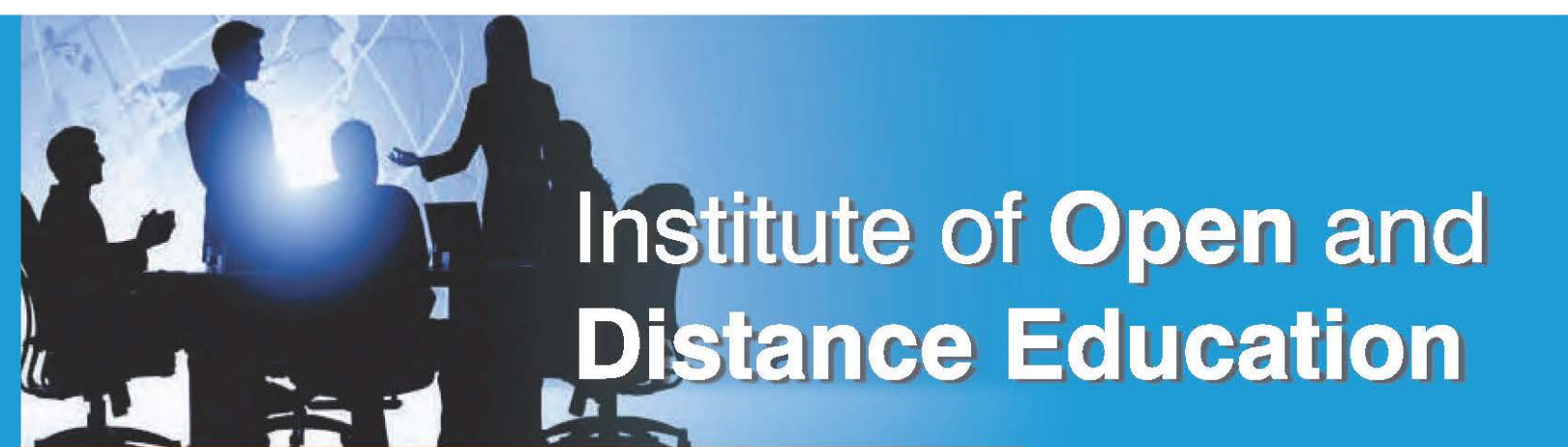




Computer Application for Managers



Institute of Open and Distance Education

Faculty of Management

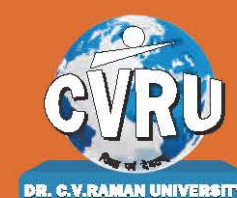
Computer Application For Managers



1MBA7



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A STATUTORY UNIVERSITY UNDER SECTION 2(F) OF THE UGC ACT

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Computer Application for Managers

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UNIT 1

INTRODUCTION TO COMPUTER

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1.0 AIMS AND OBJECTIVES

After studying this lesson, you should be able to:

- Describe computer system
- Explain characteristics of computer system
- Describe the uses of computer in business
- Explain various computer generations

1.1 INTRODUCTION

Nothing has revolutionized modern life the way rapid progress of computers has. For better or worse, computers have infiltrated every aspect of our society. Today, computers do much more than simply compute. They make airline or railway reservation and teach on-line; some super store scanners calculate our grocery bills while keeping the store inventory; computerised telephone switching has greatly improved the telephone system and Automatic Teller Machines (ATM) let us conduct banking transactions from virtually anywhere in the world.

As computers become more widespread in the workplace, new ways to harness their potential developed. As smaller computers become more powerful, they could be linked together, or networked, to share memory space, software, and information and communicate with each other.

1.2 WHAT IS A COMPUTER?

In a laymans 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. The 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 an output. We can define computer as follows:

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

Table 1.1: Terminology used in Definition of Computer

Term	Meaning
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

1.3 A SIMPLE MODEL OF A COMPUTER

Computers have shaken up the world. They have made us dependent upon them. We expect them to be present at every place: be it the reservation counter, the microwave cooking or even driving a car. Now that computers have moved in our society so rapidly, one needs, at least the basic computer skills to pursue one's career goals and function effectively and efficiently. We can say that computer literacy is the need of today and voice of tomorrow to survive in the fast changing world of computers.

For most of the people computer literacy is restricted to using the keyboard for typing a document or making use of it for the calculations. But this is not enough. One must know the fundamental concepts about what computers constitute of and how do they work. Take an example, you drive a motorbike and you take it for the servicing. There is one way that you tell the service boy to service the motorbike and I will collect it in the evening. Another way could be that you tell him that, apart from servicing, please change the engine oil and clean the carburetor too. This way the service man would be more careful while doing the job of your motorbike and you too will be able to solve at least some of the small problems when the mechanic is not available. The lack of knowledge sometimes leads to getting into great troubles. Lack of knowledge can cause mistakes while using the computer also. Sometimes this lack of knowledge causes some fear in the people. This fear is termed as CYBERPHOBIA. (This is not a technical term, it is just used for the people who are scared of using the computers.)

1.3.1 Computer: The Definition

For most of the people, computer is a machine used for calculations or computation, but actually, it is much more than that. Precisely, "Computer is an electronic device for performing arithmetic and logical operations", or "Computer is a device or flexible machine to process data and convert it into information".

Now, in the above two definitions, three words are tricky that need some explanation. Let us start with logical operations-these are the type of operations in which decision(s) is/are involved. Data is simply raw facts or figures collected whereas the information is what one gets after processing the data. Information is always useful and meaningful for the user. Let us consider an example in which marks of various subjects are collected for a particular group of students. Now, these marks independently (data) are of no use as such for the class teacher, but once she/he adds the marks of all the students and calculates their respective percentages, this becomes information and it serves her/him in finding out the answer for the queries like Who has stood 1st in the class? or How many people have got distinctions in the class? or What is the overall performance of the class?

Computers are not only used for the purpose of calculations. An accountant, a grocery shop owner, a bank or an ATM uses it like a computational device, whereas an author uses it as a writing tool, a musician as a device for controlling the music, kids as a machine for playing games and so on.

Now, you must be thinking that what is so special about this machine that people from diversified fields can use it so flexibly for entirely different functions. The answer is that "computer is programmable" meaning that it all depends upon what program computer is using for performing a particular function.

Now, the next question that comes into one's mind is, what is a program? In a very simple language we can say that "A Program is a set of instructions telling the computer what to do."

1.3.2 Basic Anatomy of Computers

Broadly computer can be said to be made up of hardware and software. The computer hardware (actual machine) is defined in such a way that it does whatever the software (computer programs) tells it to do.

There are four basic operations which a computer performs irrespective of the program which is running on it. They are classified as:

1. **Input:** This is for the purpose of inserting or feeding data into the computer by means of an input device like keyboard.
2. **Processing:** Some kind of processing is done in the computer to take out or transform the data in some way.

3. **Output:** The computer produces output on a device, such as printer or a monitor that shows the result of processing operations.
4. **Storage:** The computer stores the result of processing operations for future use in some storage device like hard disk or a floppy disk.

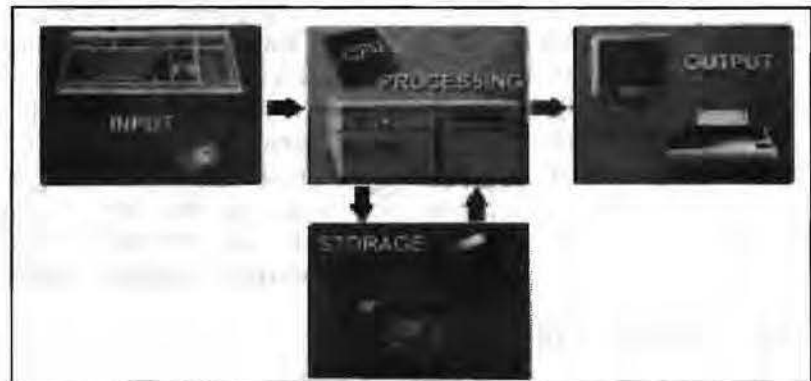


Figure 1.1

These operations are often referred to as IPOS cycle. But, the four steps of IPOS cycle — input, processing, output and storage — may not necessarily appear in the same sequence as they are defined.

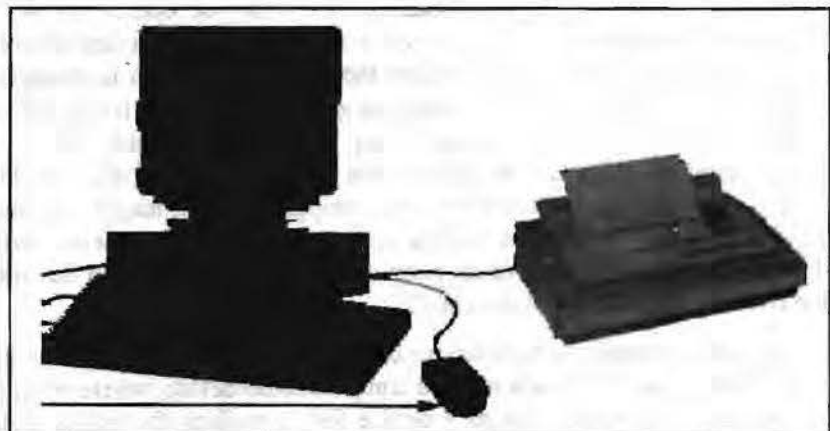


Figure 1.2

1.4 CHARACTERISTICS OF COMPUTERS

The various characteristics of computers are:

- **Speed:** A computer is a very fast and accurate device. It can process thousands of instructions within a few seconds for which a human being can take several days or months.
- **Accuracy:** Degree of accuracy of the computer is very high. Errors can occur in computerized system also but most of them occur due to human mistakes rather than technical problems in the computer.
- **Versatility:** We can perform many different tasks on the computer. One moment it might be busy in calculating the statistical data of a business organization for annual performance evaluation and at next moment it is capable of working on inventory control.
- **Permanent Memory:** We can store very large amount of information in the secondary storage devices. This information stays with the computer for further use where as humans tend to forget things.

- **No Intelligence:** A computer can perform the information processing and reasoning only on the basis of the intelligence provided by human beings (in terms of programs developed) but it cannot make decisions on its own.
- **Diligence:** Computer is free from problems like exhaustion, lack of concentration, confusion, etc., unlike human beings.

1.5 CLASSIFICATION OF COMPUTERS

The classification of computers is based on the following three criteria:

- (a) According to Purpose
- (b) According to Technology Used
- (c) According to Size and Capacity

Based on these criteria, the classification of computers is illustrated in Figure 1.3 and discussed below:

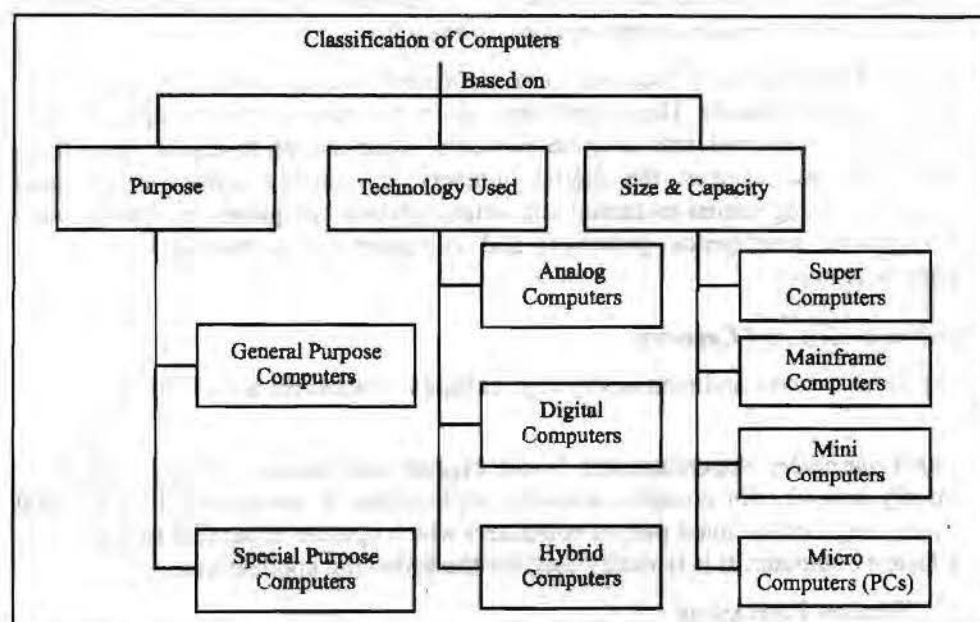


Figure 1.3: Classification of Computers Based on Different Criteria

According to Purpose

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

1. **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.
2. **Special Purpose Computers:** Computers designed from scratch to perform special tasks like scientific applications and research, weather forecasting, space applications, medical diagnostics etc. are called Special Purpose Computers.

According to Technology Used

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

1. **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.
 - (b) *Speedometer*: Car's speedometer is another example of analog computer where the position of the needle on the dial represents the speed of the car.
2. **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 enter data in decimal or character form, it is converted into binary digits (0's and 1's). Almost all the computers used nowadays are digital computers and we will discuss the detailed working and components of these computers in subsequent sections of this unit.
 3. **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).

According to Size and Capacity

According to the size and memory/storage capacity, computers are of following four types:

1. **Supercomputer**: Supercomputer is the biggest and fastest computer, which is mainly designed for complex scientific applications. It has many CPUs (Central Processing Units – main part of computer) which operate in parallel to make it as a fastest computer. It is typically used for the following applications:
 - ❖ Weather Forecasting
 - ❖ Petroleum Exploration and Production
 - ❖ Energy Management
 - ❖ Defense
 - ❖ Nuclear Energy Research
 - ❖ Structural Analysis
 - ❖ Electronic Design
 - ❖ Real-time Animation
 - ❖ Medicine

Some of the examples of supercomputers are CRAY3, CRAY-XMP-14, NEC500, PARAM 9000 and PARAM 10000.

2. **Mainframe Computer**: Mainframe computers are very large and fast computers but smaller and slower than supercomputers. These are used in a centralized location where many terminals (input/output devices) are connected with one CPU and thus, allow different users to share the single CPU. They have a very high memory (several hundred Megabytes) and can support thousands of users. They are mainly used for following applications:

- ❖ Railway and Airline Reservations
- ❖ Banking Applications
- ❖ Commercial Applications of Large Industries/Companies

Some of the examples of mainframe computers are IBM 3090, IBM 4381, IBM 4300 and IBM ES-9000.

3. **Minicomputer:** Minicomputers are medium-scale, smaller and generally slower than mainframe computers. Like mainframes, they have many terminals which are connected with one CPU and can support many users. The cost of minicomputer is very less as compared to mainframe. Therefore, it is mainly used in applications where processing can be distributed among several minicomputers rather than using a mainframe computer.

Some of the examples of minicomputers are PDP-1, IBM AS/400 and DEC Micro VAX. IBM AS/400, which is actually a midicomputer (computer with performance between a mainframe and minicomputer) is becoming very popular among minicomputers.

4. **Microcomputer:** A microcomputer is the smallest digital computer, which uses a microprocessor as its Cpu. Microprocessor is a single chip (Integrated Circuit) Cpu. Microcomputer is popularly called as Personal Computer (PC). It can be used both as a stand-alone machine and a terminal in a multi-user environment. Microcomputers are becoming very popular nowadays due to very high processing power and memory. Today, a powerful microcomputer may be used as a substitute for mini or mainframe computer.

Microcomputers are either of desktop or portable model. Portable computers can be carried from one place to another. Some of the models are called as laptops while others as notebook computers. Notebook computers are smaller, lighter and costlier than laptops. Desktop computers fit on a desktop and are used widely in offices and homes. The pictures of some of the desktop and portable computers are shown in Figure 1.4.



Figure 1.4: Some Desktop and Portable Computers

There are many types and models of microcomputers, which are summarized in Table 1.2.

Table 1.2: Different Types of Microcomputers along with the Technical Specifications of CPU

CPU Model	Clock (MHz)	Data Bus	Register (BIT)	Max. Memory (RAM)	Comments
8088	8	8	16	1 MB	First 8 bit microprocessor (Original PC)
8086	8	16	16	1 MB	First 16 bit CPU on a chip (PC/XT)*
80286	20	16	16	16 MB	5 times faster than PC/XT (PC/AT)**
80386 SX	33	16	32	16MB	80386 with an 80286 bus
80386 DX	40	32	32	4 GB	True 32 bit CPU on a chip
80486 SX	40	32	32	4 GB	Math co-processor disabled
80486DX2	66	32	32	4 GB	More speed with Math co-processor enabled
80486 DX4	100	32	32	4 GB	More speed than 486 DX2
Pentium Pro (P5)	200	64	32	4 GB	Superscope architecture Able to execute 2 instructions simultaneously
Pentium II (P6)	266	64	32	64 GB	Faster than Pentium Pro

1.6 ARCHITECTURE OF A COMPUTER SYSTEM

In last section, we discussed that there are many types of computers. The internal architectural design of computers differ from one model to another, however the basic components of a computer remains the same for all models. The diagram of a generalized architecture of a computer system is shown in Figure 1.3. Before discussing the details of computer architecture, we would define the computer system as follows:

“A complete computer installation including the central processing unit, the peripherals such as hard disk drives, floppy disk drives, monitor, printer, mouse and operating system which are designed to work and interact with each other and with the user is called a computer system.”

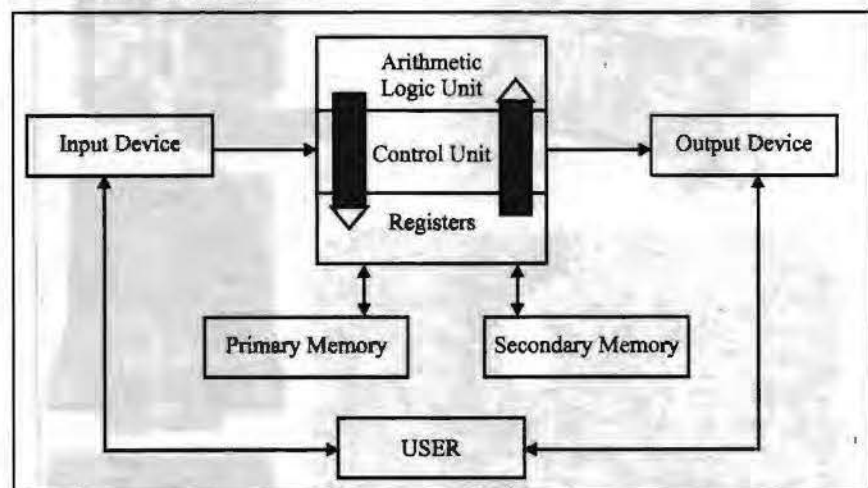


Figure 1.5: Functional Diagram of a Generalised Architecture of a Computer System

A computer system has following three main components:

- Input/Output Unit
- Central Processing Unit
- Memory Unit

1.6.1 Input/Output Unit

We know that the computer is a machine that processes the input data according to given set of instructions and gives the output. Before a computer does processing, it must be given data and instructions. After processing, the output must be displayed or printed by the computer. The unit used for getting the data and instructions into the computer and displaying or printing output is known as an Input/Output Unit (I/O Unit).

The Input Unit is used to enter data and instructions into a computer. There are many peripheral devices which are used as input/output units for the computer. The most common form of input device is known as a terminal. A terminal has a electronic typewriter like device, called keyboard along with a display screen, called Visual Display Unit (VDU) or monitor. Keyboard is the main input device while monitor can be considered both as an input as well as an output device. There are some other common input devices like mouse, punched card, tape, joystick, scanner, modem etc., which are explained in later part of this unit. Monitor, printer and plotter are the main peripheral devices used as output units for the computer.

1.6.2 Central Processing Unit

Central Processing Unit (CPU) is the main component or "brain" of a computer, which performs all the processing of input data. Its function is to fetch, examine and then execute the instructions stored in main memory of computer. In microcomputers, the CPU is built on a single chip or Integrated Circuit (IC) and is called as Microprocessor. The CPU consists of following distinct parts:

1. **Arithmetic Logic Unit (ALU):** The arithmetic and logic unit of CPU is responsible for all arithmetic operations like addition, subtraction, multiplication and division as well as logical operations such as less than, equal to and greater than. Actually, all calculations and comparisons are performed in the arithmetic logic unit.
2. **Control Unit (CU):** The control unit is responsible for controlling the transfer of data and instructions among other units of computer. It is considered as a "Central Nervous System" of computer, as it manages and coordinates all the units of computer. It obtains the instructions from the memory, interprets them and directs the operation of the computer. It also performs the physical data transfer between memory and the peripheral device.
3. **Registers:** Registers are the small high speed circuits (memory locations) which are used to store data, instructions and memory addresses (memory location numbers), when ALU performs arithmetic and logical operations. Registers can store one word of data (1 word = 2 bytes & 1 byte = 8 bit; details of BITS and BYTES are discussed in later part of this unit) until it is overwritten by another word. Depending on the processor's capability, the number and type of registers vary from one CPU to another. Registers can be divided into six categories viz. General Purpose Registers, Pointer Registers, Segment Registers, Index Registers, Flags Registers and Instruction. Pointer Registers, depending upon their function. The detailed functions of each and every register is beyond the scope of this book.
4. **Buses:** Data is stored as a unit of eight bits (BIT stands for Binary Digit i.e. (0 or 1) in a register. Each bit is transferred from one register to another by means of a separate wire. This group of eight wires, which is used as a common way to transfer data between registers is known as a bus. In general terms, bus is a connection between two components to transmit signal between them. Bus can be of three major types viz. Data Bus, Control Bus and Address Bus. The data bus is used to move data, address bus to move address or memory location and control bus to send control signals between various components of a computer.

5. **Clock:** Clock is another important component of CPU, which measures and allocates a fixed time slot for processing each and every micro-operation (smallest functional operation). In simple terms, CPU is allocated one or more clock cycles to complete a micro-operation. CPU executes the instructions in synchronization with the clock pulse.

The clock speed of CPU is measured in terms of Mega Hertz (MHz) or Millions of Cycles per second. The clock speed of CPU varies from one model to another in the range 4.77 MHz (in 8088 processor) to 66 MHz (in Pentium) CPU speed is also specified in terms of Millions of Instructions Per Second (MIPS) or Million of Floating Point Operations Per Second (MFLOPS).

1.6.3 Memory Unit

Memory Unit is that component of a computer system, which is used to store the data, instructions and information before, during and after the processing by ALU. It is actually a work area (physically a collection of integrated circuits) within the computer, where the CPU stores the data and instructions. It is also known as a Main/Primary/Internal Memory. It is of following three types:

- (a) Read Only Memory (ROM pronounced as "Ra-om")
 - (b) Random Access Memory (RAM pronounced as "R-aem")
 - (c) Complementary Metal Oxide Semiconductor Memory (CMOS)
- (a) **Read Only Memory:** Read Only Memory is an essential component of the memory unit. We know that the computer, being a machine, itself has no intelligence or memory and requires the instructions which are given by man. Whenever the computer is switched on, it searches for the required instructions. The memory, which has these essential instructions, is known as Read Only Memory (ROM). This memory is permanent and is not erased when system is switched off. As appears with its name, it is read type of memory i.e. it can be read only and not be written by user/programmer. The memory capacity of ROM varies from 64 KB to 256 KB (1 Kilobyte = 1024 bytes) depending on the model of computer.

ROM contains a number of programs (set of instructions). The most important program of ROM is the Basic Input Output System (BIOS, pronounced as "bye-os") which activates the hardware (physical components of computer) such as keyboard, monitor, floppy disk etc. in communicating with the system and application software (set of instructions or programs).

Types of ROM: There are many types of ROM available for microcomputers like Mask ROM, PROM, EPROM, EEPROM and EAPROM.

- (b) **Random Access Memory:** Random Access Memory (RAM) is another important component of Memory Unit. It is used to store the data and instructions during the execution of program. Contrary to ROM, RAM is temporary and is erased when computer is switched off. RAM is a read/write type of memory and, thus can be read and written by user/programmer. As it is possible to randomly use any location of this memory, therefore, this memory is known as random access memory. The memory capacity of RAM varies from 640 KB to several megabytes (1 Megabyte = 1024 KB) with different models of PC.

Types of RAM: There are two types of RAM used in PCs - Dynamic and Static RAM.

- (c) **Complementary Metal Oxide Semiconductor Memory:** Complementary Metal Oxide Semiconductor (CMOS) memory is used to store the system configuration, date, time and other important data. When computer is switched on, BIOS

matches the information of CMOS with the peripheral devices and displays error in case of mismatching.

1.7 COMPUTERS IN BUSINESS

Computers can process vast quantities of business data at enormous speed with unfailing consistency and unimaginable flexibility.

These capabilities of computers open new approaches to problem solving and data processing.

Following six characteristics of computers make them indispensable for use in business:

- (a) **Speed:** Computers speed up data processing by many orders of magnitude as compared to the manual system.
- (b) **Data Volume:** Vast amount of data can be stored and processed very quickly.
- (c) **Repetitiveness:** The more repetitive the task, the more profitable it is to automate it.
- (d) **Complexity:** Problems with several interacting variables can be solved quickly and accurately.
- (e) **Accurate Output:** As high accuracy can be obtained as needed; also accuracy is not affected by boredom and fatigue and is not Subjective.
- (f) **Declining Costs:** There has been a steady decline in the cost of per unit of data processed.

1.8 FACILITIES AVAILABLE IN COMPUTERIZED SYSTEM

1.8.1 For Data Capture

Data capture is the identification of new data to be input. It is always best to capture the data as soon as possible after it is originated.

The commonly used input device is a keyboard. Mouse, joy stick, light pen, touch screen, and trackballs are some of the devices which do not require typing of input information.

On-line Mode: Following devices are used to capture data on-line:

Keyboard

- A computer keyboard is a sophisticated electromechanical component designed to create special standardized electronic codes when a key is pressed.
- The codes are transmitted along the cable that connects the keyboard to the computer system unit or terminal, where the incoming code is analyzed and converted into the appropriate computer usable code.

Light Pen

- It is a pointing device, used to select a displayed menu option on the CRT. Light pens are frequently used by graphics designers, illustrators, and drafting engineers.
- It is capable of sensing a position on the CRT screen when its tip touches the screen.

- A user can draw directly on the CRT screen with the light pen if the computer system is provided with Computer Aided Design (CAD) package such as AutoCad 14.

Mouse

- A mouse is also a pointing device.
- As the mouse is rolled across the desktop, the cursor moves across the screen.
- The user can select menu or command by pushing a button on the mouse once or twice.

Scanners

Scanners are a kind of input device. They are capable of entering information directly into the computer. The main advantage of direct entry of information is that users do not have to key in the information. This provides faster and more accurate data entry.

Important types of scanners are:

- (a) Optical scanners
- (b) Magnetic ink character readers

Optical Scanners

The following are the commonly used optical scanners:

- Optical Character Readers (OCR)
- Optical Mark Readers (OMR)
- Optical Bar-Code Readers

Terminals

Terminals can be "dumb", "smart", or "intelligent", and are used mainly by those who do their work on mini or mainframe computers (or supercomputers).

A variety of computer terminals are used to enter data, including the following popular types:

- Point-of-Sale (POS) terminals
- Financial transaction terminals
- Executive workstations
- Portable terminals
- Microcomputers used as terminals

Smart Cards

- It contains a build-in microcomputer chip.
- In case of smart cards, there are less chances of fraud.
- How much cash a customer has to his credit is stored in the chip before it is issued to him.
- When the customer uses the card to make purchases, the required amount is deducted from the balance by a special electronic machine used by merchants.
- The electronic machine used by merchants communicates with the card issuing company's computer from time to time for money transactions. Thus, a card holder has the facility of keeping electronic money with him.

- When his electronic money is used up, he can replenish electronic money by depositing money at automated banking machine of card-issuing company.
- A record of purchases made by the customer can also be stored in a smart card.

Off-line Mode: Off-line data entry involves devices through which data are recorded on some media and then into the computer later.

In almost 90% of the applications, data entry is done off-line. This saves the precious computer processing time.

The following devices are used to capture data off-line.

Key-to-tape

A Key-to-tape device, also known as magnetic tape encoder, is designed to record keyed data directly onto magnetic tape.

Key-to-floppy

These data entry machines are used to store data directly on flexible disks, called diskettes or floppies.

Key-to-disk

Used as data recording stations in systems where data from different points has to be recorded for processing at one point.

1.8.2 For Data Validation

The accuracy of input data should either be verified manually or by a computer program. Some of the techniques used for this purpose are described below:

Using Control Totals

In this technique, the verification program verifies the total.

When business transaction occurs, it is noted down and calculated at the point of transaction (by clerk) and the same transaction data is entered by the computer operator in the computer system.

The data entered by the operator are totalled by the computer. If the two entries do not match, then it is a clear indication that there is a mistake.

In this manner only correct data will be passed to the machine before processing is done.

Using Built-in Cheques by the Computer Program

There should be some control to make sure that no data are entered which is beyond a certain value.

For example, the salary cheques for a particular organization may not exceed Rs. 20,000.

If so, then if a cheque is made for an amount more than Rs. 20,000, then computer will point an error.

1.8.3 For Storage and Retrieval

Once the valid data has been entered in the system, it is essential that this data is stored securely for future use.

Major types of external storage devices used in computerised systems are:

- Magnetic tapes or cartridge

- Hard disks
- Floppy disks
- Compact Disk (CD)

1.8.4 For Output

There are two basic categories of computer-produced output:

- Output for immediate use by people, and
- Output that is stored in computer-usable form for later use by the computer. Output can be in either hard copy or soft copy form.

Hardcopy Output Devices

The commonly used hardcopy output devices are:

- (a) **Printers:** These are the most popular commonly used output devices.
 - ❖ Capable of printing characters, symbols, and sometimes graphics on paper.
 - ❖ Printers are categorized according to whether the image produced is formed by physical contact (impact printers) or not (non-impact printers) of the print mechanism with the paper.
- (b) **Plotters:** A plotter is a specialized output device designed to produce high-quality graphics in a variety of colors.

There are two basic types of plotters: those that use pens and those that do not. Drum plotters and flatbed plotters both use pens. Electrostatic plotters do not.
- (c) **Microfilm and Microfiche:** In this technique the output from the computer is recorded on a microfilm as microscopic film images. The information recorded on the microfilm can be read with the help of a microfilm reader.
 - ❖ A microfiche (pronounced as fish, French word, which means card) is a 4 x 6 inch film sheet.
 - ❖ It can store up to 270 pages of information.
 - ❖ It is easier to read a microfiche as compared to a microfilm.

Softcopy Output Devices

Cathode Ray Tube (CRT)

- Probably, the most popular softcopy output device.
- Used with terminals connected to large computer systems and as a monitor for microcomputer system.
- The CRT's screen display is made up of small picture elements, called pixels for short. The smaller the pixels, the better the image clarity, or resolution.

Voice Output Systems

- Relatively new and can be used in some situations where traditional display screen softcopy output is inappropriate.
- Two different approaches to voice output have evolved, speech coding and speech synthesis.
- Used in applications such as automobiles, toys, and games.

1.8.5 For Transmission

The most exciting developments in data processing today is data communication.

Communications, the transfer of information is the basis of office automation.

Some examples of everyday data communication are:

1. **Airline Reservation:** Computer is usually located far from the agent; data communication must be used to relay data from the terminal to the computer and back.
2. **Automated Banking:** ATMs are now widely used in most banks for better customer services. The user can make deposits and withdrawals, check balances, and even pay utility bills through the machines.
3. **Point-of-Sale Terminals:** Used in retail stores, instead of cash registers. These terminals send records of sales to a central computer, which maintains accounting and inventory records.

Data communication takes on several forms. These are given below:

- (a) Data can be transferred between two geographically distant personal computers by using modems, the dial-up telephone system, and a communications program in each computer.
- (b) Data can be transferred between two side-by-side computers by hooking up a cable from one computer's serial port to the other computer's serial port.
- (c) PC can act like a remote terminal to a mini or mainframe computer.
- (d) PC can be part of a local area network, in which software and hardware resources can be shared among many user.

1.9 INDIAN COMPUTING ENVIRONMENT

Office work includes many administrative and management activities. The preparation, distribution, processing and review of documents are the common activities of an organization. Prior to the advent of computers, these office activities were either performed manually or with the help of mechanical and electrical machines. During the past few decades, the basic nature of office has changed remarkably. Office automation deals in application of latest technologies in improving the overall proficiency of the office.

1.9.1 Office Automation

"Office automation is the application of computer and related technologies like communication and networking to integrate the general office tasks so that the efficiency of office work is improved."

"Office automation does not mean just to install computers and communication devices in an office, but it is much more than that. We will discuss in later part of this unit, how an office can be automated in a real sense."

Needs for Office Automation

Although all the work of a small or big office can be performed manually, but it is very difficult or even impossible today for an organization to compete in the market without office automation. There are many essential requirements of today's office environment, which are listed below:

- To reduce cost of administrative overhead;
- To increase the efficiency of office tasks;

- To provide better service to the customers;
- To provide accurate information to the management;
- To provide best and fastest way of communication.

The above requirements cannot be achieved without using latest technologies and therefore, office automation is needed for an organization.

Office Functions Needed to be Automated

Many types of functions are performed in an office. The basic functions, which are needed to be automated in any office are:

1. **Document Generation:** In all offices, many documents are needed to be prepared, typed and printed. Typewriters, computers and printers are widely used in automating this routine task of offices.
2. **Document Processing:** Documents are also needed to be processed in order to extract useful information required for MIS and other official purposes. Many office automation tools like word processing, desktop publishing etc. are used to perform this task.
3. **Document Distribution:** All offices require an electronic distribution system for transferring documents and data within and outside the organization. The main office automation tools for distribution of documents are Photocopiers, Teletax and Fax machines.
4. **Archival Storage:** The office documents are also needed to be stored for a long period, so that they can be retrieved when required. This task is achieved by the use of different storage devices like tapes, disks etc.

Office Automation Systems

For achieving the basic functions of an office, different types of office automation systems are used. These systems can be broadly classified into following four types:

1. **Document Management Systems:** These systems include computerised tools for generation, storage, processing and distribution of documents.
2. **Communication Systems:** These systems are used for sending messages, documents and data within and outside the organization.
3. **Teleconferencing Systems:** An electronic means of communication for conducting seminars and training programmes in an organization is achieved through various teleconferencing systems.
4. **Support Systems:** Besides the above major office automation systems, certain support systems for managing the activities of work groups are also used in some offices.

1.10 COMPONENTS OF COMPUTER SYSTEM

Computer components can be broadly divided into two categories – Hardware and Software. Hardware refers to any physical component of a computer. For example, CPU, Monitor, Keyboard, Hard Disk, Floppy Disk etc. are physical components and thus, are hardware. Software refers to the programmes which are required to operate the computer. For example, DOS (Disk Operating System), BASIC, COBOL, dBASE, An Accounting Software etc. are all software. An analogy of hardware can be the book which you are reading and then software would be the text written on this book. Another analogy could be - 'brain' is a hardware but 'memory stored in brain' is a software.

Both hardware and software are dependent on each other. CPU, Memory Unit, Hard Disk etc. are useless until they are provided instructions and data for storage and processing. Similarly, BASIC or COBOL language has no use until it is stored and processed by hardware components of computer.

1.10.1 Hardware Components of Micro Computer

In today's computer industry, a wide variety of hardware components are available for microcomputers. Managers must be aware of the working and uses of different hardware components, so that they can make good decisions about purchase of computer systems. The hardware components of microcomputer can be classified into following types:

- (a) Motherboard
- (b) Input Devices
- (c) Output Devices
- (d) Storage Devices
- (e) Cards
- (f) Ports and Cords
- (g) Power Supply

All these hardware devices except motherboard are called peripheral devices, as they are connected to the motherboard.

Motherboard

Motherboard, also called as System Board, is the most important hardware component of a microcomputer. Motherboard is so called as all the other boards (printed circuit boards having chips or other electronic components) of the computer are connected to this board, hence it is like mother of all other boards.

Box 1.1: Components of Motherboard

A motherboard contains the CPU chip, Memory chip (ROM and RAM chips), I/O interface, expansion slots and many other logic circuits. It may also contain a maths co-processor chip. CPU or processor chip is the main component of motherboard. The types of CPU chip (8088/80286/80386/80486 etc.) vary from one model of PC to another. The function of maths coprocessor chip (8088/80287 etc.) is to support the CPU chip in processing of mathematical calculations.

Memory chips are physically installed on the motherboard by different packing methods. There are three different types of packing of RAM chips DIP, SIMM and SIPP. DIP (Dual Inline Package) is the most common packing, having a small rectangle box with leads on both sides. SIMM (Single Inline Memory Module) packing contains a number of chips soldered on an expansion board having an edge connector. SIPP (Single Inline Pin Package) is similar to SIMM, but uses pin rather than an edge connector. Expansion slots are connectors on motherboard where expansion cards like display card, hard disk controller card etc. can be connected. I/O interface is the channel between the CPU and a peripheral devices (keyboard, monitor etc.).

Input Devices

Input devices are used to input data, information and instructions into the RAM, The common input devices of a PC are described below and shown in Figure 1.4.

- **Keyboard:** Keyboard (similar to a typewriter) is the main input device of computer. It contains three types of keys – alphanumeric keys, special keys and function keys. When a key is pressed, an electronic signal is produced. This signal is detected by a keyboard encoder that sends a binary code corresponding to the

key pressed to the CPU. There are many types of keyboards but 101 Keys Keyboard is the most popular one.

- **Mouse:** Mouse (similar to a mouse) is another important input device. 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, which senses the movement of the mouse and sends the corresponding signals to CPU on pressing the buttons.
- **Trackball:** A trackball looks like a mouse, as the roller is on the top with selection buttons on the side. It is again a pointing device used to move the cursor and works like a mouse.
- **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. 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.
- **Touch Screen:** Touch screen is sensitive to human fingers. Using this device, the user can point to a selection on the screen instead of pressing keys.
- **Joystick:** Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is mainly used in Computer Aided Designing (CAD) and playing computer games.
- **Digitiser:** Digitiser is used to create drawings and pictures using a digitiser tablet by a process called digitising. Digitising is a process by which graphic representations are converted into digital data. The user makes contact with the flat digitiser tablet with a pen-like stylus. As the stylus is connected to the tablet by a wire, the traced image is stored in RAM and displayed on monitor.
- **Scanner:** Scanner is mainly used in Desktop Publishing (DTP) applications. Scanner is used for digitising images such as photographs, forms, documents etc. into computer memory. Some scanners can also read text by converting them to digital code. These scanners are very useful for converting the typed pages into word-processing files. Graphics scanners convert a printed image into video image without converting it to digital code.
- **Optical Mark Reader (OMR):** It is a special type of optical scanner used to recognize 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 specially used for checking the answer sheets of examination having multiple choice questions.
- **Optical Character Reader (OCR):** It is also an optical scanner, which is capable of detecting alphanumeric characters typed or printed on paper using an OCR font. 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:** This device is an optical scanner used for reading bar-coded data (data in form of light and dark lines). Bar-coded data is generally used in labelling goods, numbering the books or encoding ID or A/c numbers.
- **Magnetic Ink Character Recognition (MICR):** MICR is used to recognize the magnetically-charged characters, mainly found on bank cheques. MICR is used by the banking industry for the processing of cheques. A special equipment is used to encode, decode and process the cheques.
- **Voice-Input Devices:** These devices can recognize the human voice. They seem to be very useful but are not popular due to storage of limited vocabularies and variations in way of pronouncing words by different persons.

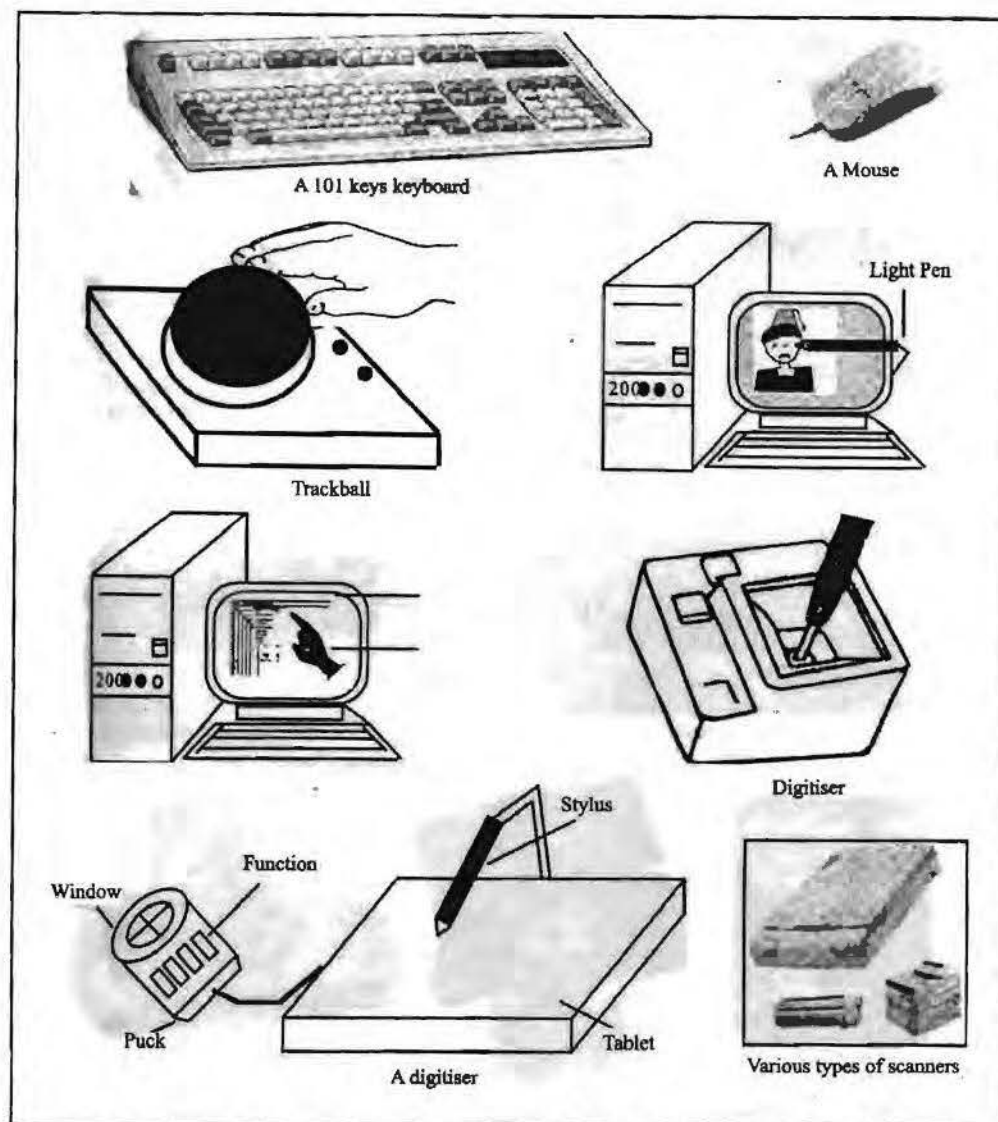


Figure 1.6: Common Input Devices of a PC

Output Devices

Output devices are hardware components which are used to display or print the processed information. The common output devices are described below and shown in Figure 1.7.

Monitor

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

- (a) CGA (Color Graphics Adapter)
- (b) MDA (Monochrome Display Adapter)
- (c) HGA (Hercules Graphics Adapter)
- (d) EGA (Enhanced Graphics Adapter)

(e) VGA (Video Graphics Adapter)

(f) SVGA (Super VGA)



Figure 1.7: Common Output Devices of a PC

Depending upon color of display, monitors can be classified as Monochrome (with single color black/white display) and Color (with all colors display) Monitors.

Printer

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

Types of Printers: There are many types of printers which are classified on various criteria as illustrated in Figure 1.8. Printers can be broadly categorized into two types.

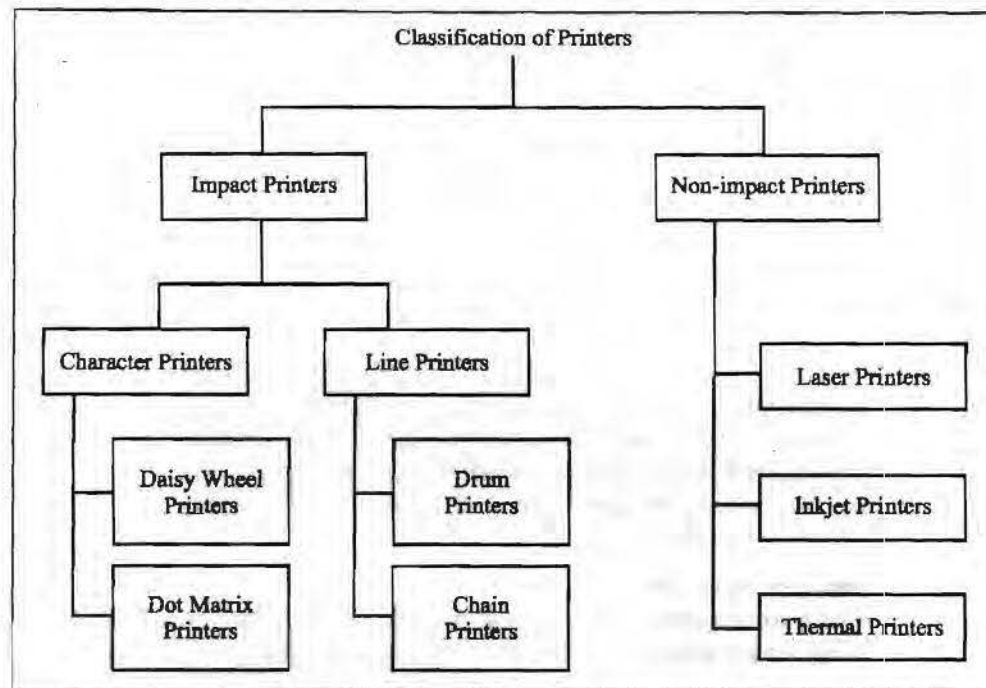


Figure 1.8: Classification of Printers

1. **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 Printers:** These printers print one character at a time. These printers are again of two types Daisy Wheel and Dot Matrix Printers. Daisy Wheel Printers these printers print the characters by a mechanism that uses a plastic or metal hub with spokes, called daisy wheel. 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. 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.
 - (b) **Line Printers:** These printers print one line at a time. Their printing speed is much more than character printers. They are again of two types Drum Printers and Chain Printers. Drum Printers these printers print the line by a rotating drum having a ring of characters for each print position. The hammers 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 as 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 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.
2. **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:** These printers look and work like photocopiers. 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 charged 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. 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 color cartridges for multi-color printing.
- (c) **Thermal Printers:** These printers print the characters by melting a waxbased ink off a ribbon onto a special heat sensitive paper. They give letter-quality printing but are relatively expensive in maintenance than other printers.

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 discussed below:

- (a) **Flatbed Plotters:** These plotters print the graphical images by moving the pen on stationary flat surface material. They produce very accurate drawings.
- (b) **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.
- (c) **Inkjet Plotters:** These plotters use inkjets in place of pens. They are faster than flatbed plotters and can print multi-colored large drawings.

Computer Output Microfilm

Computer Output Microfilm (COM) is a technique to produce output on a microfilm media (microfilm reel or microfiche card) as illustrated in Figure 1.9. 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.

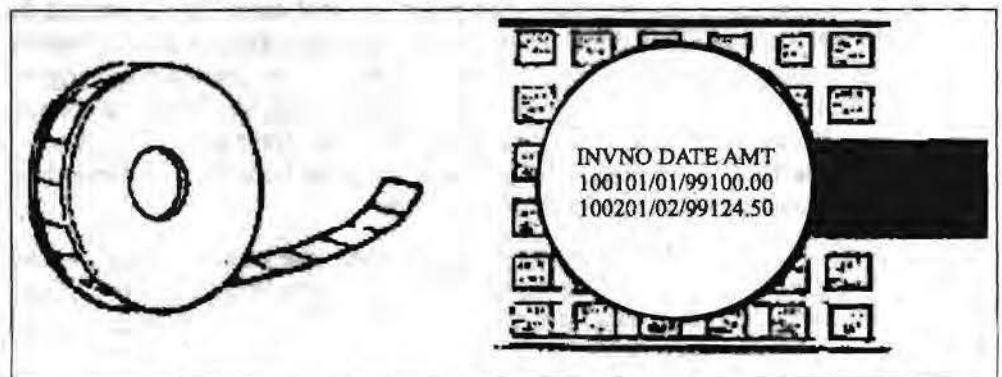


Figure 1.9: Computer Output/Microfilm

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 organizations which need to store and manipulate large amount of data. It helps them in tremendous savings in paper and document handling costs.

Storage Devices

In preceding part of this unit, we have discussed about the primary memory of computer. Primary memory (especially RAM) stores the data, instructions and informations temporarily during processing by CPU. When computer is switched off, this memory gets erased. How does a computer store the data, information and software permanently, so that they can be retrieved whenever required? Certainly, there must be some storage devices in computer. Now, we will discuss about different Storage Devices, sometimes also called as Secondary Memory Devices.

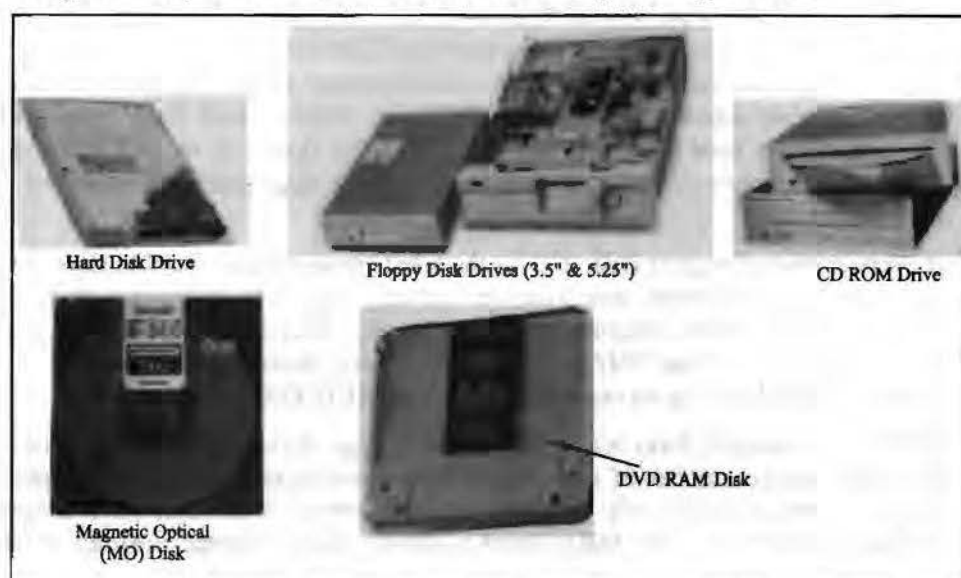


Figure 1.10: Common Storage Devices

There are many storage devices used with microcomputers. Some of the common storage devices are explained below and shown in Figure 1.10.

1. **Winchester Disk (Hard Disk):** Winchester Disk is the most common storage device of present day microcomputers. It is popularly called as Hard Disk Drive (HDD) or sometimes as Fixed Disk Drive. It is fixed inside the computer and is not easily removable. It is used for storing the software and data inside computer. It is known as 'Winchester Disk', probably because this drive was first made by IBM at Hursley Laboratory, located near Winchester in England.

Winchester Disk consists of one or more disk platters, an access mechanism and read/write heads which are sealed in a case. Hard disk size depends upon the disk platter's diameter. There are many different platter sizes (such as 5½, 3½, 2½ inch etc.). The 3½ inch size platter is common with PCs and 2½ inch with laptop/portable computers. Read/write head is used to write any information on the disk surface or to read it back.

There are different types of hard disks depending upon their storage capacities. Storage capacities of hard disks range from 10 MB to 6.3 GB, but 4.3 GB are nowadays a common part of Pentium computers.

2. **Floppy Disk:** Floppy Disk (FD) is another common storage device which is small, flexible and easily removable. It is made of a plastic disk coated with magnetic

material, which is sealed inside a square plastic jacket. It is called as 'Floppy' because it is soft having flexible physical property. Data can be written on or read from this floppy by a drive, called Floppy Disk Drive (FDD), which is fixed inside the computer.

Table 1.3: Comparison among Different Types of Floppies

Type of Floppy	Size	Density	Sectors	Tracks	Storage Capacity
DSDD*	5.25 inch	Double	9	40	360 K
DSLDD*	3.5 inch	Low	9	80	720K
DSHD* Big	5.25 inch	High	15	80	1.2MB
DSHD Small	3.5 inch	High	18	80	1.44 MB

*DS stands for Double Sided, LD for Low Density and HD for High Density

There are many types of floppies depending upon their sizes and storage capacities as illustrated in Table 1.3. The original floppy, developed by IBM, is an 8" floppy, but the most popular sizes available for present day PCs are 5¼" and 3½". The storage capacity of floppies vary from 360 KB to 1.44 MB. The floppies can store data on both sides (Double-sided Floppies) or on single side (Single-sided Floppies) depending upon the floppy drive. Double sided floppy drives are most frequently used in present day PCs. The latest floppy drive, that packs two high density floppy drives (5.25 & 3.5 inch) into a single package, is known as Combo Drive.

3. **Compact Disk:** Compact Disk (CD) is the latest storage device, used to store data, information and software, which can be read only and not be changed or erased. It is an optical read only memory, made up of a resin. Therefore, it is actually called as Compact Disk Read Only Memory (CD-ROM). However, the information is stored on CDs by using an expensive drive, called CD-ROM drive.

Nowadays compact disks are very popular storage devices for microcomputers because a large number of software including multimedia, audio and graphics software are available only on these disks. Compact Disks can store a large volume of data (upto 680 MB), which is almost same a storage capacity of 630 MB Hard Disk.

WORM (Write Once Read Many) is a type of compact disk which can be recorded only once and not erased. It can store more data than CD-ROM, generally measured in gigabytes.

4. **Magnetic Tape:** Magnetic tape is the oldest storage device available for microcomputers. It is generally used to store a large volume of data that is needed to be sequentially accessed and processed. The tape is made up of a plastic ribbon coated with an iron-oxide material, which can be magnetized. The data stored on tape can be read as well as erased and written again.

Magnetic tape is a sequential access storage device, hence it is not possible to read the data randomly or directly. Therefore, magnetic tapes are suitable only for storing data for backups and batch mode applications and not for on-line applications. On the other hand, magnetic disks (floppy and hard disks), which are discussed above, are considered best storage devices for on-line applications.

5. **Video Disk:** Video disk is used to store text, video and audio data. It is widely used for training applications as it can be played like a phonograph record.
6. **Magneto Optical Drive:** Magneto Optical (MO) drive is the latest of all storage devices. This drive uses both a laser and an electromagnet to record data on a removable cartridge. The surface of the cartridge contains tiny embedded magnets. The unique feature of MO drive is that it has a very high storage capacity.

Although MO drive is costlier and slower than HDD, it has a long life and is more reliable.

7. **DVD ROM/RAM Disk:** DVD ROM and DVD RAM disks are optical disks having a storage capacity of 4.7 GB and 5.2 GB respectively. These disks are becoming the next generation's new standard for higher capacity removable media. They are ideal for storage of huge amount of information required for multimedia applications. One can put 133 minutes of high quality of video with digital sound on a DVD RAM Disk.

Cards

Cards are the printed circuit boards used to hold the chips (integrated circuits). There are many types of cards used in PC, the important ones are Video Card, Sound Card, I/O Card, Controller Card and Memory Card. Video card (Display Card) generates the text and graphic images for monitor while sound card generates the sound. Pentium computers, generally, use a PCI (Peripheral Component Interconnect) video card to speed up graphics. I/O Card provides a place for connecting mouse and printer. Cables of hard disk and floppy disk are connected to controller cards. Memory Card provides a place for memory chips.

Ports and Cords

Besides the important hardware discussed above, the computer has several components which are used as pathway for flow of data. The rear of a PC has many empty holes or external sockets called ports or connectors. There are many types of ports in a PC, the most important ones are Serial Port, Parallel Port, Game Port and Video Port. Serial Port is used to connect a mouse, modem or scanner. Parallel Port is generally used to connect a printer. Game Port is used to connect the joystick while Video Port is a connector for monitor.

Cords are the cables used to plug into the ports. There are different types of cables for connecting different types of input, output and storage devices. The important cords used in a PC are keyboard cords, power cords, monitor cords and printer cords.

Power Supply

Power supply is considered as the 'Heart' of a Pc. Computer requires a clean and steady power source for working properly. Power supply is that important hardware, which provides the power source to a computer. It provides a voltage range of 4.95 to 5.25 volts for the highest performance of the system. Power supplies vary in size and power (in watt).

1.10.2 Classification of Software

Software are broadly classified into following two types:

- (a) System Software
- (b) Application Software

System Software

Software, which 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 categorized into following three types:

- (a) System Management Software
(Operating Systems, DBMS, Operating Environments)
- (b) System Development Software
(Language Translators, Application Generators, CASE Tools)
- (c) System Software Utilities

Application Software

Software which are required for general and special purpose applications like database management, word processing, accounting etc. are called as 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.

- (a) General Purpose Application Software
(Database Management Packages, Word Processors, Spreadsheets, Office Automation Packages)
- (b) Special Purpose Application Software
(Desktop Publishing, Multimedia, Business Applications)

1.11 THE COMPUTER GENERATIONS

In recent years, the computer industry has grown at a phenomenal pace. In a short time of 35 years or so, computers have improved tremendously. In the last decade the speed of computer has increased 200 times. Not only that the reliability curve has also taken a sharp increase. The cost per unit of calculating has gone down by 500 times. The storage capacity is increasing so fast that now it seems that nothing is impossible to store. Large data can be stored in very small devices.

The term “generations” was initially introduced to distinguish between different hardware technologies. Gradually it shifted to both hardware and software as the total systems consists of both of them.

The computers can be divided in five past generations, i.e, depending upon the technologies used. The five generations of computer are:

1.11.1 First Generation (1942 – 1955)

Until 1951, electronics computers were the exclusive possession of scientists and the military. Till then nobody tried to use them for business purpose. The idea of marketing them was conceived by Mauchly and Eckert, creators of ENIAC's. As US census bureau was already using IBCP cards, they were the pioneers in buying this computer for the first time in 1951. The company created by M and ETS became UNIVAC division of Sperry and Corporation (later known as UNISYS).

The bringing of first UNIVAC (Universal automatic computers) general purpose electric digital computer, marks the beginning of the first generation of electronic computers.

These computers used valves and all the components were joined by copper wires. Due to large size of the components and due to the facts that the components had to be spaced apart as the valves dissipated a lot of heat, the computers were very bulky and required huge electric power, airconditioners, maintenance and space for their installation. Further, the speed of operation was very slow and had a very low reliability factor as vacuum tubes failed frequently. They were still given the name of “electronic brains” by the journalist. They also said that these electronic brains will

change the world one-day. Later IBM corporation developed IBM 701, IBM 702 and IBM 650 and few other systems. These were called the first generation computers. The popular brand of first generation computer was IBM 650, which had a magnetic drum memory and utilized punch cards for input and output. This type of computer was of an intermediate size and was designed to meet the requirements of business and scientific applications. The available memories ranged from a few hundred thousand words of main storage. The cycle time was of the order of few milli seconds. It was only after 1957 that magnetic tapes were introduced as a faster and convenient storage medium. A single tape could hold approximately 1100 P cards (i.e. about 2 pages of information).

IBM made 19 IBM 701 computers and at that time industry felt that these 19 computers are sufficient enough to take care of American business. These computer required special facilities and highly trained personnel.

The instructions given to FGC were in machine language (i.e. 0's and 1's). As the language was tough and understood by very few people. There were very few personnel available for it.

Computer belonging to this generation had the following characteristics:

- Comparatively large in size as compared to present day computers.
- Generated lot of heat, they were not consistent and reliable as the valves tended to fail frequently.
- Low capacity internal storage.
- Individual, non-related models.
- Processors operated in the milliseconds speed range.
- Internal storage consisted of magnetic drum and delay lines.

1.11.2 Second Generation (1955 – 1964)

FGC were very unreliable, mainly because of vacuum tubes which kept on burning out. Users had to be prepared all the time with dozen of extra tubes to replace them. The computers of this generation were characterized by the use of Solid State devices (transistors) instead of vacuum tubes. Transistorized circuits were smaller, generated little heat, were less expensive and consumed less power than vacuum tube circuits and were much greater in processing capacity. Since transistors had a faster switching action, this generation computers were significantly faster and smaller and were more reliable too than first generation computers. The use of magnetic cores as the primary internal storage medium and the introduction of removable magnetic disc pack were other major developments of the second generation. Although magnetic tapes were still used commonly. These computers had built in error detecting devices and more efficient means were developed to input and retrieve from the computer. They were easier to work with. More efficient programming methods and higher level languages like FORTRAN and COBOL become available. It was easily understandable by people especially because no codes (like Assembly language) had to be remembered by the programers. Moreover unlike Assembly language the high level language were not machine specific i.e. same set of programs could be used on computers produced by different manufactures. The instruction cycle time dropped from several hundred microseconds of the first generation in tens of micro- seconds of the second generation. The main memory in these systems could store several hundred thousand words.

This generation of computers could communicate with others using telephone lines. Transmission of data from one computer to another was possible in this generation of computers. Although the processing was very slow but the idea was convenient which was further developed in next generations. The problems which second-generation

computer faced was that input and output devices were too slow. The projects started in second generation to solve these problems. They used second generation technology but finally proposed results in third generation.

Dr Daniel Slotnick worked out first solution. He was working with Burroughs Corporation, at that time. He designed a computer for the US department of Defence and tried to solve the problem of machines sitting idle waiting for input and output. The computer known as ILLIAC IV was developed. It has 4 control units and thus was able to perform input/output and processing (mathematical operation) at the same time. Slotnick was granted a patent for "Parallel Processing". They were also called as first super computer. The second super computer was proposed by MIT (Massachusetts Institute of Technology) by a group of students and professors. The name of the project was MAC (Multiple Access Computer) and concept of multiprogramming was developed there. The system could process the programs concurrently which were run by different users.

Some of the popular models in this generation of computer systems, we IBM-1401, IBM-1620, BURROUGHS B-200 SERIES, HONEY-WELL H-400, NATIONAL CASH REGISTER NCR-315, 500 AND UNIVAC-1004. Many of these computers were used for business applications.

Computers of this generation had the following characteristics:

- Smaller in size compared to the first generation computers.
- Generated a lower level of heat, as components were much smaller.
- Greater degree of reliability because of solid state technology.
- Higher capacity of internal storage.
- Use of core storage instead of magnetic drum and delay lines.
- Related series of processors –the family concept.
- Processor operated in the microsecond speed.
- High cost direct accesses storage.

1.11.3 Third Generation (1964 – 1975)

A revolution in the computer developments took place with the development of Integrated Circuits (IC) on a single silicon chip. In 1958, Jack St Clair Kelby and Robert Noyce invented the first IC. IC incorporated number of transistors and electronic circuits on a single wafer or chip of silicon. IC is called chip because of the way they are made. They are also called as semi conductors as combining layers of materials that have varying capacity to conduct electricity form them. This ushered in the third generation of computer systems in 1964. The integrated circuits enhanced considerably the processing capability and the speed of the computer. During the period 1964 to 1970, capability of placing 12 or more logic gates on a single chip was developed into a well-defined technology of Small-Scale Integration (SSI). A logic gate is a circuit to perform arithmetic of addition, subtraction, multiplication or division. In 1970 this technology was redefined to a point where hundreds or more gates could be placed on a chip of silicon and incorporated as functional logic block in an overall system. This technology was termed as Middle Scale Integration (MSI). There was intense pressure on the semiconductor manufacturer to provide greater densities of gates on a single integrated circuit chip. Consequently more complex chips were developed with the ultimate goal of obtaining a central processor on a single physical circuits element. These circuits had higher reliability and lower power consumption and substantially reduced size. Component densities of 1,000 to 10,000 gates on a single silicon chip became possible. The technology consisting of 1,000 gates per chip, termed Large-Scale Integration (LSI), started to become commercially viable in 1975. The later technology consisting of more than 10,000 gates per chip is

called Very Large Scale Integration (VLSI) or Grand Scale Integration (GSI). These circuit became very useful in assembling computers. Some of the popular third generation computers are-IBM-360, series, IBM-370 series and ICL-2900 series. The large advanced computer systems are usually called 'Main Frame'.

Integrated circuits technology is responsible for bringing in revolution in the computer industries. Scientists were aware that more powerful computers can be built by building more complex circuits, but as these circuits had to be wired by hand, these computer were too complex and expensive. IC solved this problem by introducing a computer that costed lower then first generation computer and offered more memory and faster processing.

In 1962, a new company built a plant in "Silicon Valley", near Sanjose, California. DEC (Digital Equipment Corporation) revolutionised the total computer industry with this computer which used IC's.

The first commercially available minicomputer was introduced in 1965. The PDB-8 (Programmed Data Processor) could fit easily in the corner of a room and did not require any attendant to it. The computer could be accessed by number of users from different locations of the building. (That was actually implementing time-sharing, which was developed in second generation). The price was one tenth of the traditional main frame, which made it possible for smaller companies to afford.

IBM was dominant in the market by releasing 360 series of computer. They were of different sizes of main frame computers. The main advantage of using this computer was use of same machine language compatibility thus making it easy and cost effective specially when upgraded.

By 1967, IBM decided to change its track as number of programming language came in the market. This was the beginning of software industry as the languages grew and people who had the skills to translate user requirements in these languages were high on demand now.

One more technology development which look place now was the launching of first telecommunications satellite. The communication stations on the earth were now in a position to send and receive data by means of satellite enabling communications between the computer systems around the world.

Admiral Grace Nurray Hopper, also known as "the mother of COBOL" and "Amazing Grace" was sent to Harvard to work on the first large scale digital computer. She travelled to various computer conferences and gave lectures in various colleges about the data processing insights. She wrote more than 50 papers and articles on software and programming language.

Dr Hopper tells about the origin of Bug and Debug in her book "understanding computers". It was 1945, when students were working on Mark II and it stopped working. Programmers kept trying to figure out what's wrong with the computer, finally discovered that there was a moth caught in one of the relays causing the whole trouble. They removed it and the computer started working fine. There the terms "Bug" and "Debug" were introduced. The first bug can still be seen taped on a page in a logbook at the Naval Weapons Museum in Dahlgren, Virginia.

Computers of this generation have the following characteristics:

- Smaller in size as compared to second generation computers.
- Higher capacity internal storage.
- Remote communication facilities.
- Multiprogramming facilities.
- Reduced cost of direct access storage.

- Processors, which operate in nanosecond speed range.
- Ranges of computers with a common architecture whereby models were upward compatible.
- Use of high level languages such as COBOL.
- Wide range of optional peripherals.

1.11.4 Fourth Generation (1975 – 1989)

The 1970's marked the beginning of a new generation of computers, produced by computer giants like IBM, ICL, NCR and Burroughs. From design viewpoint, the new generation provided increased input-output capability, longer component life as well as greater system reliability. From the functional view point, new powerful language were developed to broaden the use of multiprogramming and multiprocessing and major shift from batch processing to on line, remote interactive processing.

The development of microprocessor chip, which contains an entire Central Processing Unit (CPU) on a single silicon chip led to the mushroom growth of inexpensive computers. They are not computers by themselves but they can perform all the functions of arithmetic logic unit and control units of the CPU. When these microprocessors are connected with memory and input-output devices, they become microcomputers. The semiconductor memories are also very small and very cheap. There are several types of memory chips. Three of the most commonly used are: (a) Random Access Memory (RAM) in which data can be read or written corresponding to the main memory of the conventional computer, (b) Read Only Memory (ROM) and (c) Programmable Read Only Memory (PROM). In the ROM chips, the data is 'burnt' into the chip at the manufacturing time. It cannot be changed. These chips are used in systems where the data need not to be changed. Even when power supply fails, the data remains in the memory. In case of PROM a user can program and even correct the data if necessary. The fourth generation of computers may be called microcomputer generation. The input-output devices used with the fourth generation computers are quite advanced. Among the advanced input-output devices employed in fourth generation computers are optical readers by which whole documents can be led into the computer, audio response terminals by which an operator can vocally introduce data or instructions and graphic display terminals by which an operator can feed pictures into the computer.

The use of very large integrated circuits (VLSI) has made the fourth generation (micro) computers very compact, much less expensive, faster, more reliable and of much greater data processing capacity than equalized third generation computers.

Some computers belonging to fourth generation are DEC-10, STAR-1000, PDP-11 and APPLE Series Personal Computers.

1.11.5 Fifth Generation (1989 – Present)

Till fourth generation of computers, the major stress was on improving the hardware from valves to transistors and then to integrated circuits, which resulted in miniaturization and fast speed of computers. However, the lack of thinking power has forced the scientists to work further for fifth generation computers. The concept of "Artificial Intelligence" is being used in these computers and Japanese call them "Knowledge Processors". Automatic programming, computational logic, pattern recognition and control of robots, the processes and which need skill and intelligence are examples of Artificial Intelligence. These computers, when developed, will be able to execute billions of instructions per second and will have unimaginable storage capacities. The present day high level languages will become obsolete on these machines and new computer languages and related software will be needed.

The fifth generation gives the highest priority to making systems that are easy and natural to use. Its other objective relates to the types of technological support needed to support "problem solving systems" according to the fifth generation committee. "In these systems", the Committee adds, "Intelligence will be greatly improved to approach that of a human being. When compared to conventional systems, the man – machine interface will be closer to that of human behaviour." The fifth generation has three functional requirements:

- Easy to use computers with high intelligence and natural human input and output mechanism;
- Reliable and efficient software development by new languages, new computer architectures and systems software which overcome previous problems; and
- Improved overall functions and performance aimed at making computers smaller, lighter, faster, of greater capacity, more flexible and more reliable.

It is these objectives which set the main themes for the future of computing, whatever techniques are used to achieve them.

1.12 COMPUTER LANGUAGES

One man communicates with another in a language, which another man can understand. Similarly, man communicates with computer in a language, which machine can understand. This language which consists of a set of commands, understandable by computer directly or after translating, is known as Computer Programming Language. There are many types of computer languages, which can be categorized into following four types:

1. Low-level Languages (First and Second Generation Languages);
2. High-level Languages (Third Generation Languages);
3. User-Friendly Languages (Fourth Generation Languages);
4. Object Oriented Languages (Fifth Generation Languages).

1. **Low-level Languages:** In early days of computers, only those languages were used for programming, which could be directly executed on computer. Languages, which computer can understand directly and are machine dependent, are called low-level languages. For example, Machine Language and Assembly Language are two important low-level languages. Machine language is the oldest and most difficult of all the languages. It is also known as First Generation Language. In machine language, all the instructions are given to computer in binary digits, and hence are directly understood by the computer. On the other hand, assembly language is easier than machine language, and is known as Second Generation Language. In assembly language, instructions are given using mnemonic operation codes (such as ADD, MUL etc.) instead of binary digits.

Low-level languages are used for development of system software. As they are not used for applications development, managers or application programmers do not need to learn these languages.

2. **High-level Languages:** Development of applications using low level languages requires a deep understanding of the hardware. In order to facilitate the programmers to write programs without knowing the internal details of computer components, many languages were developed. These languages use common English words and are translated into low-level languages before processing by the computer. These languages which computer cannot understand directly and are not machine dependent, are called High-Level Languages (HLL). These languages are also known as Third Generation Languages. Some of the common high-level languages are:

- (a) BASIC (Beginners All Purpose Symbolic Instruction Code);
- (b) COBOL (Common Business Oriented Language);
- (c) FORTRAN (Formula Translator);
- (d) PASCAL (Name of a Scientist);
- (e) C (it does not stand for anything).

These languages were widely used for applications development, but most of them are outdated nowadays due to popularization of 4GLs. The uses of different 3GLs are summarized in Table 1.4.

Table 1.4: Uses of 3GLs (Third Generation Languages)

Language	Uses
BASIC (Beginner's All Purpose Graphics Symbolic Instruction Code)	Used for all purposes (Commercial, Scientific, Educational, etc.) by beginners.
COBOL (Common Business Oriented Language)	Mainly used for development of commercial applications on all types Computers.
FORTTRAN (Formula Translator)	Used for development of scientific (mathematical) applications.
PASCAL (Name of a Scientist)	Used for both commercial and scientific applications.
C (No full form)	Very powerful language for development of both system and application software.

3. **User-friendly Languages:** Although high-level languages are simpler to codify than low-level languages, they still require a lot of time to learn their programming syntax. Hence, these languages are beyond the reach of many computer users (including MIS professionals), who do not want expertise in programming. Therefore, a new category of languages have been developed which are user-friendly, very easy to codify and simplest to learn. These languages are called as User-friendly Languages and popularly known as 4GLs (Fourth Generation Languages). Some of the common 4GLs are dBASE, Foxbase, Foxpro, MS Access, Oracle, Sybase and Ingres. The uses of different 4GLs are summarized in Table 1.5.
4. **Object-oriented Languages:** We have discussed that the object-oriented programming is the latest approach in programming. The languages which are based on Object-Oriented Programming (OOP) approach, are called as Object Oriented Languages. They may be classified into Fifth Generation Languages. Object Oriented Languages are specially useful for development of GUI (Graphical User Interface) applications. These languages also offer a unique feature of Reusable Code. Some of the popular object-oriented languages are Smalltalk, C++ and Object COBOL, Object Pascal, Simula, Eiffel, Java & Visual J++. C++ and Visual J++ are widely used nowadays for development of windows-based applications. The uses of different object-oriented languages are summarized in Table 1.6.

Table 1.5: Uses of 4GLs (Fourth Generation Languages)

Language	Uses
dBASE	Used for development of mainly single user DOS based database applications.
Foxbase	Used for development of both single and multiuser DOS based database applications.
Foxpro	Used for development of both DOS and Windows based database applications.
Oracle	Used for development of relational database applications on any operating environment.
Sybase	Mainly used for development of on-line applications such as Decision Support Systems and Transaction Processing.
Ingres	Used for development of relational database applications of VAX/UNIX operating System.

Table 1.6: Uses of Object Oriented Languages (Fifth Generation Languages)

Language	Uses
Smalltalk	Used for development of mainly graphical applications.
C++	Used for development of all types of object oriented applications.
Object COBOL	Used for development of object oriented applications on mainframe computer.
Object PASCAL	Used for general object oriented applications.
Simula	Mainly used in research environment.
Eiffel	Used for general object oriented applications.
Visual J++	Very popular for development of Windows based applications.

Notes: There are certain languages which support most of the features of object-oriented programming except inheritance. These languages are not pure object-oriented languages and are known as object-based languages. For example, Ada, a high level language designed for process control, is an object-based language.

1.13 LANGUAGE TRANSLATORS

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 convert the codes of other languages into machine code, are collectively called as Language Translators.

Types of Language Translators

Language Translators are categorized into three types:

- (a) **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 development of system software.
- (b) **Interpreters:** Instructions of a high-level language are coded in many statements. At the time of their execution, they are converted into machine code statement by statement, by using system software, called Interpreters. For example, programs written in BASIC language are executed by using BASIC A 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, they are very slow for executing large programs. Hence, interpreters are not suitable for most of applications development.
- (c) **Compilers:** In 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, they are preferred in development of application software.

Differentiate between Interpreters and Compiler

Difference between compiler and interpreters are summarized below:

Table 1.7

	Interpreter	Compiler
Translation into machine code	One line at a time	Entire program at a time
Source file required	Yes	No
Speed of execution	Slow	Fast
Linker needed	No	Yes
Execution environment	Operating system and Interpreter	Operating system only
Dependence	Machine independent	Machine dependent
Frequency of translation	Each time of execution	Only once

Check Your Progress

1. UNIVAC stands for

.....
.....

2. IBM Stands for

.....
.....

3. VLSI stands for

.....
.....

4. COBOL stands for

.....
.....

1.14 LET US SUM UP

A computer is an electronic device that can perform a variety of operations according to the instructions given by the programmer/user and provides the desired information as an output. Computers are fast, accurate, diligent, having high memory, but no intelligence.

Computer are classified as general purpose or special purpose computers according to the purpose of their requirement. According to the technology used, computers are classified as analog which are used for scientific and engineering application, digital which are considered as general purpose computers or hybrid computers. Which incorporate the technology of both analog and digital computers. According to their size, computer can be classified as super computer, mainframe computer, minicomputer and micro computer.

The main components of computer are input/output units central processing unit and memory unit. Input unit is used to enter data and instructions into a computer. CPU performs all the processing of input data: Memory is used to store the data, instructions and information before during and after the processing by ALU. Output unit makes available output to the users.

CPU consists of ALU (Arithmetic Logic Unit) which is responsible for all arithmetic and logical operations, CU (Control Unit) which controls the transfer of data and instructions among other units of computer Registers, which are used to store data, instructions and memory addresses when ALU performs arithmetic and logical operations, Buses which are used to transfer data between registers and clock which measures and allocates a fixed time slot for processing each and every micro operation.

Memory is the internal storage area, which holds the data and instructions during processing. The three types of main memory or Internal memory are RAM (Random Access Memory), ROM (Read Only Memory) and CMOS (Complementary Metal Oxide Semiconductor Memory).

Computers are used in business for data capturing in on-line as well as off-line mode, for storage and retrieval of information, for output and for transmission. Offices are needed to be automated to reduce cost of administrative overhead and to increase efficiency of office tasks and staff. The hardware components of microcomputer can be classified into motherboard, Input devices, output devices, storage devices, cards, ports and cords and power supply. Various Input devices are keyboard, mouse, track ball, light pen, touch screen, Joy stick, digitizer, Scanner, Optical Mark Reader (OMR), Optical Character Reader (OCR) Bar Code Reader (BCR), Magnetic Ink Character Recognition (MICR) and voice input devices various output devices include monitor, printer, plotter and computer output micro file. Storage devices include hard disk, floppy disk, compact disk, Magnetic tape, video disk, Magneto optical drive, DVD ROM/RAM disk, etc.

1.15 KEYWORDS

ALU: Arithmetic Logic Unit of a computer which is used to perform arithmetic and logic operations.

Assembler: A program which translates an assembly language program to its machine language equivalent.

Assembly Language: A low-level language for programming a computer in which mnemonics are used to code operations and alphanumeric symbols are used for addresses.

Cache Memory: A small high speed memory which is used to temporarily store a portion of a program or data from the main memory. The processor retrieves instructions or data from the cache memory. Instruction and data caching speeds up computation.

Chain Printer: A printer in which the characters to be printed are embossed on a chain or a band. The chain is fashioned as a loop and print heads are activated to print specified characters.

Communication Channel: A medium through which (electric) signal are transmitted and received.

Compiler: A system program to translate a high level language program to machine language.

Computer: This is a machine which executes an algorithm stored in its memory to process data fed to it and produces the required results.

Control Bus: A set of wires used to transmit signals to control the operation of various units of a computer.

CPU: Central processing unit of a computer. It consists of circuits to perform arithmetic and logic and also has circuits to control and co-ordinate the functioning of the memory and I/O units of a computer.

1.16 QUESTIONS FOR DISCUSSION

1. What is the difference between minicomputer and microcomputer?
2. Write a short note on personal computer.
3. Describe the architectural of computer system.
4. State the basic units of computer. Name the subunits that make up the CPU, and give the function of each of the units.
5. What is the function of memory? What are its measuring units?
6. What are characteristics of second generation computer?
7. Describe fifth generation computers.
8. What are computer languages? Describe its various types.

Check Your Progress: Model Answer

1. Universal automatic computers
2. International business machine
3. Very large scale integration
4. Common object oriented language

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UNIT-2

SOFTWARE PACKAGES

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- 2.0 Aims and Objectives
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- 2.2 Personal Computers in Business
- 2.3 PC Software Packages
- 2.4 Disk Operating System
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 - 2.4.3 DOS Commands
 - 2.4.4 Internal and External Commands
- 2.5 Windows Operating System
- 2.6 Let us Sum up
- 2.7 Keywords
- 2.8 Questions for discussion
- 2.9 Reference/ Suggested readings

2.0 AIMS AND OBJECTIVES

After studying this lesson, you should be able to:

- Explain personal computers in business
- Describe software packages
- Explain DOS
- Identify windows operating system

2.1 INTRODUCTION

In this lesson, we are discussing all the important software concepts and providing you the latest knowledge of all the software available in the market. 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.

2.2 PERSONAL COMPUTERS IN BUSINESS

Computers have become a requirement in the business industry. Computers easily complete duties that are tedious and timely for humans. The business uses of

computers are extensive. Although many of the computer duties are not irreplaceable, business has become dependent on their accuracy and timeliness.

- **Accounting:** Business success is dependent upon accuracy. Many businesses use accounting software and ledgering systems to ensure the accuracy of their financial status.
- **Customer Interaction:** Computers now assist human call centers with answering customer questions, taking payments and providing general assistance. The automated voice systems are available with unrestricted hours and are always friendly.
- **Scheduling:** Scheduling is of great importance to many businesses, especially businesses involved in manufacturing and deliveries. Scheduling systems allow businesses to ensure they are meeting their goals while being efficient.
- **Communication:** Communication is most important in business. Computers provide businesses with a wide array of communication methods that include, but are not limited to, email, chat, web conferencing and VOIP.
- **Websites and Advertising:** The combination of websites, advertising and marketing provide a swift means to vast business globalization. Websites make the company quickly available to everyone.

The computer technology applied to information system will effect the information system in following ways:

- **Speed of processing and retrieval of data increases:** Manual systems, howsoever well organized, often fail to match the demand for information for decision-making. Computers with its unbelievably fast computational capability and systematic storage of information with random access facility provide relevant information with minimum loss of time.
- **Scope of use of information system has expanded:** The importance and utility of information system in business organisations is realized by most of the concerns, especially after the induction of computers for MIS development. Systems experts in business organisations developed areas and functions, where computerised MIS could be used to improve the working of the concern. This type of applications hitherto is not feasible under the manual system. It is now possible to use an online real-time system to provide information to various users sitting at a remote distance from a centrally located computer system.
- **Scope of analysis widened:** The use of computers can provide multiple type of information accurately and in no time to decision makers. Information provided by a computer equips an executive to carry out a thorough analysis of the problems and to arrive at the final decision.
- **Complexity of system design and operation increased:** The need for highly processed and sophisticated information based on multitudes of variables has made the designing of the system quite complex.
- **Integrates the working of different information sub-system:** A suitable structure of management information system may be a federation of information sub-system, viz., production, material, marketing, finance, engineering and personnel. Each of these sub-systems is required to provide information to support operational control, management control and strategic planning. Such information may be made available from a common-data-base. The common data base meets out the information requirements of different information subsystems by utilizing the services of computers for storing, analyzing and providing the information.
- **Increase the effectiveness of information systems:** Prior to the use of computer technology for information purposes, it was difficult to provide the relevant

information to business executives in time even after incurring huge expenses. The use of computer technology has overcome this problem. It is now possible to provide timely, accurate and desired information for the purpose of decision making.

2.3 PC SOFTWARE PACKAGES

Software packages includes operating systems, language processors, general purpose packages and special purpose packages

Systems Software: Facilitates better utilization of system resources, including

- Operating systems (e.g., MS-DOS; Windows; OS/2; MacOS; etc.)
- Language processors (e.g., for C++, FORTRAN, COBOL, etc.)
- General purpose, end-user packages

Applications Software: Developed for specific application needs, including:

- Financial accounting
- Payroll
- Personnel management
- Inventory control
- Geographical information systems (GIS)
- Computer aided design (CAD)
- Computer aided manufacture (CAM)

Common Software: The various common software's are:

- Electronic spreadsheets
- Data management systems
- Integrated packages
- Operations research
- Statistical analysis
- Project management
- CAD/CAM
- Computer-aided software engineering
- Presentations
- Word processing
- Text processing
- Desk-top publishing

2.4 DISK OPERATING SYSTEM

An Operating System (OS) is an integrated set of specialized programs that is used to control and manage the resources and overall operation of a computer system. It is a class of software, which controls the execution of other programs.

DOS is the most commonly used operating system. The full form of DOS is Disk Operating System. It is a single user operating system which means that only one application can be made to run at one time. DOS provides a 'Platform' or an 'Environment' which lets the application program to interact with CPU and I/O

devices. Many application software requires DOS for running. The common among these are word processors like Wordstar, Professional write; spreadsheet programs like Lotus 123, VP Planner Plus; accounting software like Tally, EX, etc. Each software package has a specific command to get itself running on DOS. For example, in order to run the spreadsheet program, Lotus 123, you will have to enter 123 at the DOS prompt, DOS will run Lotus 123 for you. On any application software shuts down, the control again has to come back to DOS and the DOS prompt can be seen again on the screen. Now, DOS is ready to accept more commands from you.

MS DOS (Microsoft Disk Operating System), a product of Microsoft Corporation of USA, is the most popular operating system for PCs. Another operating system available in the market is the PC DOS, a product of IBM, which is almost similar to MS DOS. Whether you use MS DOS or PC DOS, the basic commands of DOS remains the same.

2.4.1 Loading DOS

The booting happens automatically when the computer is switched on, provided DOS is available to it. DOS can be present on both hard disk as well as the floppy disk. So, when the system is turned on, a search for DOS is done on floppy drive first. If it is not present on the floppy drive, the DOS is searched for on the hard disk. Thus, for booting to happen, the DOS must be present either on the floppy or on the hard disk. So, if DOS is not present on the hard disk, insert the floppy carrying DOS software in the A drive before switching on the system. If the system boots from floppy, the following prompt comes on the screen:

A:\>

where underscore character '_' indicates the cursor (blinking mark) of the screen. However, if booting has been done from the hard disk, then the following prompt will come:

C:\>

C:\> or A:\> is the DOS Prompt. Looking at DOS Prompt, you can easily make out the currently active drive. If you want to switch yourself over to the another drive, then simply type its drive letter after the prompt and hit the <Enter> key as shown below:

C:\>A: <Enter>

A:\>

Now again if you want to go back to the C drive, then type in C: and hit the <Enter> key.

2.4.2 Files and Directories in DOS

File is a collection of related information. Any kind of text, data or program that is entered, is stored in a file. Now, it is very essential to organize your files in an ordered manner. This makes file search easier otherwise, it can really be a difficult and time consuming job to search for a particular file out of the whole lot of files stored on the disk. An example of library can make the explanation of the concept more clear. As you must have already observed, the books in a library are put in big cabinets. Each cabinet is divided into many shelves and sub-shelves. Each shelf or sub-shelf contains books on a particular subject. So, the required book on a particular subject can be found out very easily without wasting much time and effort.

On similar grounds, all the files that are related to each other are clubbed at one place. This is known as a Directory Structure or simply a Directory. A directory structure resembles an inverted tree. The main directory becomes the Root directory. The directories and files become the branches of this directory tree. Any number of files

and directories can be added to it thus, making the tree grow big downwards. Let us take an example:

Suppose we wish to store two kinds of files on our disk: ACCOUNT and EXPENSE. Further, we wish to keep two more kinds of files (say CASHSALE and CREDSALE) under ACCOUNT sub-directory. DOS can very much help you in organizing your files through directory structure which is shown in Figure 2.1.

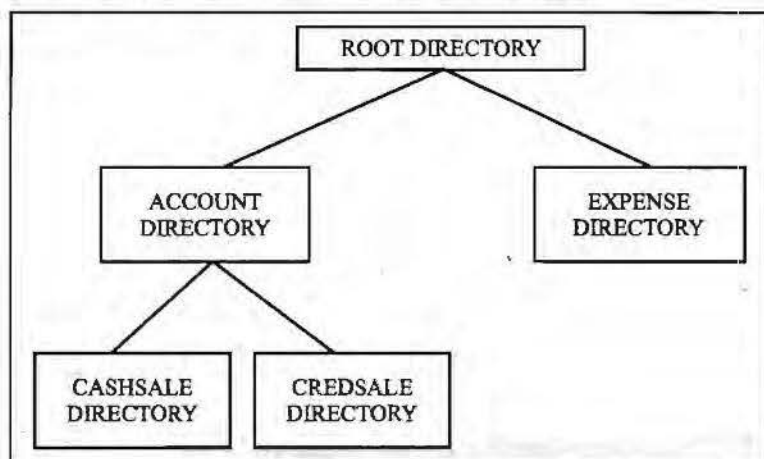


Figure 2.1: Example of Directory Structure

It is clear from the figure that:

1. On the top of the directory structure, there is a Root directory. This directory is always present and is shown by \ (backslash) for referencing. Any file or directory that is created is always under the Root directory.
2. EXPENSE is the sub-directory of the Root Directory.
3. ACCOUNT is the parent directory of the directories CASHSALE and CREDSALE. It can also be said that the CASHSALE and CREDSALE are the sub-directories of the ACCOUNT directory. Thus, a directory under a directory is called a sub-directory.

It can be clearly seen that the files relating to a particular subject can be put under a directory. For example, all the files relating to expenses can be put under EXPENSE sub-directory whereas all the files relating to cash sales can be stored under the sub-directory CASHSALE.

Referencing Files

It's time to learn, as to how to locate a file? The directory structure shown in Figure 2.2 has two sub-directories under the Root directory. The sub-directory EXPENSE has two files under it.

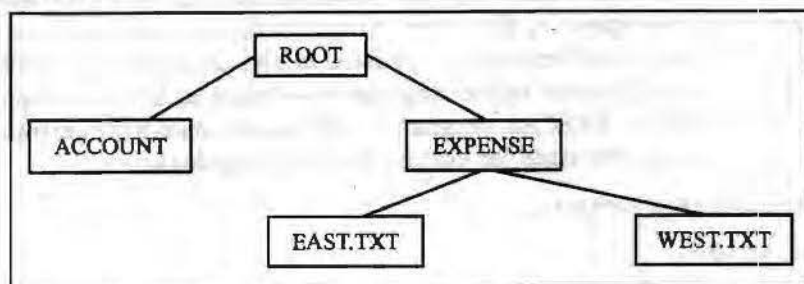


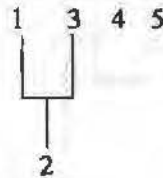
Figure 2.2: Referencing Files

DOS allows you to go from one directory to another by following a certain path. In the beginning, the user is always resident in the Root directory. While travelling from

one directory to another, **certain** rules have to be followed. A user cannot go directly from ACCOUNT sub-directory to EXPENSE sub-directory. To go from one sub-directory to another, you have to first go to its parent directory or the Root directory. Thus, for going from ACCOUNT sub-directory to EXPENSE subdirectory, you first have to go to Root directory. Similarly, for going from the file EAST.TXT to WEST.TXT, you have to go to the EXPENSE sub-directory first. Thus, in other words, while moving from one directory to another, you have to go to its parent directory first.

Now, in order to reach out to the file WEST.TXT the following path has to be followed:

C:\>Expense\ West.txt



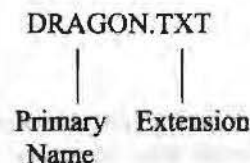
Here,

- 1 is the drive name where the file is resident in;
- 2 is the path which DOS takes to reach for a file;
- 3 is the directory under the Root;
- 4 is the primary name of the file that is to be accessed; and
- 5 is the extension name of the same file.

The backslash (\) has to be used for tracing out the path. The first backslash takes you to the Root directory. The subsequent backslashes separate the directories, sub-directories and the filename that are given in the whole path.

File Naming Conventions

There are certain rules that have to be followed while giving names to your files. A file name has two parts Primary Name and Extension (Secondary Name). A dot (.) separates a primary name from an extension. Let us see the two parts of the file named DRAGON.TXT.



A primary name cannot have more than eight characters and an extension cannot have more than three characters. A file name having only the primary name and no extension is absolutely valid because it is optional to give an extension to a file name. An extension is generally given by the language or software used. For example, if you are entering a BASIC or PASCAL program, its file name would have extension BAS or PAS respectively. A file name can contain the following characters:

1. An Alphabet (A-Z) or (a-z)
2. A number (0-9)
3. Special characters such as: \$, #, &, @, !, %, (,), -, {, }, " A, etc.
except *, ?, full stop (.) and space ().

It is a good practice to give meaningful names to your files. However, no two files can have exactly the same name on the disk. Thus, a name given to a file on a disk has to be unique.

A look at a few valid and invalid file names:

VALID	INVALID
MYHUNT	MY BOOK.DOC
Dragon.Txt	B.R. Arora
Uphill.up	S?JAIN.BAS
VIJAYA	EXCELBOOKS
Employee.Emp	ANARAG.**
157.IN	VICKY.MEHTA

The rules for naming a directory are the same as that of naming files.

2.4.3 DOS Commands

DOS offers a variety of commands to perform various functions. With the help of DOS commands, you can display the list of files and directories that are present on the disk, create new files and directories, remove unwanted files and directories and much more. DOS commands can be entered either in uppercase or lowercase letters. The format of a DOS command is called syntax. All DOS commands begin with command name. When DOS carries out the instructions given by you, it is called the execution of DOS command. Let us discuss some of the DOS commands in detail.

Directory Commands of DOS: The directory commands help you to create new directories and remove existing ones. They also allow you to travel from one directory to another. You can also view the listing of files and directories that are present on the disk.

1. *Displaying a List of Files on the Disk: DIR Command*

This particular DOS command helps you in displaying a list of files or directories that are present on hard disk as well as floppy disk. Thus, to see the contents of your hard disk, issue the following command:

```
C:\>DIR <Enter>
```

The above command displays the primary name, extension and size of files in bytes. It also displays the date and time when the file was created or modified last. If you wish to view the contents of the floppy drive, then you first switch yourself to the floppy drive and then issue the DIR command as shown below:

```
C:\> A: <Enter>
```

```
A:\>DIR <Enter>
```

Figure 2.2 shows two sub-directories ACCOUNT and EXPENSE. If you wish to view the contents of the sub-directory EXPENSE, then issue the following command:

```
C:\>DIR \EXPENSE <Enter>
```

Let us assume that there is one more sub-directory by the name BUSINESS existing under EXPENSE. To view the contents of this sub-directory, issue the following command:

```
C:\>DIR \EXPENSE\BUSINESS <Enter>
```


If you have a large number of files on the disk, then on issuing, DIR command, the screen scrolls up and only a few file names are shown. In such a case, issue the following command:

```
C:\>DIR/P <Enter>
```

The above command will show the contents of the disk pagewise or screenwise. Now, if you are interested only in seeing the file names, then issue the following command:

```
C:\>DIR/W <Enter>
```

The above command shows the names of files and directories widthwise. So, in one line only five names of files and directories are shown. The other details like the size of file, the date and time of each file creation are not shown. The directories are shown in square ([]) brackets.

2. *Making a Directory: MD Command*

In the earlier part of this unit, we discussed that all the related files should be clubbed at one place, called a directory or sub-directory. So, to club all the related files under one head, new directories and sub-directories have to be created. Let us create a new sub-directory by the name INCOME under the Root directory.

The following command can achieve this:

```
C:\>MD INCOME <Enter>
```

where MD stands for Make Directory. Further, let us create another sub-directory by the name HOSPITAL under the sub-directory Income.

```
C:\>MD INCOME\HOSPITAL <Enter>
```

3. *Removing a Directory: RD Command*

With time, certain directories grow old and are no more needed. It is better to delete such directories because they can save us many precious bytes on the disk. So, let us delete the sub-directory HOSPITAL with the following command:

```
C:\>RD INCOME\HOSPITAL <Enter>
```

where RD stands for Remove Directory.

A directory or a sub-directory has to be essentially empty before removing it. For example, in order to remove the sub-directory HOSPITAL, there should not be any directories and files under it. So, you must first delete all the files and remove all the sub-directories present under the sub-directory HOSPITAL before removing it.

4. *Changing Directory: CD Command*

Let us again refer to the Figure 2.2. Suppose you are under the EXPENSE sub-directory and you want to access the files or directories in the ACCOUNT sub-directory. This would involve the changing of directory from EXPENSE to ACCOUNT. This will make the ACCOUNT directory active. The task of changing directories can be accomplished with the help of CD command.

Look at the following example:

```
C:\>CD ACCOUNT <Enter>
```

where CD stands for Change Directory.

The above command will take you to the sub-directory ACCOUNT as shown by the following prompt:

```
C:\ACCOUNT>
```

If you want to go to the sub-directory CASHSALE straight from the sub-directory EXPENSE, issue the following command:

```
C:\>CD ACCOUNT\CASHSALE <Enter>
```

After the above command, the following prompt will come:

```
C:\ACCOUNT\CASHSALE>
```

The command for going to the root directory from the above prompt is:

```
C:\ACCOUNT\CASHSALE>CD\ <Enter>
```

But, the command for going to the parent or previous directory (whether it is a sub-directory) is:

```
C:\ACCOUNT\CASHSALE>CD.. <Enter>
```

If you are in the sub-directory CASHSALE, the above command will take you to ACCOUNT sub-directory as shown below:

```
C:\ACCOUNT>
```

File Commands of DOS: DOS offers a number of file commands for performing various operations on your file like copying, deleting and renaming the files.

1. Copying Files: The COPY Command

At times, you may have to work on some other machine. So, this involves copying files from one disk to another. Copying of files can happen from hard disk to floppy or vice-versa. Files can also be copied onto the same disk with a different name. The COPY command helps us to accomplish all these tasks.

The syntax of the copy command is:

```
COPY <Source drive>: (File spec 1) <Target drive>: (File spec 2)
```

Where

Source drive refers to the drive from where the file has to be copied. It can be A, B or C.

'File Spec 1' refers to the path from where the file that has to be copied.

'Target drive' refers to the drive where the file is going to be copied.

'File Spec 2' refers to the destination where the file is going to be copied.

- (a) **Copying a file to another drive under the same name:** A file can have the same name if it is stored on different disks. Thus, to copy a file by the name SCENE from hard disk to floppy disk, issue the following command:

```
C:\> COPY C:SCENE A:SCENE <Enter>
```

As the file is copied from the active drive, then there is no need to specify the source drive in the above command. On similar grounds, if the file name remains unchanged then there is no need specify it after the target drive. Thus, the above command can also be given in the following way:

```
C:\> COPY SCENE A: <Enter>
```

- (b) **Copying a file to another disk under a different name:** The name of the file can be changed very easily while copying. The following command copies the file SCENE from the hard disk onto floppy disk by the name SERENE.

```
C:\> COPY SCENE A:SERENE <Enter>
```

- (c) **Copying a file with a new name on the same disk:** The file can be copied with a different name and stored on the same disk. Proceeding with the above example,

let us save the file SCENE with a new name, SERENE and copy it onto the same disk.

```
C:\>COPY SCENE SERENE <Enter>
```

Once this command is executed, we have the same file under two different names, stored on the same disk.

- (d) **Copying files from one directory to another:** Suppose you have placed all your files under the root directory. Now, at later point of time, you wish to club all the related files at one place. This can be easily done. Create a directory and copy the required files from the root directory to this newly created directory. DOS allows you to copy files from one directory to another.

Let us assume that you have a file by the name NORTH.TXT in the root directory and you wish to copy this file in the newly created Area sub-directory. The following command will do this:

```
C:\>COPY NORTH.TXT \AREA <Enter>
```

Similarly, you can copy files from any directory to any other directory. DOS only needs the specification of full path from you. Let us copy a file OLD.TXT which exists under the sub-directory DATA to the sub-directory INFO which is resident in the floppy disk.

```
C:\>COPY DATA \OLD.TXT A:\INFO <Enter>
```

2. **Deleting Files: DEL Command**

With time, certain files grow old which are no longer required. So, it is desirable to delete such files because unwanted files occupy precious space on the disk. Suppose there is a file on the hard disk by the name TRYPRG which is no longer required. The following command deletes this file:

```
C:\>DEL TRYPRG <Enter>
```

If the file SALE.PRГ exists on the floppy disk, first you go to the A: prompt and then delete the file as shown below:

```
C:\>A: <Enter>
```

```
A:\>DEL TRYPRG <Enter>
```

While deleting any file of a sub-directory, its full path should be given as illustrated in the following example. Let us assume that the TRY.PRГ file exists under a subdirectory MANAGE on the hard disk. To delete this file-issue one of the following commands:

```
C:\>DEL C:\MANAGE\ TRYPRG <Enter>
```

OR

```
C:\>DEL MANAGE\TRYPRG <Enter>
```

You can also delete the IMT.PRГ file by first changing to that sub-directory and then issuing the DEL command as given below:

```
C:\>CD\MANAGE <Enter> C:\MANAGE>DEL TRY.PRГ <Enter>
```

3. **Renaming Files: REN Command**

DOS allows you to give new names to your files. Assume that there is a file by the name OLD.TXT and now you wish to give a new name NEW.TXT to it. Carry out one of the following commands to get your work done.

```
C:\>REN OLD.TXT NEW.TXT <Enter>
```

OR

```
C:\>REN DATA \OLD.TXT NEW.TXT <Enter>
```

The file OLD.TXT which resides under the sub-directory DATA now has a new name NEW.TXT.

Wildcards

Often you may need to do a similar kind of job on a number of files. If these files have something in common, then we can save the effort of performing repetitive job. So, these files can be referred collectively by using the wildcard facility provided by DOS. The use of wildcards in a DOS command gives greater flexibility when using similar type of file names. DOS offers two wildcards : ? and *. Each ? can be replaced by exactly one character or none, if it is given at the end of the filename. As and when the ? wildcard is specified in the middle of a filename, it has to necessarily match one character. The * wildcard can match eight or less characters in the primary name and three or less characters in the extension part.

Let us take an example to make the concept of wildcards clear. Suppose the following files are present onto your disk:

Old.Txt	INCOME. pro	Alpha	Page.in
Go.Exe	OLDI	Dragon.Exe	KOMAL
Expense.prg.	OLD20.bas	Over.prg	Annual. doc
New. doc	Zee.com	Old.doc	Paper. com

The following commands illustrate the concept of wildcards:

- (a) If you wish to see all the files that start with the letter O and any extension, then give the following command:

```
C:\>DIR O *.* <Enter>
```

The above command will list the files OLD.TXT, OLDI, OVER.PRG, OLD20 and OLD.DOC

- (b) Now, let us copy all the files with any number of characters in the primary name and the extension EXE with the following command.

```
C:\>COPY *.EXE A: <Enter>
```

The above command will copy the files GO.EXE and DRAGON.EXE onto the floppy disk.

- (c) To delete all the files beginning with OL, having two more characters in the primary name and any extension, issue the following command.

```
C:\>DEL OL??* <Enter>
```

With this command, the files OLD.TXT, OLD.DOC and OLDI are going to be deleted because these are the only files present on the disk which match the given wildcard pattern. The above command will not delete the files OVER.PRG and OLD20, because the former does not start with OL and the latter has 5 characters primary name.

- (d) Similarly, to copy all files starting with P and an extension comprising of two characters ending with N issue the following command:

```
C:\>DEL P*.*N <Enter>
```

This will delete the file P AGE.IN because this is the only file matching the given wildcard pattern.

- (e) For copying all the files having primary name OLD and any extension from floppy to EXPENSE sub-directory of hard disk, issue the following command:

A:\>COPY OLD.* C:\EXPENSE <Enter>

The above command will copy only two files OLD.DOC and OLD.TXT.

- (f) To copy all the files with primary name anything and no extension from EXPENSE sub-directory of hard disk to floppy, issue the following command:

C:\>COPY \EXPENSE*. A: <Enter>

The above command will copy the files ALPHA, OLD1 and KOMAL.

- (g) To delete all the files of floppy, issue the following command:

A:\>DEL *.* <Enter>

After giving the above command, the following message will come on the screen:

Are you Sure (Y /N)? _

Press 'Y' if you really want to delete all files otherwise press any key. Never try the above command on root directory of hard disk, otherwise your most important DOS file COMMAND. COM will also be deleted and thereafter you will not be able to boot the system from the hard disk. Therefore, wildcards with DEL command should be used with great caution.

Some More DOS Commands

You have already been introduced to the directory and file commands of-DOS. Now, let us make ourselves familiar with other commonly used commands.

1. Displaying and/or changing date: The DATE Command

DOS allows you to show as well as change the current date once you are on the DOS prompt. Issue the following command to see or change the today's date:

C:\>DATE <Enter>

After issuing the above command the following screen appears:

Current date is Thu 11-12-

Enter new date (mm-dd-yy): _

So, key in the new date in 'month-date-year' format. However if you do not want to change this date simply hit the <Enter> key. The current date will be taken as new date.

2. Displaying and/or changing the current time: The TIME Command

The TIME command is used to display and change the current time.

C: \> TIME <Enter>

On issuing this command, the following screen appears:

Current time is 11:05:10:01

Enter new time:

Enter the new time in hours: minutes: seconds format. Hit the <Enter> key if you do not want to change the time. The new time can also be specified along with TIME command.

3. Clearing screen: The CLS Command

In order to clear the cluttered and clumsy screen, issue the CLS command. This will remove the contents shown on your screen thus making it look neater and cleaner. The CLS command is given in the following manner.

C:\>CLS <Enter>

4. *Creation of a new file: The COPY CON Command*

Text Files can be created by COPY CON command. Look at the following example:

```
C:\>COPY CON HELLO.TXT <Enter>
```

This command tells DOS to copy the information from the keyboard or Console and put it in the file HELLO.TXT. On issuing the command the following screen appears:

```
C:\>COPY CON HELLO.TXT
```

You will find a blinking cursor in the second line. Enter the text and terminate : each line by pressing <Enter> key as illustrated below:

```
My first DOS file. The name given to this file is Hello.Txt.<Enter>
```

It is very easy to create files in DOS. <Enter>

Once all the required text is entered, hit the <Ctrl+Z> keys together to mark the end of Text. <Ctrl+Z> keys tell DOS that no more text is going to be entered now. Again hit the <Enter> key.

5. *Displaying contents of files: The TYPE Command*

The contents of any file can be viewed very easily by giving the TYPE command followed by the file name. Let us see the contents of file HELLO.TXT that we have just created by issuing the following command.

```
C:\>TYPE HELLO.TXT <Enter>
```

You can also send the output of a file to the printer. The following command starts the printing job provided the printer is on.

```
C:\>TYPE HELLO.TXT >PRN <Enter>
```

6. *Displaying a message on the screen: The ECHO Command*

At times, you may require to display a text on the screen while executing a set of commands. The ECHO command helps you to display a meaningful message on the screen. This command is issued as illustrated below:

```
C:\>ECHO Please insert floppy in drive A: <Enter>
```

The ECHO command is a special DOS command used exclusively in batch files (the files containing a set of DOS commands). There is one more form of ECHO command i.e., ECHO OFF as shown below:

```
C:\>ECHO OFF <Enter>
```

The above command tells DOS not to display other commands in the batch file.

7. *Displaying the currently logged sub-directory: The PROMPT Command*

Users always prefer to see the prompt for currently logged sub-directory. The PROMPT command tells DOS to include the sub-directory, greater than (>) sign or any text as a part of the prompt. The various forms of PROMPT command are discussed as:

- (a) To display the path designation (e.g., \ACCOUNT\EXPENSE) and the greater than sign as a DOS prompt, issue the following command:

```
C:\> PROMPT $p$g <Enter>
```

After giving the above command, if you are logged to EXPENSE sub-directory of ACCOUNT sub-directory in the root directory, then the following prompt will come on the screen:

```
C: \ACCOUNT\EXPENSE>_
```

- (b) To display a text "I Love India" along with path designation and greater than prompt, issue the following command:

```
C:\>PROMPT I Love India $p$g <Enter>
```

The above command will display the following prompt:

```
I Love India C:\>_
```

- (c) To display just greater than sign without path designation, you can give the following command:

```
C:\>PROMPT <Enter>
```

The command will display the following prompt:

```
C>_
```

8. *Specifying a sub-directory PATH: The PATH Command*

By this time, you must be familiar with the directory structure of DOS. Suppose your program (say PRINCE.COM file) lies on the GAME sub-directory of the root directory and you want to execute it from any other sub-directory (say WINDOWS). To execute PRINCE.COM file, first you will have to make GAME as the currently active sub-directory and then issue the following command:

```
C:\GAME>PRINCE <Enter>
```

DOS provides a shortcut way to locate and run the above program from any other sub-directory by specifying the path as illustrated below:

```
C:\WINDOWS>PATH C:\GAME <Enter>
```

The above command tells DOS that GAME sub-directory is in the current search path of DOS. DOS will first search the required program file in the currently logged drive and then GAME sub-directory. Thus, the PRINCE.COM file can be executed directly from WINDOWS or any sub-directory as shown below:

```
C:\WINDOWS>PRINCE <Enter>
```

The PATH command is generally used in batch files.

2.4.4 Internal and External Commands

Every computer has a set of predefined instructions that its CPU can execute. These instructions are known as machine instructions. Machine instructions perform very elementary operations – called micro-operations – such as 'ENABLE THE BUS', 'LOAD THE REGISTER', 'ADD' etc. a machine instruction needs to be loaded into the CPU's Instruction register for the execution to proceed.

No machine instruction exists for carrying out users' operations like 'COPY A FILE', 'RENAME A FILE' etc. these operations correspond to a sequence of large number of micro-operations. However, users do not have to write all those instructions themselves. Operating system provides these macro-instructions which are called commands.

A command is a sequence of a combination of micro and macro operations that accomplishes some pre-defined task of the user. These commands must be loaded into the RAM when one wishes to execute them otherwise they keep lying in the form of files on the secondary storage device.

Some commands are used more frequently than others. For example, DIR command of DOS is heavily used by the users while FORMAT command is used very seldom. If all the commands are loaded into the RAM at the time of booting there will not be much space left for the users' programs in the RAM. On the other hand if no command is loaded into the memory, it must be loaded before one may execute it.

This requires many read-write operations to and from secondary storage and RAM slowing the operation.

To avoid the above two extreme situations operating systems load only frequently used commands into the RAM at the time of booting. Other commands are loaded into RAM from the disk as and when needed. Moreover, when a recently loaded command has finished execution the memory is reclaimed by the operating system.

The commands which are part of DOS system files – MSDOS.SYS and IO.SYS or Kernel of Unix – and which get loaded into the memory along with the operating system at the time of booting are called Internal Commands. On the other hand, the commands that reside on the disk as executable files - EXE, .COM or .BAT in DOS, .sh or .bin in Unix – and enter the memory when needed are called External Commands.

If search your disk for DIR.EXE or DIR.COM or DIR.BAT you will not find them unless, of course you have created them yourself. Still you can execute the command DIR. This is because DIR is an internal command and is available in the memory. It got loaded into the memory at the time of booting along with rest of DOS.

However, you will find FORMAT.COM, XCOPY.EXE etc. on the disk. These are external commands. When you issue one of these commands, DOS loads it from the disk to the memory, executes the same, and removes it from the memory once the execution is over.

Note that while looking for the external command file, DOS searches the current directory first, then each of the directories listed in the PATH environment variable in that order. If the command file is found in any of these locations, it is loaded and executed otherwise an error message – “Bad command or filename” is issued to the user and the command terminates.

Some of the often used DOS internal commands are – CD, DIR, RD, MD, DEL, COPY, CLS, REN, TYPE, DATE, TIME, ECHO, VOL, PROMPT, PATH etc. while external commands are – FORMAT (FORMAT.COM), XCOPY (XCOPY.EXE), FDISK (FDISK.EXE), CHKDSK (CHKDSK.EXE) ETC.

The differences between the internal and external DOS commands are tabulated hereunder.

DOS Commands

	Internal	External
a.	Loaded into RAM at the time of booting	Loaded into RAM when executed by the user
b.	Reside on the disk as a part of system files – MSDOS.SYS and IO.SYS	Reside on the disk as separate executable files – .COM, .EXE or .BAT in DOS and as .sh or .bin in UNIX
c.	Execution speed is fast because it does not need to be loaded when called	Execution speed is slow because it needs to be loaded and removed when called
d.	Always work	May not work if the command file is not found by the operating system
e.	These commands are memory resident	These commands live into the memory as long as they execute then are removed and the space is reclaimed for other programs
f.	Size of these commands is rather small	These commands can be very large
g.	These are most often used commands	These are less often used commands

1. *Making the disk usable: FORMAT Command*

Before discussing the format command in detail, let us first see what is meant by the term 'Formatting'. Generally when you purchase a diskette from the market, it is unformatted. It can be compared with a notebook which has blank pages without any

ruler lines. You would prefer to put lines, write page numbers and categories the pages into equal parts so that an index can be made and the required topic can be searched very easily. Similarly, DOS organizes the disk into concentric circles which are called tracks. Tracks are further divided into triangular regions. Each such region is called a sector. The organization of disk into tracks and sectors is called Formatting. The Figure 2.3 makes the formatting concept more clear.

FORMAT command is used for formatting a hard disk or floppy disk. As FORMAT is an external command, a file by the name FORMAT.COM should be present on your disk. In order to format the floppy disk, issue the following command:

C:\> FORMAT A: <Enter>

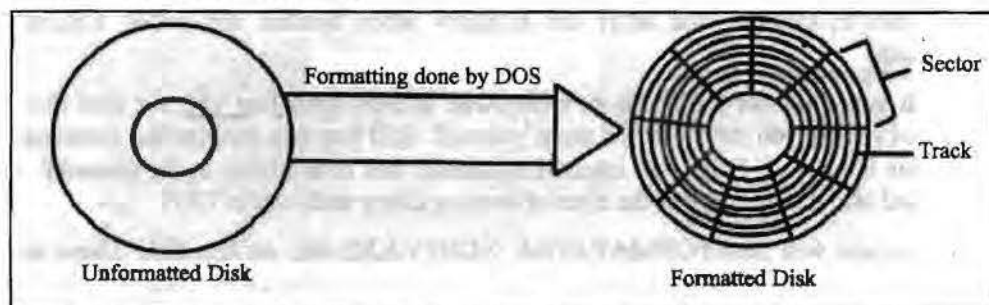


Figure 2.3: Process of Formatting

Once the above command is executed, the following message appears:

Insert new diskette in drive A:

and strike ENTER when ready

Insert a floppy disk in drive A and hit the <Enter> key. When the formatting of the disk is done, the following message appears on the screen.

Enter Volume Label (upto 11 characters):_

Here, you can give a name to the disk for its easy identification. A label upto 11 characters can be given to the disk after it is formatted. If you don't want that your disk should carry any label, simply press <Enter> key. Now, the following message will come:

Format Another (Y/N)?_

Now, if you want to format another disk, then hit 'Y' (for Yes) and insert that disk in the drive otherwise type in 'N' (for No) or press any key to end the format program.

New disks should always be formatted for using them. But old disks can also be formatted. Formatting will make the disk blank by erasing all its data. You may require to format an old disk if it has bad sectors and is needed again for usage. However, the FORMAT command should be used with extreme caution. Any disk whether hard disk or floppy disk will lose all data stored on it once the formatting operation is done. Therefore, you should not try the FORMAT command for formatting the hard disk. If you format the hard disk, all the contents stored on it are going to be removed permanently and new tracks and sectors will be created.

FORMAT command also provides a method for making your disk bootable. The following command is used for this purpose:

C:\>FORMAT A:/S <Enter>

With the help of this command, all the operating system files (COMMAND.COM and two hidden files) are copied from the hard disk to the floppy disk. This floppy can now be used to load DOS in the computer's memory if you are unable to boot the

system from the hard disk. The COPY command cannot serve the above purpose because it cannot copy the two hidden files of DOS in the boot sector.

2. *Checking a disk: The CHKDSK Command*

The command CHKDSK helps to check the status of the disk. After checking the disk, CHKDSK displays several items of information. However to get executed, this command needs the program file CHKDSK.COM. Let's check the status of the disk in drive A through the following command:

C:\>CHKDSK A: <Enter>

On successfully checking the disk, the following status is shown on the screen:



```

Volume SHFFA1 is not bad
1 file(s) 164 byte(s)
1 directory 160 byte(s)
Total disk space 744000 bytes
707200 bytes available
CHKDSK completed successfully

```

If no drive letter is specified with CHKDSK command, then the currently active drive is checked for.

3. *Giving volume label to disk: The LABEL Command*

Although, you have seen that a volume label to the disk is given at the time of formatting the disk, DOS also provides LABEL command to change, delete or give new label. This command needs a program file LABEL.COM. Let us give a label to the floppy disk by the following command:

C:\>LABEL A: <Enter>

Once the above command is executed the following screen appears:

```

Volume label in drive A has no label
Volume label (11 characters, ENTER for none) _

```

So hit the <Enter>key if you want to delete the volume label without typing in anything. You can also provide volume label directly with the following command.

C:\>LABEL A:MANOJ <Enter>

4. *Copying contents of one the floppy disk to another: The DISKCOPY Command*

The DISKCOPY command helps you to copy all the contents of one disk onto the other in such a way that both disks become identical. It copies the contents of the floppy disk present in source drive onto the disk present in the destination drive. If you have a single drive on your computer, then the same drive can act as source as well as the destination drive. The command to copy the contents of one floppy onto the other is given here:

C:\>DISKCOPY A: A: <Enter>

When you issue the given command a screen like the one shown below appears:

```

Insert SOURCE diskette in Drive A
Press any key to continue

```

At this point, insert the diskette whose contents are to be copied and then hit any key. Another message appears on the screen as shown below:

Insert TARGET diskette in drive A

Press any key to continue

So, after this message appears, insert the diskette into which the files are to be copied. Thereafter, press any key to continue the process. Once the process of copying is completed, the following screen appears:

Copy Complete

Copy Another (Y/N)?_

Press the 'Y' (for Yes) key if you want to copy the contents of some other diskette. DOS will again prompt you to enter the source diskette. However, if you want to stop the DISKCOPY process, press 'N' (for No). DISKCOPY command first formats the target diskette if it is unformatted and then copies files onto it. So, if any contents exist on the target diskette, they are all going to be removed. The DISKCOPY command needs the program file DISKCOPY.COM for execution.

5. Copying files and directories: XCOPY Command

The XCOPY command is used to copy the files present in sub-directories. The command 'Copy *.*' copies the files of the currently working directory and DISKCOPY command copies the entire contents from one floppy to another. So, they are not helpful in copying files selectively. The XCOPY command offers three special advantages:

- (a) It prompts you to specify the files that you want to copy.
- (b) It can also copy directories and other lower level directories.
- (c) It can be used to copy files from the hard disk to the floppy disk.

Now, let us explore the XCOPY command. If you wish that DOS should ask for your confirmation for copying a file, then use the /P option along with the XCOPY command. Consider the following example:

```
C:\>XCOPY C:ACCOUNT A:ACCOUNT /P <Enter>
```

If you want to copy the directories and lower level directories, then use the /S option along with the XCOPY command. Look at the following example:

```
C:\>XCOPY C: ACCOUNT A:ACCOUNT /S <Enter>
```

This command will copy the directory and all the sub-directories onto the A disk. However, if the /S option is not specified, then the XCOPY command works within the single directory. You can also use /P and /S option simultaneously with the XCOPY command as shown below:

```
C:\>XCOPY C:ACCOUNT A:ACCOUNT /P/S <Enter>
```

The whole path can be specified with the XCOPY command. This command again needs the program file XCOPY.EXE in order to get executed.

BATCH Files

Very often, you keep keying in the same sequence of commands to do a repetitive job. For example, everyday, when you start your work on the computer, you first see the listing of files present on the hard disk. Then, you copy all the files with extension EXE and TXT from the floppy disk to hard disk. Thus, for achieving your task, you have to issue the following commands everyday.

```
C:\>DIR/P <Enter>
```

```
C:\>COPY A: *.EXE C: <Enter>
```

```
C:\>COPY A: *.TXT C: <Enter>
```

DOS can really simplify your task. All the sequence of commands can be put in a file which is called a batch file. This file offers a great advantage. Any number of commands given in a batch file can be executed by just giving a single command at the DOS prompt. DOS executes all these commands one by one. All the batch files can have any primary name but the extension given to these kinds of files is BAT. The method of creating a batch file is exactly similar to that of creating any other file on DOS. Let us see it, through an example:

```
C: \>COPY CON MY. BAT <Enter>
```

```
DIR/P <Enter>
```

```
COPY A: *.EXE C: <Enter>
```

```
COPY A: *.TXT C: <Enter>
```

```
<CTRL+Z> <Enter>
```

In the above example, a batch file by the name MY.BAT has been created. If you want to execute this file, simply type in the name of the file at the DOS prompt as shown below:

```
C:\>MY.BAT <Enter>
```

or C:\>MY <Enter>

The commands given in this batch file are going to be executed one by one in the sequence specified.

The AUTOEXEC. BAT File

The AUTOEXEC.BAT is an autoexecutable batch file. It is a special kind of a batch file. This file is executed as soon as the operating system is loaded in the computer's memory. The AUTOEXEC.BAT file is needed when you want it to be executed automatically each time the system is switched on. Now, as soon as the computer is switched on, DOS searches for the AUTOEXEC.BAT file in the Root directory of the bootable disk. If the system finds this file, then all the commands given in it are executed one by one instantly without even asking for date and time. The AUTOEXEC.BAT file is created like any other batch file. Look at the following example:

```
A:\>COPY CON AUTOEXEC.BAT <Enter>
```

```
ECHO OFF <Enter>
```

```
CLS <Enter>
```

```
ECHO My first Autoexec.bat file successfully executed <Enter>
```

```
PROMPT $P$G <Enter>
```

```
PATH C:\DOS;C:\WINDOWS <Enter>
```

```
<CTRL+Z> <Enter>
```

Enter the above commands on the root directory of bootable floppy disk. Reset your system. You will notice the above created batch file being executed automatically.

2.5 WINDOWS OPERATING SYSTEM

Windows Basics

Because there are many ways to set up Windows and do basic tasks, it's important to know your options and to choose those that best fit your needs. In this chapter, you learn about basic features that help you get your work done, as well as how to explore and customize Windows 2000. You also learn about the Internet and how to get connected by using the Internet Connection wizard.

What is the Desktop?

The desktop is the area that first appears on the screen after you start Windows XP. The desktop is your workspace. On the left side of your desktop are icons, small pictures that represent files such as documents, folders, or programs. When you want to open a file, double-click its icon.

Note: The procedures in this book describe the double-click method of browsing. Your computer manufacturer may have selected a desktop style that uses the single-click option. If so, point to an icon to select a file, and single-click the icon to open the file.



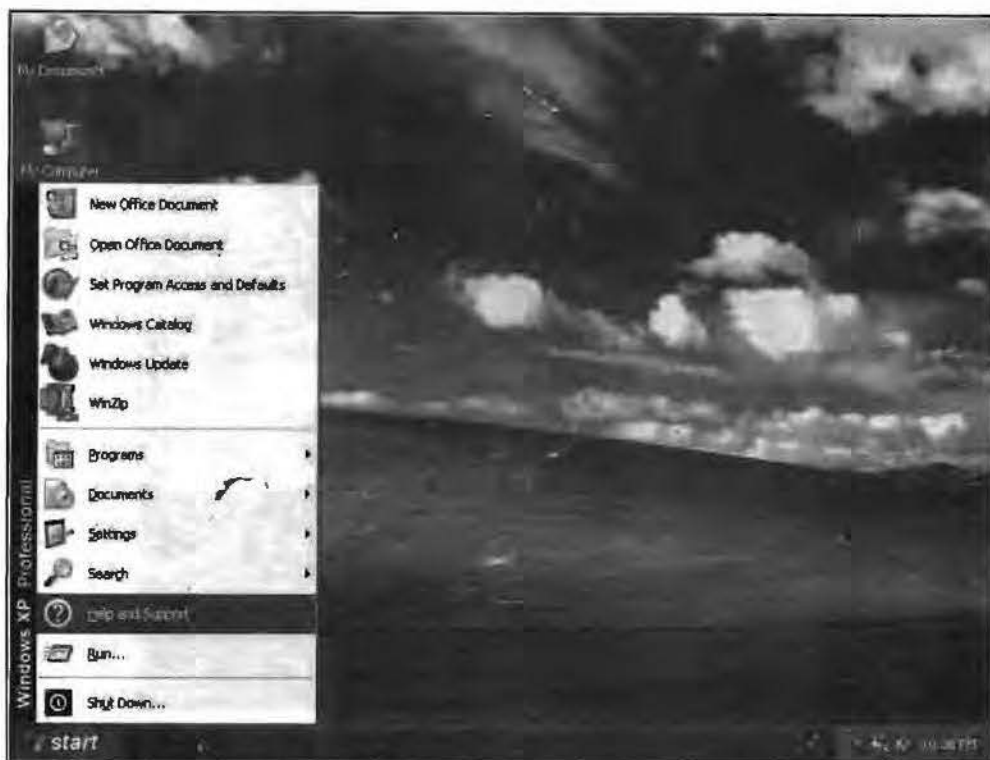
Depending on how your computer is set up, your icons might be different from those in the illustration.

Getting Help

Windows XP Help is your principal source of information for learning how to use Windows XP. Always available from the Start menu, Help describes how to perform a wide variety of tasks—from setting up a printer to connecting to the Internet. Help also contains a glossary, keyboard shortcuts, troubleshooters, an online version of this book, and links to Web-based resources.

To Open Windows XP Help

1. Click the Start button.



2. On the Start menu, click Help.

Windows XP Help appears. You can find topics listed on the Contents tab, look up keywords on the Index tab, and search for text by using the Search tab.

You can also get information about a dialog box by clicking the question mark button on the title bar and then clicking the dialog box area in question.

Exploring your Computer

You can navigate in Windows XP by using the taskbar (including the Start button), My Computer, Windows Explorer, or My Network Places. In some cases, one way is more efficient than another. For example, it's faster to start programs from the Start button than from Windows Explorer, but Windows Explorer gives you a more complete picture of all of the files on your computer. In other cases, the choice is personal preference. When browsing through folders (containers for documents and programs), for instance, you can use either My Computer or Windows Explorer—it's a matter of how you prefer to display the contents of your computer. The following sections familiarize you with some of your choices.

The Taskbar and the Start Button

You can use the taskbar and the Start button, which usually appear at the bottom of your screen, to navigate in Windows XP. Both features are always available on your desktop, regardless of how many windows you have open.

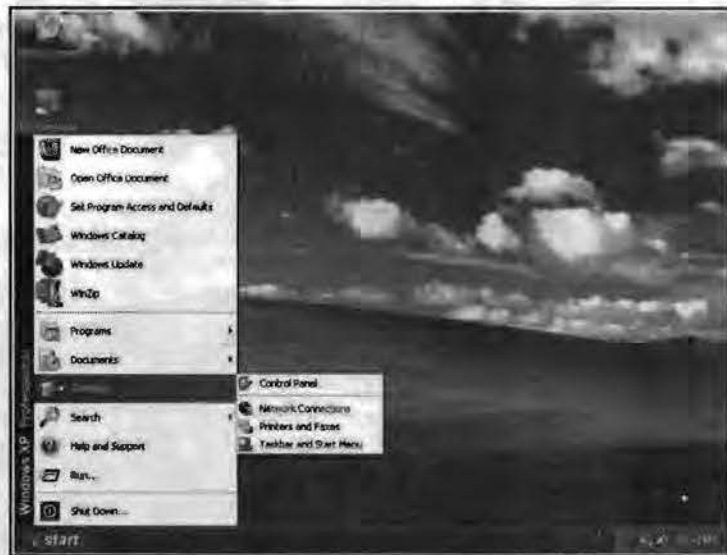


Buttons on the taskbar show you which windows and programs are open, even when some are minimized or hidden beneath another window. You can easily switch to a different window or program by clicking its taskbar button.

If you're upgrading from Windows NT version 3.51, you'll notice that your program groups now appear on the Start menu.

The Start button displays a list of commands and shortcuts (pointers to files) that you can use to accomplish almost any task. You can start programs, open documents,










customize your system, get Help, search for items on your computer, and more. Some items on the Start menu have a right-facing arrow, which means that additional choices are available on a secondary menu, called a submenu. When you place your pointer over an item with an arrow, a submenu appears.



My Computer

Use My Computer when you want to view the contents of a single folder or disk. A disk is a device, such as a hard disk or floppy disk, on which you can store files. When you double-click My Computer on your desktop, icons representing the available drives appear in a new window. When you double-click a drive icon, a window displays the folders contained on that drive. You can then double-click an icon to open the folder or file.

Some of the following icons may appear in the My Computer window.

Double-click	To
	View the contents of the floppy disk, which is usually designated as A.
	View the contents of the hard disk, which is usually designated as C.
	View the contents of a network drive, if your computer is connected to one.
	View the contents of a compact disc in the CD-ROM drive, if your computer has one.
	View features you can use to modify your computer settings.
	Set up a printer and view information about available printers and print job status.
	Schedule or view tasks for computer maintenance.
	View the contents of a folder.
	View files and folders on a Web server, if your computer is connected to one.

Windows Explorer

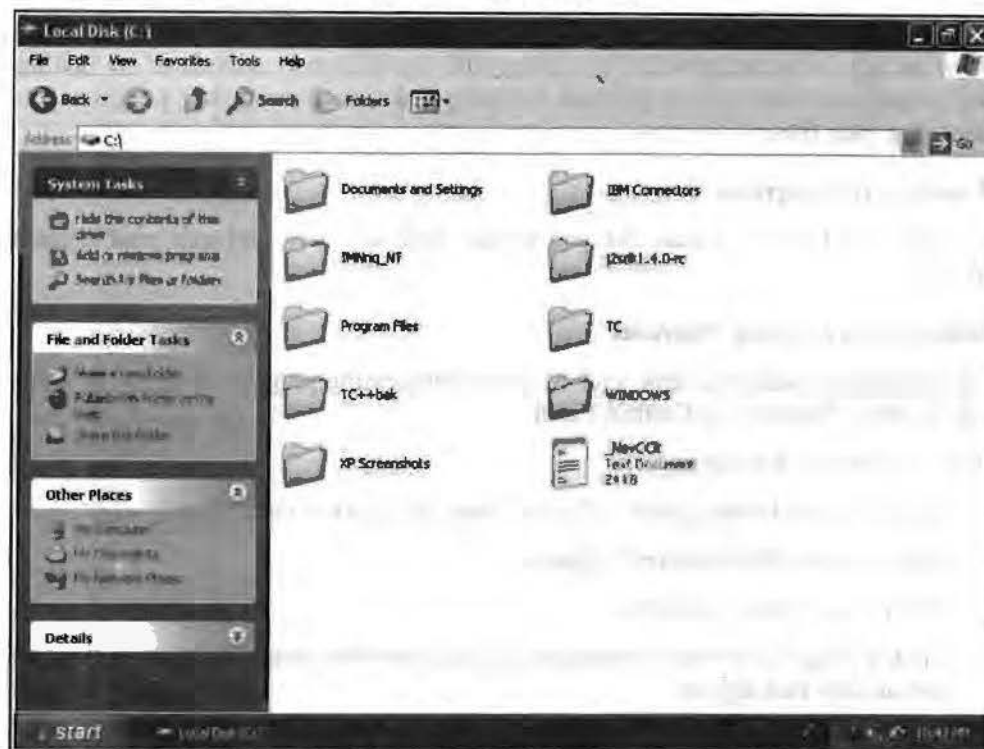
If you prefer to see files in a hierarchical structure (similar to a family tree), you'll like using Windows Explorer. Instead of opening disks and folders in separate windows,

you can browse through them in a single window. The left pane of the Windows Explorer window contains a list of your disks and folders, and the right pane displays the contents of the selected folder. You can use the View menu to change how the icons in the right pane appear.

To use Windows Explorer to view the contents of your local (hard) disk:

1. Click the Start button, point to Programs, point to Accessories, and then click Windows Explorer.
2. In the left pane, click the plus sign next to My Computer, then the plus sign next to your local disk.




The contents of your hard disk appear in the right pane.



My Network Places

A network is a group of computers connected to one another so that they can share resources such as files and printers. If your computer is connected to a network, you can use My Network Places to browse network resources the same way you browse the contents of your own computer. When you double-click My Network Places on your desktop, icons representing network resources appear in a window.

Some of the following icons may appear in My Network Places.

Double-click	To
	Create a shortcut to a specific network location. Runs the Add Network Place wizard, which helps you to create a connection to a shared folder, a Web folder on the Internet, or a FTP site.
	Display all of the computers, printers, files and folders and people available on your organization's network.
	Display only those computers in your domain or workgroup.

To open network resources

1. On the desktop, double-click My Network Places.
2. If you want to browse shared resources in your workgroup, double-click Computers Near Me. The computers and resources in your workgroup appear.

If you want to view all of the resources available on the network, double-click Entire Network. Depending on how your network is set up, you may see computers arranged by domain or by workgroup.

3. Double-click the item you want to open, just as you would open drives and folders on your own computer.

Getting your Work Done

Now that you're familiar with the desktop and the different methods of navigating, you're ready to learn how to perform everyday tasks, such as starting programs and managing your files.

Working with Programs

Windows 2000 makes it easy for you to add, remove, start, and quit your favorite programs.

Adding and Removing Programs

You can quickly add programs, such as a word processing program or game, by using Add/Remove Programs in Control Panel.

To add or remove a program

1. Click the Start button, point to Settings, and then click Control Panel.
2. Double-click Add/Remove Programs.

Add/Remove Programs opens.

3. Click Change or Remove Programs or Add New Programs, and then follow the instructions that appear.

<p>Note: You can also add and remove Windows components by clicking Add/Remove Windows Components in Add/Remove Programs and then following the instructions that appear.</p>
--

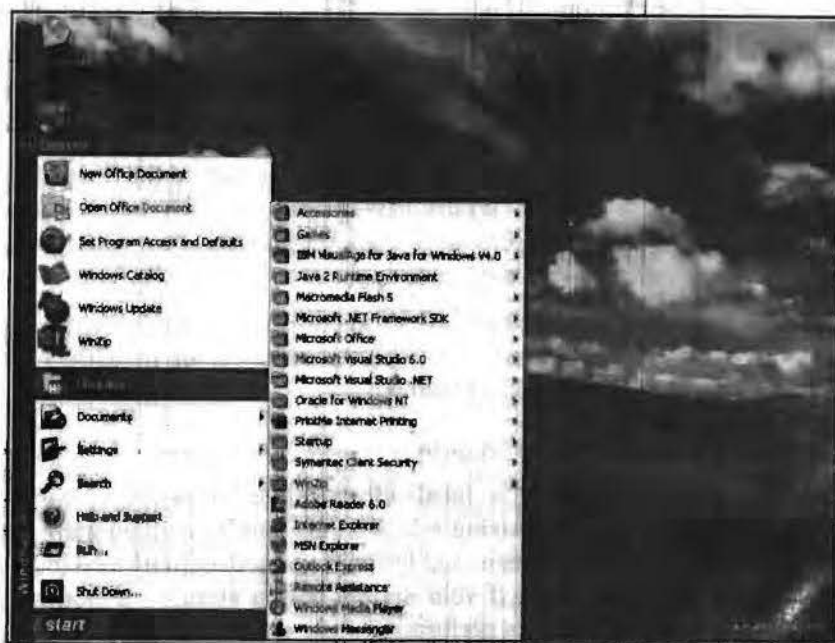
Starting and Quitting Programs

Most of the programs installed on your computer are available from one convenient location—the Programs section of the Start menu. Depending on how your computer is set up, what you see on the Start menu varies.

To start a program

1. Click the Start button, and then point to Programs.

The Programs menu appears.



2. Point to the group (such as Accessories) that contains the program you want to start, and then click the program name.

To quit a program

Click the Close button in the upper-right corner of the program window.



Managing Files and Folders

File names in Windows 2000 can be up to 255 characters, including spaces, but can't contain any of the following characters: \ / : * ? " < > |

When you add a program or use a program and save your work, you create a file. For example, the Microsoft Word program is a file, and every document you create with Word is also a file. You can better organize your files by storing them in folders. For example, you may want to create a folder for each of your projects and keep files associated with the projects, such as documents and saved e-mails, in those folders. You can also move, rename, and delete files and folders.

Working with Frequently Used Files

For easy access to files and folders that you use frequently, you can create shortcuts to them. A shortcut doesn't change the location of a file or folder, nor is it a copy—it's a pointer you use to open the file or folder quickly. Deleting, moving, or renaming the shortcut doesn't affect the original item.

In Microsoft Windows XP Professional, you will find one of three different accounts in use on any given system.

- (a) **Local user accounts:** Local user accounts allow you to log on to the local system and access resources there.
- (b) **Domain users:** Domain user accounts allow you to log on to the domain the user account belongs to in order to access network resources. You may be able to access resources in other domains depending on how the trust relationships are defined or if any modifications have been made to them.
- (c) **Built-in user:** Built-in user accounts allow you to perform administrative tasks on the local system and sometimes they can access local or network resources, depending on their configuration on the network.

Using the Local Users and Groups Snap-in

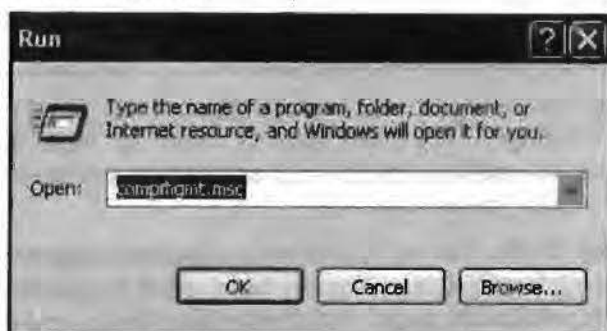
You would normally need to be a local administrator to perform most system configuration functions (even just taking a look at the current configuration settings) on a Windows XP Professional system, and in some cases, there may be a local policy set by some other administrator or if your system is in a Domain, a Domain policy setting, which may prevent you from performing some actions.

To manage local users and groups you can use the Local Users and Groups MMC and you can access this tool a number of different ways.

One way is to select Start, right-click My Computer, and then click Manage, which will open the Computer Management MMC. Under the System tools icon, click Local Users and Groups to open the Local Users and Groups MMC.



You can also type compmgmt.msc in the RUN box or from a command line to launch the Computer Management MMC.



Check Your Progress

1. FORTRAN stands for

.....
.....

2. VOIP Stands for

.....
.....

3. DOS stands for

.....
.....

4. CAD stands for

.....
.....

2.6 LET US SUM UP

An operating system is an integrated set of specialized programs that is used to control and manage the resources and overall operation of a computer system.

Dos is the most commonly used operating system. Loading of DOS into the main memory is known as booting. DOS commands are of mainly two types: internal and external. Internal commands are directly interpreted by the command processor, command.com. External commands are interpreted with help of external files (with extensions.com or .Exe).

Storage areas on a disk are known as directories. A directory may contain files and/or sub-directories inside it. The full name of a file or a directory (including path) is called pathname.

Wildcards special characters carrying special meaning. Two MS-DOS wildcards are '?' and '*'. The '?' can replace exactly one or none characters in a name. The '*' can replace number of characters in a name.

Some Dos internal commands are copy, DEL/ERASE, REN, TYPE, DIR, CHDIR/CD, MK, DIR/MD, RMDIR/RD, BREAK,CLS, DATE, PATH, TIME, PROMPT, etc. Some external commands are DISK COMP, DISKCOPY, FORMAT, LABEL, PRINT, XCOPY, etc.

Batches of MS-DOS command stored under a filename with extension. BAT are known as Batch files. The batch files with the name AUTOEXEC.BAT is automatically executed by MS-DOS at the time of booting.

MS-windows is a GUI based operating system. In windows operating system, multiple applications can be simultaneously run in different windows. In MS-windows, the screen upon which icons, windows, etc., are displayed is known as desktop.

2.7 KEYWORDS

CAD: Programs that are used to create engineering drawings. CAD programs make it easy to modify drawings. They also make it easier to keep track of material specifications. They can perform spatial and engineering estimates on the designs, such as surface or volume calculations.

Desktop Publishing (DTP): The art of creating professional documents with personal computers and small laser printers. Beyond basic word processing, DTP software provides controls to standardize pages, improve the page layout, and establish styles.

Geographic Information System (GIS): Designed to identify and display relationships among business data and locations. Used to display geographical relationships. Also used to plot delivery routes and create maps.

COBOL: An early programming language designed to handle typical transaction-processing tasks. Its death has been predicted for years, but it is hard to throw away billions of lines of code.

2.8 QUESTIONS FOR DISCUSSION

1. Describe various uses of computer in business.
2. Explain various functions of disk operating system.
3. What is the purpose of copy command?
4. What is windows explorer and give some of its functions?

Check Your Progress: Model Answer

1. Formula Translation
2. Voice over internet protocol
3. Disk Operating System
4. Computer Aided Design

2.9 REFERENCE/ SUGGESTED READINGS

Sanjeev Gupta and Shameena Gupta, *Computer Aided Management* (Using MS-Office 2003 Tools), Excel Books.

Manoj Kumar, M. Shamir Bhudookan, *Information Technology for 'O' Level*, Editions De L'Ocean Indien.

Joseph W. Habraken, *Microsoft Office 2003 All-In-One*, Que Publishing.

Jennifer Ackerman Kettell, Guy Hart-Davis, Curt Simmons, *Microsoft Office 2003: The Complete Reference*, McGraw-Hill Professional.

Laurie Ann Ulrich, *How to do Everything with Microsoft Office 2003*, McGraw-Hill Professional.

BLOCK – II

UNIT 3

WORD PROCESSING SOFTWARES

CONTENTS

- 3.0 Aims and Objectives
- 3.1 Introduction
- 3.2 Word Processor
- 3.3 MS Word 2003
- 3.4 Starting MS-Word
- 3.5 Working with Menus
 - 3.5.1 File Menu
 - 3.5.2 Edit Menu
 - 3.5.3 View Menu
 - 3.5.4 Insert Menu
 - 3.5.5 Format Menu
 - 3.5.6 Tools Menu
 - 3.5.7 Table Menu
- 3.6 Let us Sum up
- 3.7 Keywords
- 3.8 Questions for Discussion
- 3.9 Reference/ Suggested Readings

3.0 AIMS AND OBJECTIVES

After studying this lesson, you should be able to:

- Explain word processor
- Describe MS-Word
- Describe working with menus

3.1 INTRODUCTION

For most people, writing is an everyday occurrence. When computers have affected our life styles and work patterns, this activity is also not left out. Many application programs have been developed to make writing easier and smooth operation. One such most popular program is word processor. A word processing software provides a general set of tools for entering, editing and formatting text. This unit introduces MS-word as a word processing software. It focuses, on the methods for creating a word document and its various formatting features.

3.2 WORD PROCESSOR

Word processing includes typing in text and manipulating it so as to give a very systematic and organized look to your document, which enables easy reading. The application software or program which helps us in processing the text is called a 'Word Processing Software, or simply a 'Word Processor'. So, you can say that a word processor is nothing but a computer program that helps you to:

- type your text
- correct spelling mistakes and grammatical errors
- align text within margins
- offer a variety of font styles and font sizes
- see a preview of the text that you have typed in.

Popular Word Processing Packages

The commonly used word processing packages are:

- MS-WORD
- Word Star
- Word Perfect
- Professional Write

Uses of Word Processing

Normally, a word processor can accomplish the following tasks:

- Brochures
- Newsletters
- Reports
- Advertisement
- Resumes and Cover letters
- Books
- Directories
- World Wide Web Pages

There is absolutely no end to what a word processor can do. By now you must have realized that the word processing applications have become much more sophisticated than before.

Tabular differentiation between DOS and Windows:

	DOS	WINDOWS
User interface	Character based	GUI (Graphical User interface)
Number of users	Single user	Multi-user
Programming environment	Single program	Multiprogramming
Network support	Limited	Fully functional
Process management	Uniprocessing	Multiprocessing, Thread processing
Device installation	Manual	Autodetect
System security	Limited or nil	Tight

3.3 MS WORD 2003

There are many word processing softwares available in the market. The one, perhaps most popular is Microsoft Word.


Microsoft Word 2003 is a highly sophisticated word-processing member application software included in Microsoft's Office 2003 suite. It is one of the latest version of the MS-Word available at this time apart from MS-Word 2007. MS-Office 2003 suite has been designed to run on Windows XP.

MS-Word can be used to:

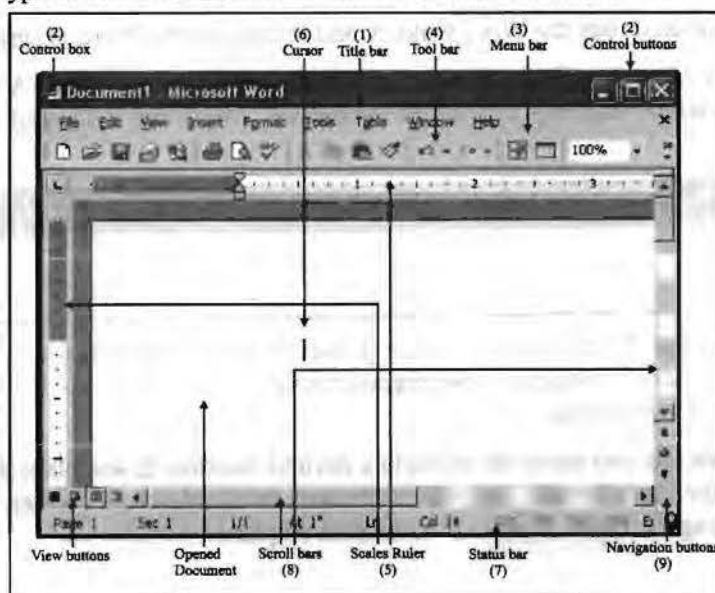
- Write letters
- Theses
- Newsletters
- Resumes
- Applications
- Books
- World Wide Web Pages
- Fax
- Envelope

3.4 STARTING MS-WORD

Microsoft word is a Windows based word processing application. To start Word session:

- Click on the start button on the Taskbar
- Then Click on the Program sub-menu in start menu.
- Click on the Microsoft Word command identified by  icon

Execution of this command will launch Microsoft Word 2003 on your computer. As a result, MS Word window appears on the screen. The look and size of a window application can be customized and therefore may vary from one installation to another. A typical Word window looks like the one shown below:



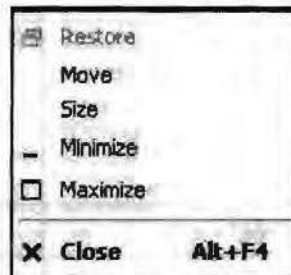
MS-Word Window




The Word window is the rectangular box in which the Microsoft program interacts with the users. The walls of the window are resizeable. When you place the mouse pointer at a window wall it changes from a single arrow to double arrow. You can now click and drag the mouse and the wall moves with it. Release the mouse button when you have sized the window as you wanted. The visible elements of the Microsoft Word window are listed below:

1. **Title (or Caption) Bar:** Title bar shows the name of the window application (Microsoft Word in this case) that owns the window and the name of currently opened document (Document1 in this case). Whenever you open a new document, by default Word attaches the names like Document1, Document2, etc. You can of course change the name of the documents by giving the names while saving the documents.



2. **Control Box:** Title bar also has a control box and a few control buttons. When you click at the control box a menu of items appears as shown below:



- (a) **Restore:** It restores the windows to previous size.
 - (b) **Move:** You can move the window on your screen.
 - (c) **Size:** You can size the windows of your size.
 - (d)  button minimizes the window. Clicking at this button will reduce the window to a small rectangular bar placed on the Windows task bar.
 - (e)  button maximizes the window to cover entire area of the desktop.
 - (f)  button closes the Word window and terminates the Word program.
3. **Menu Bar:** Menu bar displays menus available to the users of Word. A menu is a group of various logically connected commands. Menu bar is located under the title bar.



File, Edit, View, Insert, Format, Tools, Table, Window and Help are nine menus in the menu bar. Clicking at these menus displays the menu items which can be commands or sub-menus.

Menu handle lets you move the menu to a desired location. If you place the mouse pointer at the menu handle the pointer changes to double cross pointer. You can click and drag the menu to place it at the desired place.

4. **Tool Bars:** A Toolbar is a group of iconic buttons (referred to as tool buttons) each representing a menu command. By clicking these buttons respective commands can be executed. Clearly, this is much easier and faster way of command execution.



Toolbars appear generally below the menu bar but can be placed anywhere by clicking and dragging them using tool handle. You can also specify which toolbars would be displayed and which not. Moreover, you can also create your own toolbar containing desired tool buttons. When the mouse pointer is placed over a tool button a brief message is displayed for a short while. This message is known as tool tip.

5. **Ruler:** The Word window is supplied with one horizontal and a vertical ruler displayed along the left and top edges of the current document. Rulers can be used to set margins and indents in easy manner and they also provide measurement while formatting the page.
6. **Cursor:** Cursor is MS-Word pointer, which tells where on the document the action (that you choose to apply) will take place. The cursor can be moved and placed anywhere on the written part of document using a pointing device like mouse or keyboard arrow buttons.
7. **Status Bar:** This bar displays the current position of the cursor, status of some important keys of keyboard (whether the Caps key is on or off, for instance) and other relevant information. It is located at the bottom of the window.



8. **Scroll Bars:** Scroll bars are sliders that can be moved using mouse. As the scroll bar is moved, the window pans through the document exposing different regions of the document. There are two types of scroll bars:

(a) Horizontal Scrollbar

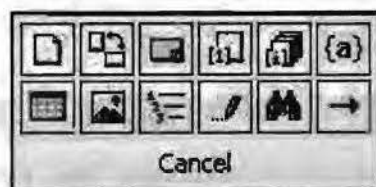
(b) Vertical Scrollbar



Horizontal Scrollbar is placed at the bottom while vertical scroll bar at the right of the document.

9. **Navigator Button:**



Document Navigator allows navigating the document by hopping from object to object of selected type. It is activated when the ball type button on the vertical scroll bar is clicked. When you click at the ball a list of object types is displayed as shown below:



You select an object type and then you can browse next object by clicking  and to previous by clicking .

10. View Button:



A document can be viewed in many different ways highlighting different aspects of the documents. View buttons are shortcuts to various view commands in the View Menu, placed adjacent to the horizontal scroll bar. Different views available are – Normal view, Web layout view, Print layout view and outline view.

Start Working with Word Document

When you open the word a blank document opens. You can start typing on it directly. But for various other activities, you need to learn about the commands in different menus present in the menu bar. You can select different menus with click of the mouse and through hotkeys also. Hotkeys are displayed underlined. Just press the underlined combination of keys (usually, Alt, unless specified otherwise) to get the action performed. For example if you wish to select the File menu you have to press the Alt+F keys to open the menu or Alt+V to select the view menu.

A list of keys or key combinations for cursor movements is given below:

Movement of the Cursor using Keyboard

Movement of the cursor	Keys
Left or Right one character	← Or →
Left or Right one word	Ctrl+ ← or Ctrl+ →
Up or Down one line	↑ Or ↓
Up or Down one paragraph	Ctrl+ ↑ or Ctrl+ ↓
To the start or end of a line	Home or End
Up or Down one screen	Page up or Page Down
To the top or bottom of the current screen	Ctrl+Page up or Ctrl+Page Down
To the start or end of the document	Ctrl+Home or Ctrl+End
To the top or end of the window	Alt+Ctrl+Page Up or Alt+Ctrl+Page Down
To the location of the insertion point when the document was last closed	Shift + F5

3.5 WORKING WITH MENUS

A user can initiate an action either by clicking (with left button of the mouse mostly) at a command option in a menu or at a tool button. Sometimes you may find some of the commands and/or buttons disabled (inactive in gray color). Word (and other window based packages) disables those commands and buttons which are not applicable or relevant to the current selection.

Commands that let you perform desired actions are grouped into logical groups called menus. You will now learn what all menu commands are available in Word 2003. The menus are:



These menus provide groups of related commands. Thus, File menu contains all the commands related to file or workbook manipulation.

These menus can be opened by clicking at them. Another way to open these menus is to press Alt+(Undelined letter of the menu name). Thus Alt+F will open File menu and Alt+O will open Format menu.

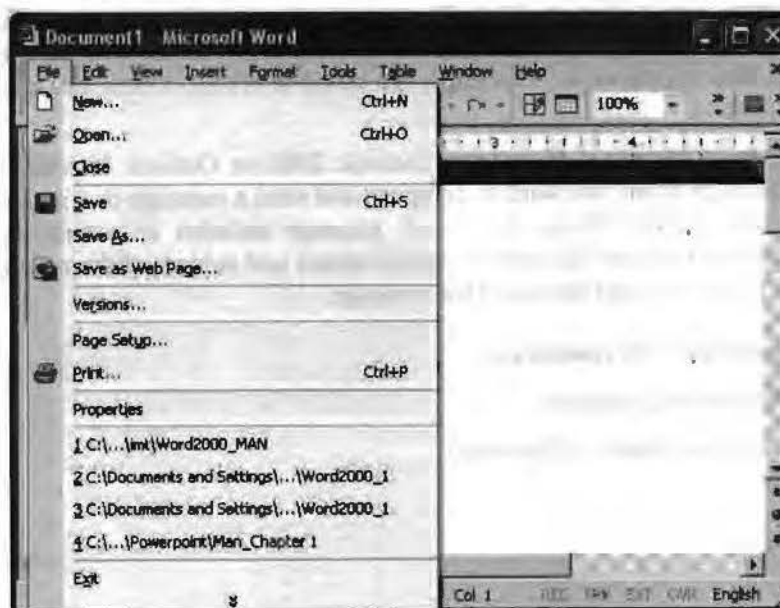
Most of the commands are also represented by their respective icons. Another way of executing a command is to click at the tool button of that command usually represented by its icon.

3.5.1 File Menu


File menu contains commands related to file operations. Different file-operations are:

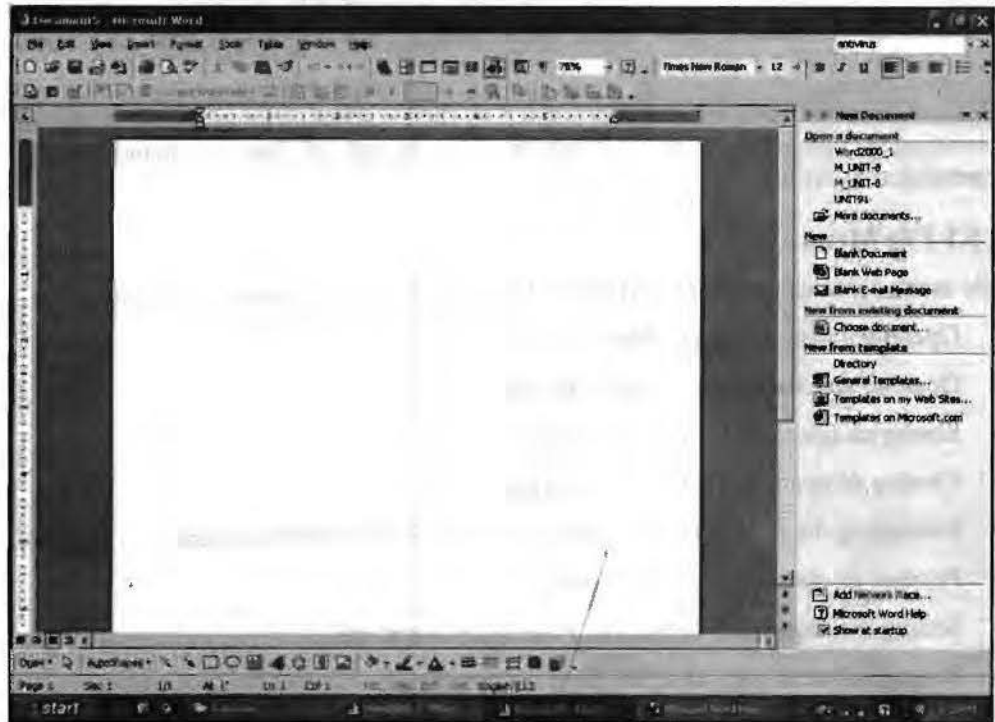
- Opening a new document: New command
- Opening an existing file: Open command
- Saving an opened file: Save command
- Closing an opened file: Close command
- Examining the print preview of an open file: Print preview command
- Printing an opened file: Print command
- Setting the page setup of the file: Page setup command
- Saving different copy of a file: Save As command
- Sending a file to other location: Send to command
- Checking the properties of the file: Properties command
- Exiting from word: Exit command

File menu is shown in the following MS-Word window.



File → New Command

1. Click on the File menu.
2. Click on the New option or press Ctrl+N through the keyboard or click at the Blank Document  icon at the standard toolbar.



Note that there are many types of pre-designed documents available in the task pane shown above.

- **Blank Document:** Start with a blank document when you want to create a traditional printed document.
- **Blank Web Page:** Use a Web Document when you want to display the document's contents on an intranet or the Internet in a Web browser. A Web page opens in Web layout view. Web pages are saved in HTML format i.e. a file with .html extension.
- **Blank E-mail Message:** If you use Outlook 2000 or Outlook Express, use an e-mail message when you want to compose and send a message or a document to others directly from Word. An e-mail message includes an e-mail envelope toolbar so that you can fill in the recipient names and subject of the message, set message properties, and then send the message.

File → Save and Save As commands

For saving the current document:

1. Click at Save command in File menu.

OR

Press Ctrl+S

OR

Press the Save tool  from standard toolbar

If you are saving the file for the first time the Save as window will appear

2. Choose the appropriate folder from Save in combo box where you want to save the document.
3. Write a file name in the File name text box.



4. And then press the Save button.

Note that if you close an open document without saving its latest content, MS-Word duly prompts you with options for saving and not saving the document. You can select the appropriate action from these options as well.

Save and Save as commands both save a document. However, the difference between both commands is that the Save as command allows the user to save a file by a different name and format also. The Save option will save the document by the same name and format as it was saved for very first time.

File → Open Command

To open an existing document:

1. Select the Open option from the File menu

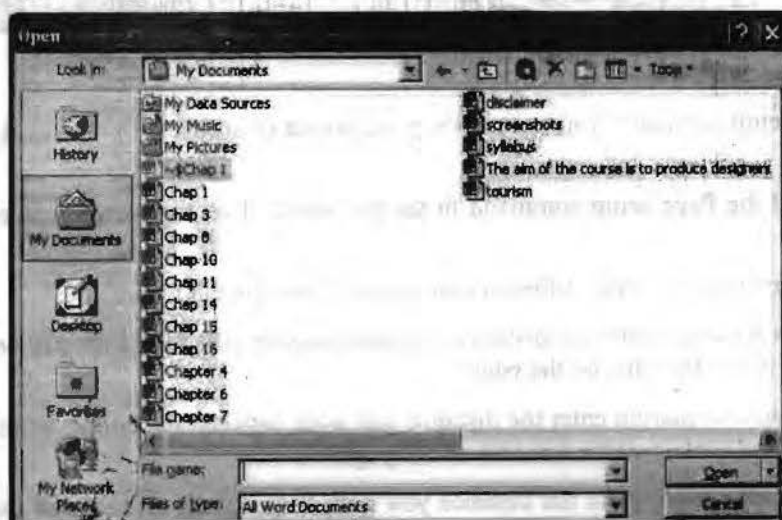
OR

Press Ctrl+O

OR

Click on the Open  tool from the standard toolbar

The Open dialog box will appear as shown below:



2. Select the appropriate folder from look-in combo box.
3. Select the required file from the file window

OR

Write the required file's name in the file name window

4. Click Open button on the right hand side

OR

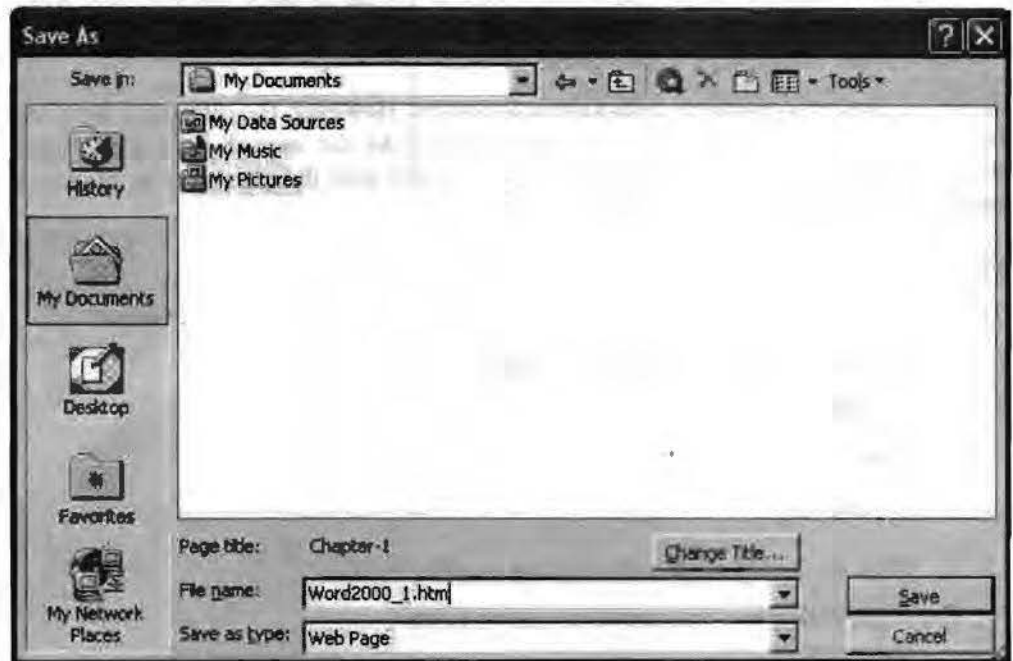
Press Enter.

File → Close Command

To close the current document, click at the close command in the file menu. Note that only current window or document will be closed since the Microsoft Word works in MDI (Multi Document Interface) environment unlike notepad which works in SDI (Single Document Interface).

File → Save as Web Page Command

Save as Web Page option will save the word document in the web page format i.e. in the html format with file extension .htm. You can view it then in the web browser.

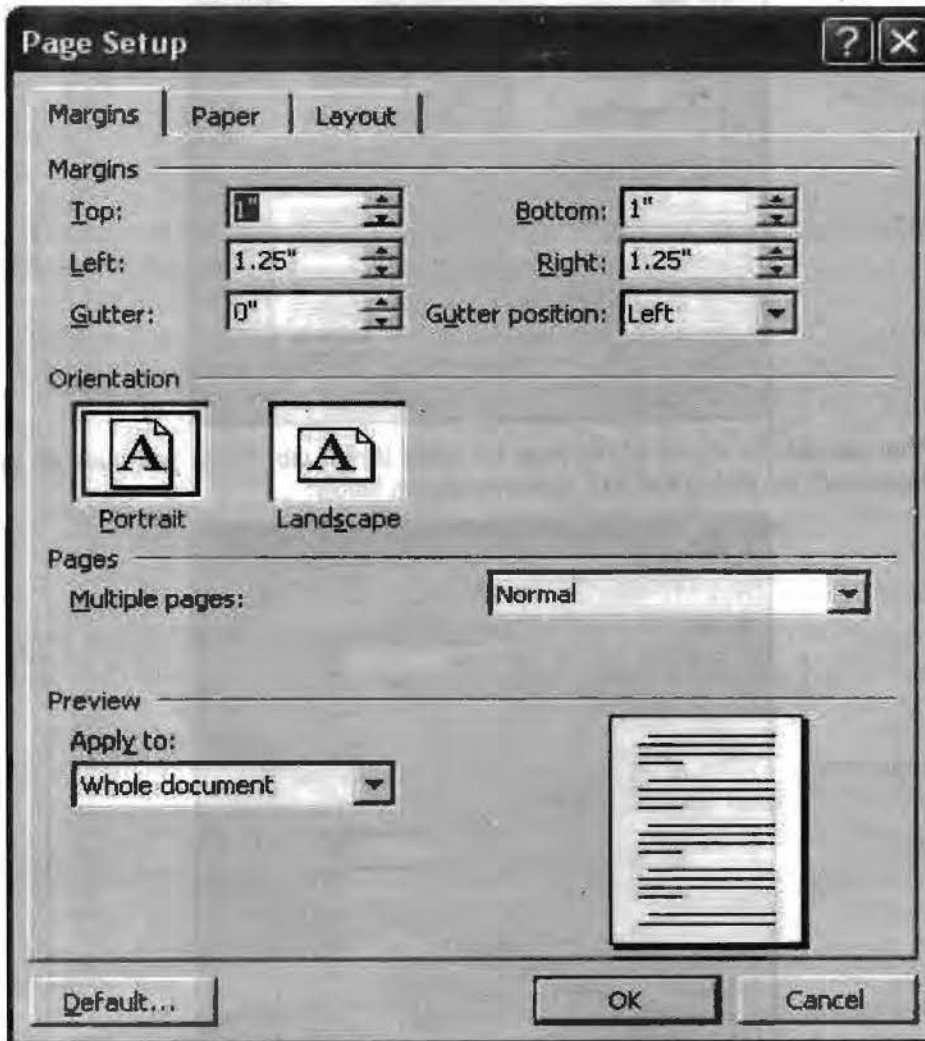


File → Page Setup

The Page setup command you can set the page layout (margins etc.). To invoke page setup:

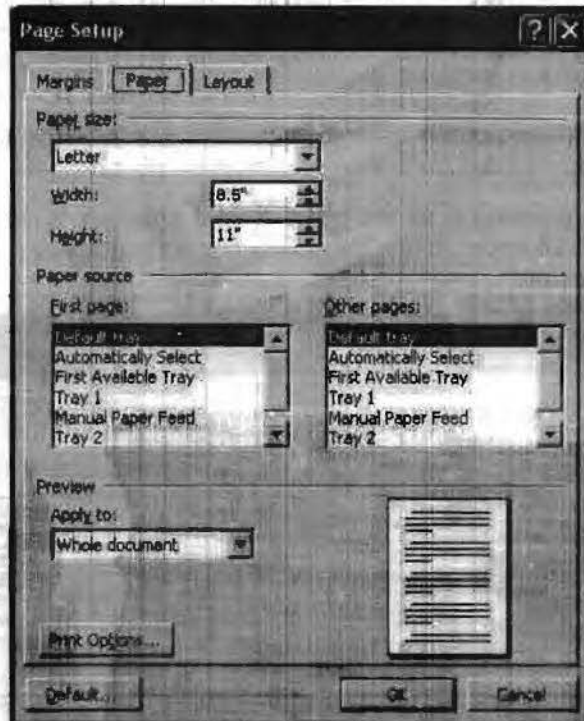
1. Click at the Page setup command in the file menu. The page setup window will appear.
2. Adjust margins or apply different options in the margin tab where,
 - (a) In top margin enter the distance you want between the top of the page and the top of the first line on the page.
 - (b) In Bottom margin enter the distance you want between the bottom of the page and the bottom of the last line on the page.
 - (c) In Left option, enter the distance you want between the left edge of the page and the left edge of unindented lines.

- (d) In Right option enter the distance you want between the right edge of the page and the right end of a line with no right indent.
- (e) In Gutter option enter the amount of extra space you want to add to the margin for binding. Word adds the extra space to the left margin of all pages if you clear the Mirror margins check box, or to the inside margin of all pages if you select the Mirror margins check box.
- (f) In Gutter Position option enter the side on which you want to add the margin for binding.
- (g) Select the orientation of the paper from Landscape or Portrait orientation frame. Portrait orientation is lengthwise while Landscape orientation is width-wise on the page.

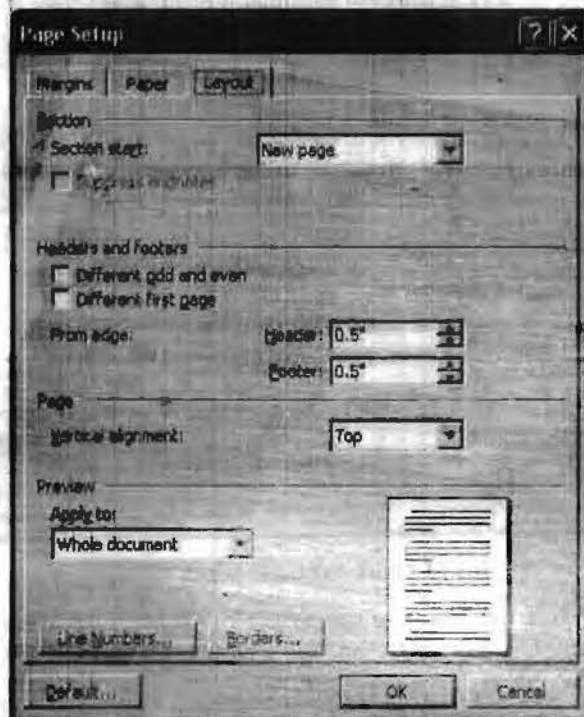


3. Select the different options of paper from the paper tab.
 - (a) From Paper size list box you can select the predefined Paper sizes like A4, legal etc.
 - (b) From Width and Height text boxes the custom Paper size can be defined by adjusting the Height and width of the paper.
 - (c) From the Paper source option you can select the source of paper that from where you are going to insert the paper in the printer.

- (d) In the Apply to list box click the portion of the document you want to apply the current settings to in the Page Setup dialog box. The default option is whole document, you can select according to the situation.



4. You can set the layout of the page by using layout tab. When you click on the layout tab, the dialog box will appear as shown below:

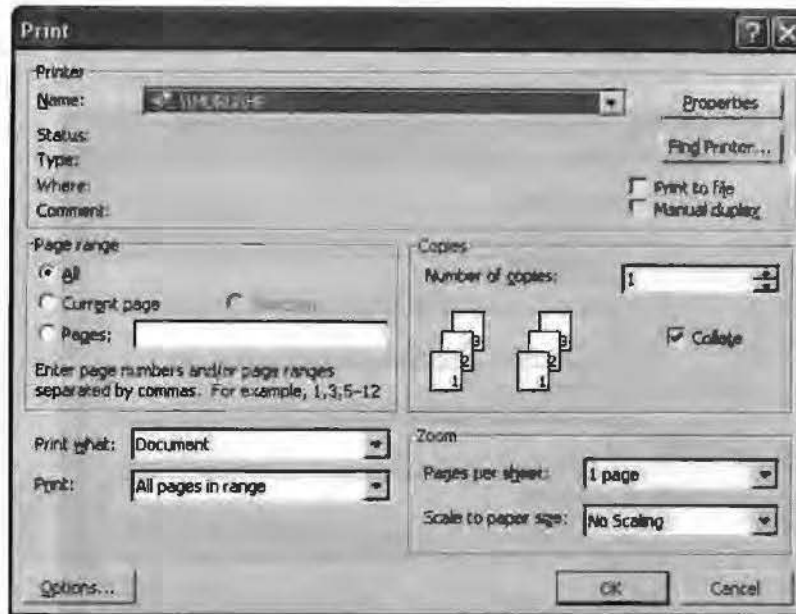


- (a) In the Selection frame select the portion from where you want the current layout to be applied.
- (b) In Header option under From edge frame enter the distance you want from the top edge of the paper to the top edge of the header. If the Header setting is larger than the Top setting, Word prints the body text below the header.

- (c) In Footer option under From edge enter the distance you want from the bottom edge of the paper to the bottom edge of the footer. If the Footer setting is larger than the Bottom setting, Word stops printing the body text above the footer.
- (d) In Page frame select the vertical alignment of the text.
- (e) In the Apply to list box click the portion of the document you want to apply the current settings to in the Page Setup dialog box. The default option is whole document, you can select according to the situation.

File → Print Option

Click at the print command, for taking the printout in the file menu. The print dialog box appears:



You can set various options before taking printout.

1. From the Name combo box in the Printer frame you can select the printer on which to print if there is more than one printer installed. You can also set the printer properties by clicking at the Properties button.
You can also save the document in print format in a file in case you do not need the printout at once. For this click on the Print to file option.
2. You can select the range of pages i.e. all pages or current page or number of pages you wish to print – from Page range frame. Click at All (default) for all the pages of the document; Current page for the current page; and page for the specified pages only; 3-6 for pages from 3 to 6, 3-3 for page number 3 only, 3,6-7 for page number 3 and all the pages from page number 3 to 7.
3. From the Print what option you can choose which part of a document you want to print i.e. the whole document or comments or anything else.
4. From Print option the pages to be printed can be selected i.e. all pages or even numbered pages or odd numbered pages.
5. You can specify number of copies of the document in Number of copies option under Copies frame.
6. In Pages per sheet option under Zoom frame you can specify the number of pages in the document that you want to print on each sheet of paper.

7. From Scale to paper size option you can select the paper size on which you want to print the document. For example, you can specify that a B4-size document will be printed on A4-size paper by decreasing the size of the font and the graphics. This feature is similar to the reduce/enlarge feature on a photocopy machine.
8. The collate check box can prints the copies of the document in proper binding order.

File → Send to Option

From Send to command you can send the document to various recipients (another application or otherwise) through various technologies like e-mail, fax etc.

File → Properties Option

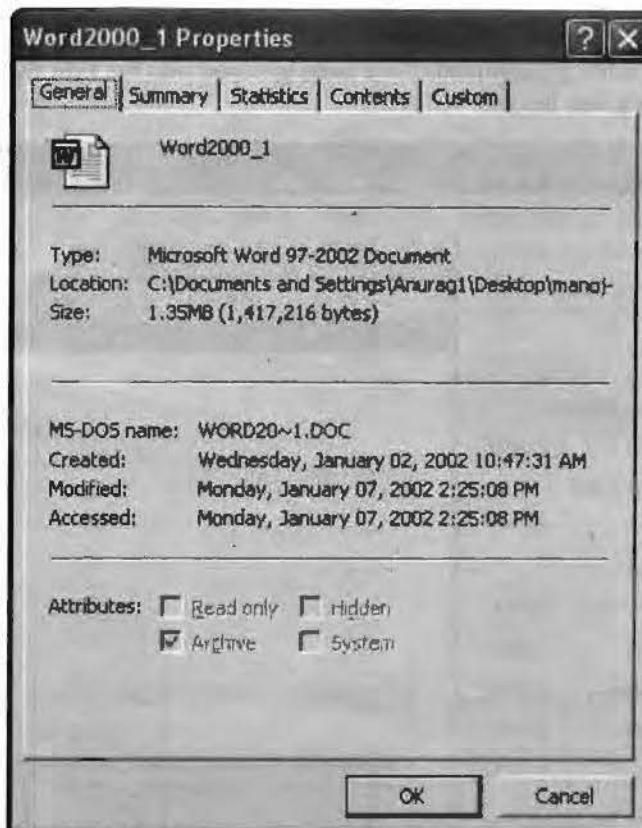
The Properties command in the file menu lets you set various properties of the document.

When you click on the properties option you will see the following window:

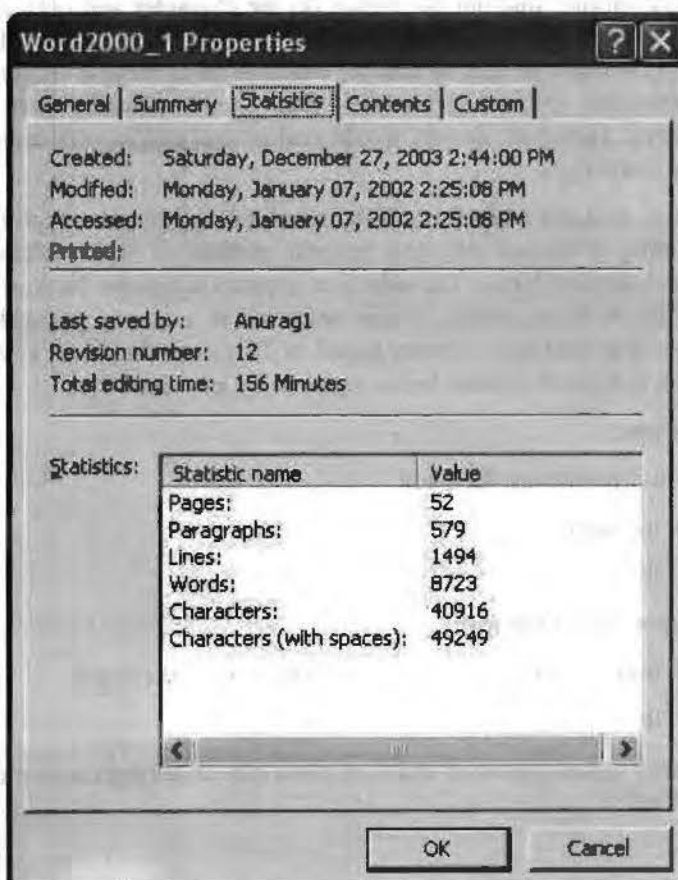
The screenshot shows a dialog box titled "Word2000_1 Properties". It has five tabs: "General", "Summary", "Statistics", "Contents", and "Custom". The "General" tab is active. Inside the dialog, there are several text input fields: "Title:" with the value "Chapter 1", "Subject:", "Author:" with the value "Anshu", "Manager:", "Company:" with the value "Personal", "Category:", "Keywords:", "Comments:", "Hyperlink base:", and "Template:" with the value "Normal". At the bottom left, there is a checkbox labeled "Save preview picture" which is currently unchecked. At the bottom right, there are two buttons: "OK" and "Cancel".

From this window you can set or see the various properties of the document. You can set the author name, company name, title of the document and various other properties. And from the other tabs you can see the various properties of the document like the ones described below:

1. In General tab you can see the type of document, the path of the file: where it is saved, the file size, date of creation of the document, date when last modified and accessed, etc.

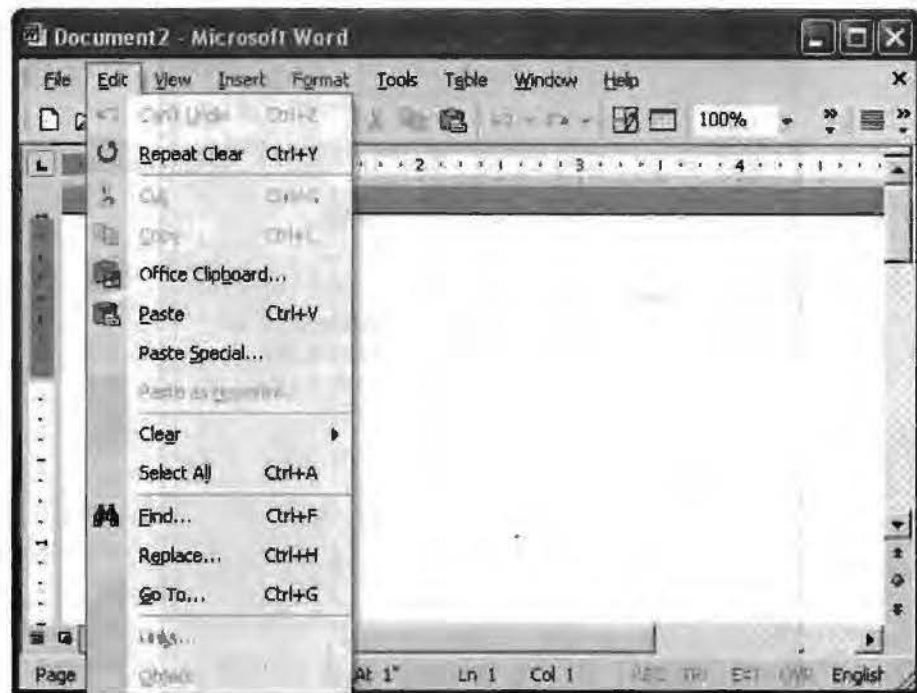


2. In Statistics tab you can see various statistics related to the document like number of pages, number of paragraphs, number of words, number of characters and number of lines in the document.



3.5.2 Edit Menu

All the necessary editing commands have been grouped into the Edit menu or toolbar. See the edit menu given below.



Block Operations

There may be a situation when you have to perform a task on a single character. Doing that is very simple. Just put the cursor on the character and perform the task. But in situations when you have to perform the same action with a group of words this may not be the preferred way. Let us take an example of deleting a whole paragraph. To delete a paragraph you can press the key repeatedly until the entire paragraph is deleted. However, as you would realize that this is very tedious way of deleting multiple characters.

A better solution is to make a block of all the characters of the paragraph by selecting it and then deleting it in one go. Any general method of text selection may be employed to select the text block. The selection appears in reverse background (white foreground and black background). While selected, if a key is pressed the entire selection is replaced by just the character keyed in. If instead the key is pressed, the selected block is deleted without being replaced by any character.

To select a word you:

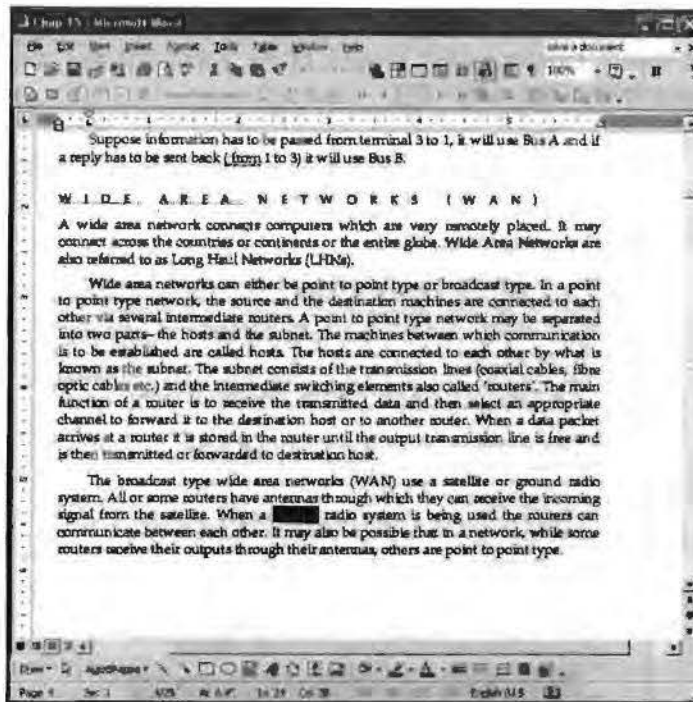
1. Place the mouse pointer on the word.
2. Double click the word.

OR

1. Place the cursor before the word.
2. Press the left button of mouse and drag it till the end of the word.

OR

1. Place the cursor before the word and then press ctrl+shift+right arrow keys.

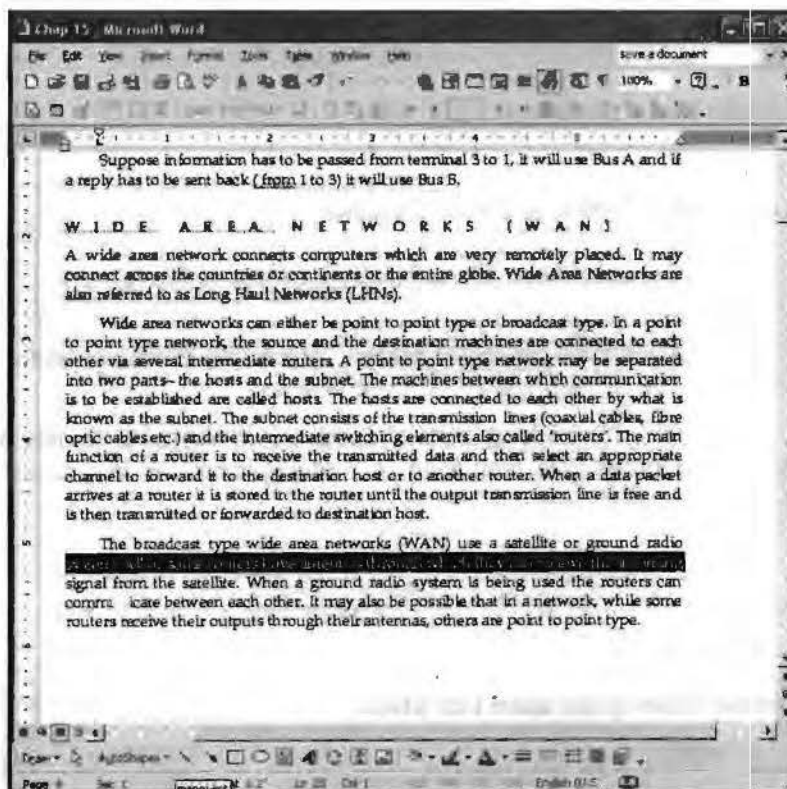


To select a line:

1. Point the mouse pointer on the left margin of the document. The mouse pointer will change to an arrow pointing opposite to usual direction.
2. Click the left mouse button only once.

OR

1. Place the cursor in front of the first character of the line.
2. Press shift+end key.



To select a paragraph:

1. Place the mouse pointer to left margin of the document and double click. The entire paragraph will be selected.

OR

1. Place the cursor on the first character of the paragraph.
2. Press ctrl + shift + down-arrow keys.



Edit → Undo/Redo Command

Sometimes, after making certain changes, it is desired to annul those changes made. MS-Word provides a command for undoing whatever was done in the previous step.

Undo



1. Click on the Undo option under Edit menu

OR

Click on the Undo button on Standard toolbar

OR

Press Ctrl+z.

The undo option displays all the recent actions, which MS-Word can undo. You can select from this list the appropriate action to be undone.

Similarly, sometimes, after undoing certain changes, it is desired to reapply the action undone. MS-Word provides a command for redoing whatever was undone in the previous step.

Redo

If an undo has to perform on the last reversed action that is known as Redo.

To perform redo you can:

1. Click on the Redo option under Edit Menu

OR

Click on the Undo button on Standard Toolbar

OR

Press Ctrl+y

Edit → Cut and Paste

Cut operation removes the selected object or objects from the present document and puts these into a memory area called clipboard. The objects may be text or picture or table or virtually anything that is available in the document. Paste means copying the content(s) of the clipboard at the specified location in the present document.

To cut text or an object:

1. Select the text(s) or object(s). Text/Object can be selected in various ways.

Any amount of text	<Drag over the text>
A word	Double-click the word.
A graphic	Click the graphic.
A line of text	Move the pointer to the left of the line until it changes to a right-pointing arrow, and then click.
Multiple lines of text	Move the pointer to the left of the lines until it changes to a right-pointing arrow, and then drag up or down.
A sentence	Hold down CTRL, and then click anywhere in the sentence.
A paragraph	Move the pointer to the left of the paragraph until it changes to a right-pointing arrow, and then double-click, or triple-click anywhere in the paragraph.
Multiple paragraphs	Move the pointer to the left of the paragraphs until it changes to a right-pointing arrow, and then double-click and drag up or down.
A large block of text	Click at the start of the selection, scroll to the end of the selection, and then hold down SHIFT and click.
An entire document	Move the pointer to the left of any document text until it changes to a right-pointing arrow, and then triple-click.
Headers and footers	In normal view, click Header and Footer on the View menu; in print layout view, double-click the dimmed header or footer text. Move the pointer to the left of the header or footer until it changes to a right-pointing arrow, and then triple-click.
Comments, footnotes, and endnotes	Click in the pane, move the pointer to the left of the text until it changes to a right-pointing arrow, and then triple-click.
A vertical block of text (except within a table cell)	Hold down ALT, and then drag over the text.

1. Select cut from Edit menu

OR

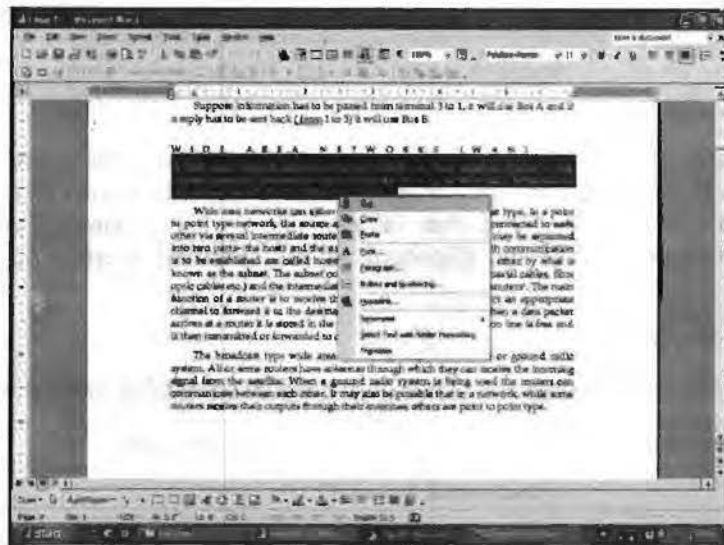
Click on the cut  button of standard toolbar

OR

Press the ctrl+x button

OR


Move the mouse pointer on the selected text and right click and select cut as shown below:



To paste from the clipboard:

1. Move the cursor at the location where the text/object is to be pasted.
2. Select Paste from Edit menu.

OR

Click paste  button on the standard toolbar

OR

Press Ctrl + v

OR

Click the right mouse button and select paste from the context menu as shown in the Figure.




Edit → Copy and Paste

Copying is duplicating the selected text/object of a document at some other desired place in the same or different document. The procedure for copying text is almost the same as that of moving text with the only difference that cutting removes the object(s) cut from its original place whereas copying leaves it as it is.

To copy a particular text/object:

1. Select the text or make the block of the text.
2. Select copy from Edit menu

OR

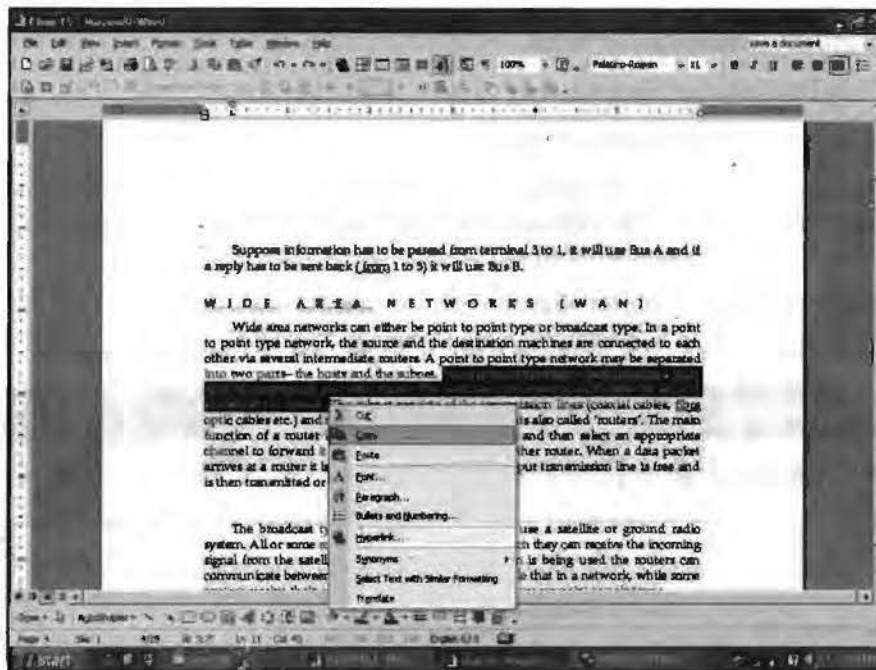
Click on the copy  button of standard toolbar

OR

Press the ctrl + c button

OR

Move the mouse pointer on the selected text and right click and select copy as shown in the Figure.



Paste operation is the same as described in the cut and paste section.

Edit → Find, Replace and Go to Options

Sometimes, while working with a document you need to find a particular text or some format or a special character or a page number, section number, comments etc. Find and its associated commands allow you to do just the same.

To find a particular text/object:

- (a) On the Edit menu, click Find

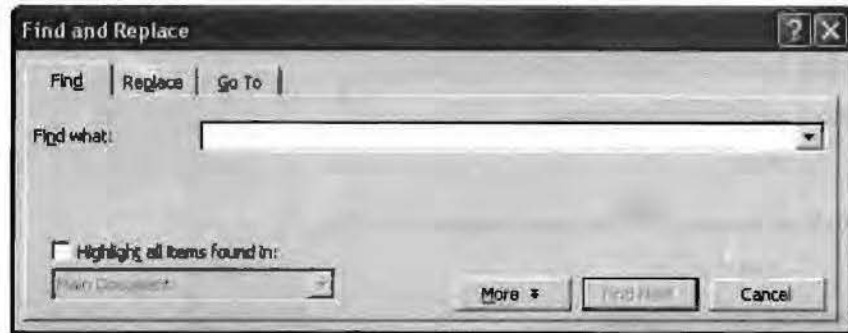
OR

Press Ctrl+F

OR

Click at Find button  in the toolbar.

Find and Replace window pops-up.



- (b) In the Find what box, enter the text that you want to search for.
- (c) Select any other options that you want. To select all instances of a specific word or phrase at once, select the Highlight all items found in check box, and then select the portion of the document you want to search in by clicking in the Highlight all items found in list.
- (d) Click Find Next or Find All.

To cancel a search in progress, press ESC.

If you have to replace a word in the document with another word you can automatically carry out the replacement. For example, you can replace all 'Acme' appearing in the document with 'Apex.'

To replace existing text/object with another text/object:

1. On the Edit menu, click Replace. The Find and Replace dialog box appears.

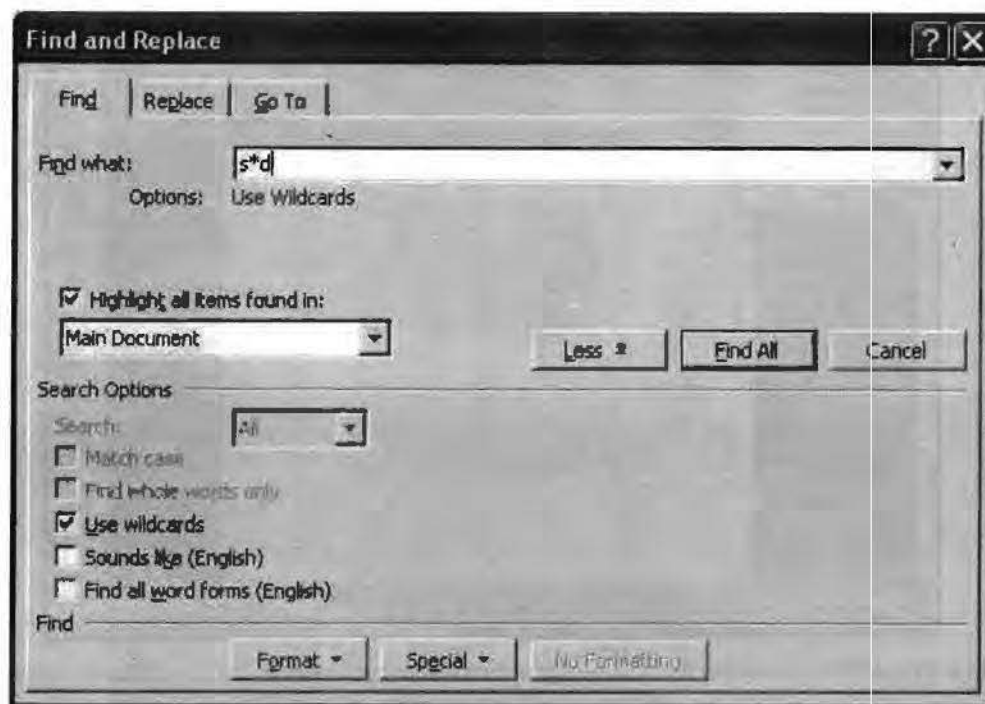


2. In the Find what box, enter the text that you want to search for.
3. In the Replace with box, enter the replacement text.
4. Select any other options that you want.
5. Click Find Next and Replace repeatedly to replace interactively, or Replace All to replace all the intended objects automatically.
6. To cancel a search in progress, press ESC.

In a similar manner you can find and replace text formatting, objects, spaces and anything that is listed in the Format and Special sub-menus.

Edit → Use Wildcards To Find and Replace

You can also specify a pattern using wild card (* or ?) in the search string. For example, use the asterisk (*) wildcard to search for a string of characters ("s*d" finds "sad" and "started").



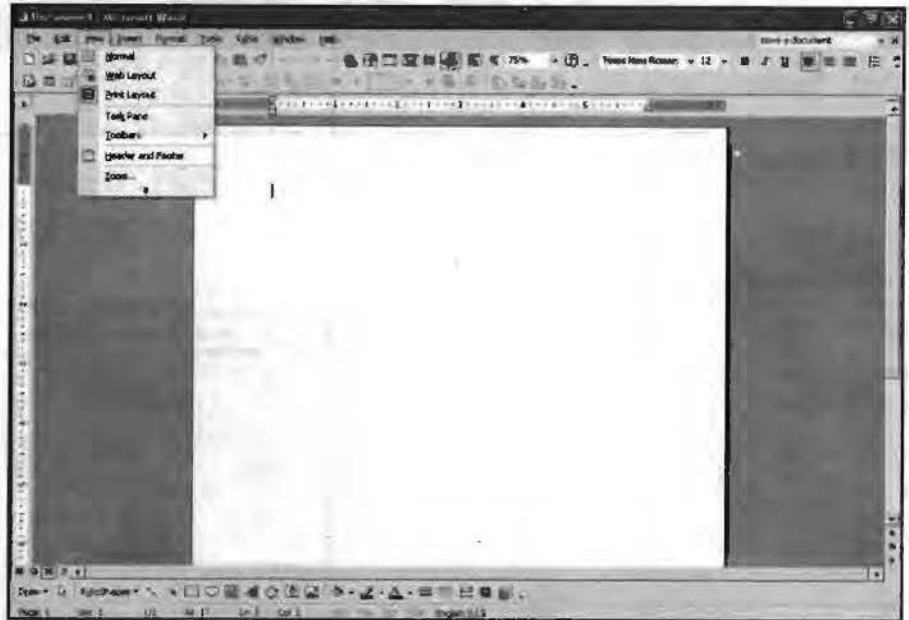
1. On the Edit menu, click Find or Replace.
2. If you don't see the Use wildcards check box, click More.
3. Select the Use wildcards check box.
4. Enter a wildcard character in the Find What box. Do one of the following:
 - (a) To choose a wildcard character from a list, click Special, click a wildcard character, and then type any additional text in the Find what box.
 - (b) Type a wildcard character directly in the Find what box.
5. If you want to replace the item, enter what you want to use as a replacement in the Replace with box.
6. Click Find Next, Replace, or Replace All.
7. To cancel a search in progress, press ESC.

When the Use wildcards check box is selected, Word finds only the exact text you specify. (Notice that the Match case and Find whole words only check boxes are unavailable – dimmed – to indicate that these options are automatically on; you can't turn off these options.)

To search for a character that's defined as a wildcard, type a backslash (\) before the character. For example, type \? to find a question mark.

3.5.3 View Menu

MS-Word provides a wide variety of views for seeing your document in different ways. Various commands under View menu facilitate this action. To access the view menu click on the view menu or press alt + v from keyboard.

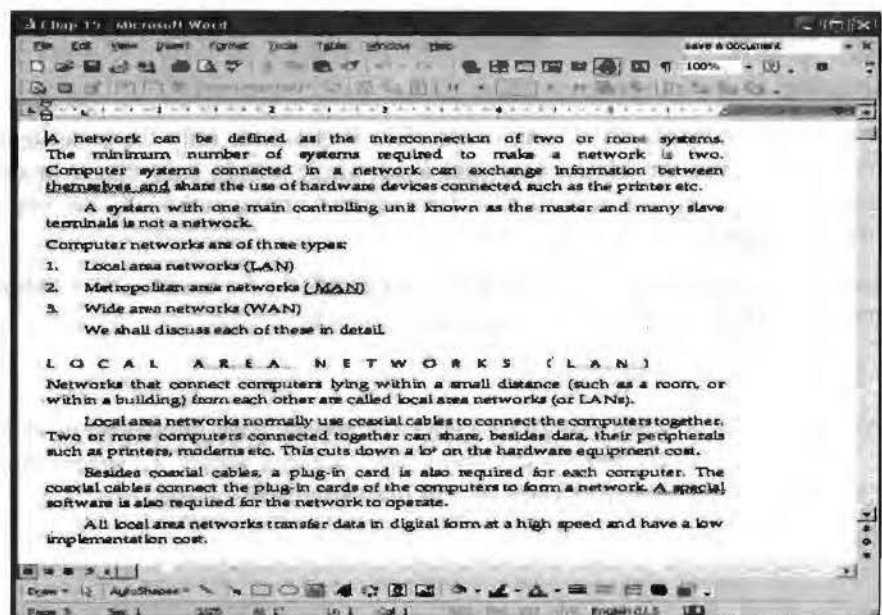


MS-Word 2003 provides the following options to view a document in different styles.

1. Normal
2. Web Layout
3. Print Layout
4. Outline
5. Full Screen

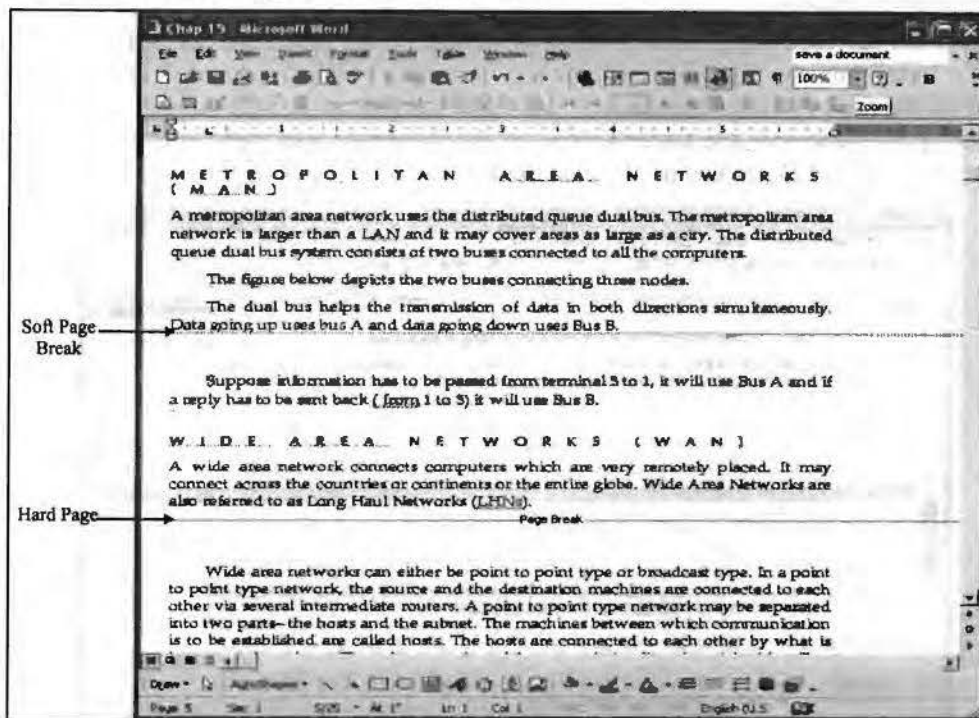
View → Normal View

In the Normal view you can only view the Horizontal ruler instead of both horizontal and vertical ruler. It does not display the margin areas of the page that's why you can't see the headers and footers.



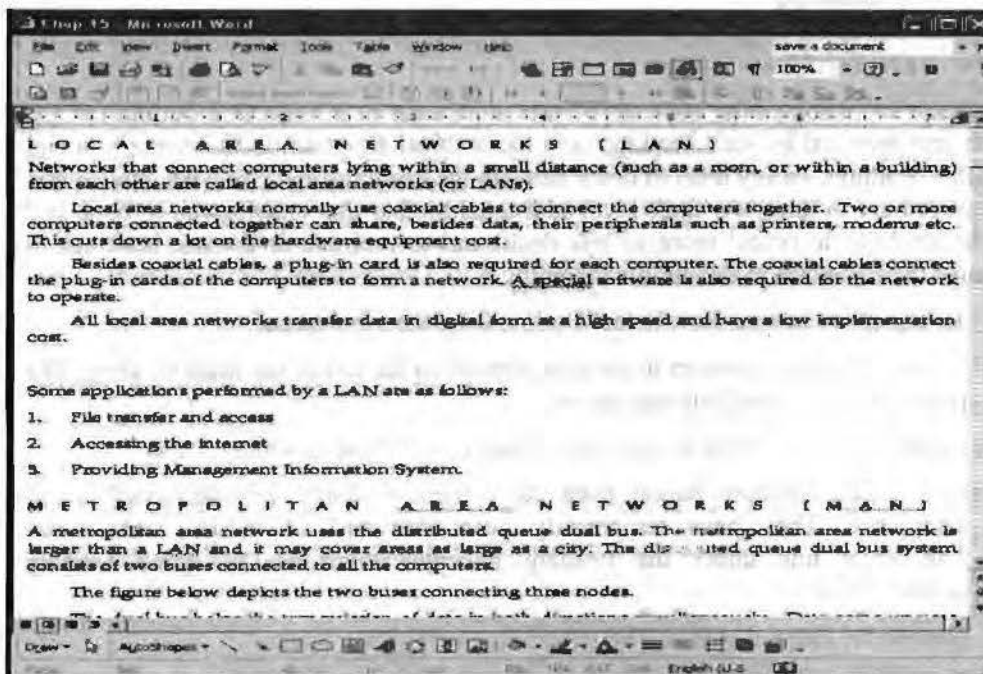
The advantage of the Normal view is that you differentiate between the Soft page break (one that MS-Word gives you when the text flows out of one page), which will appear as horizontal line running across the page; or a hard page break (one which you

insert to end the page before it goes full) which will appear as dotted horizontal line with the MS-Word's Page Break as shown below:



View → Web Layout View

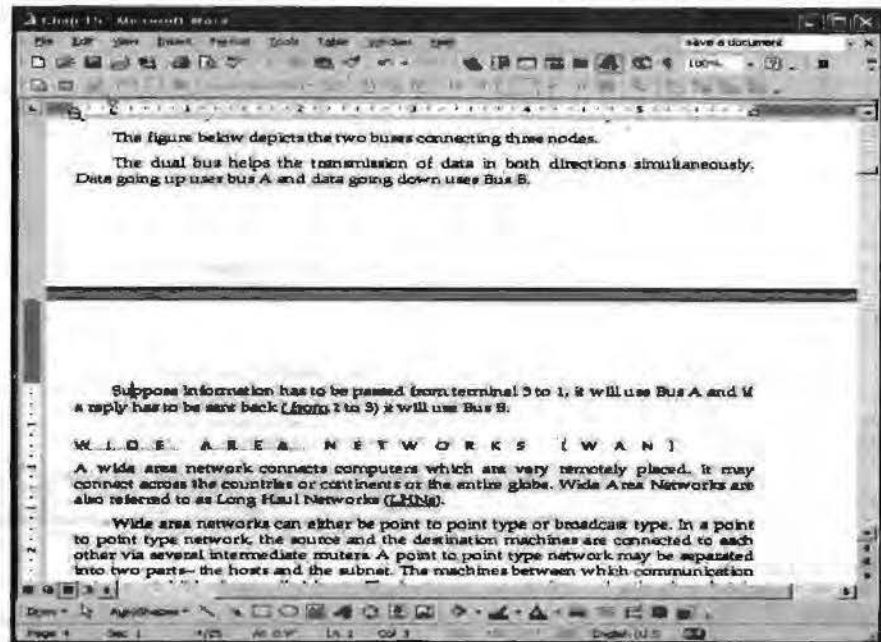
With the help of Web Layout view one can view the document in the way it will appear when opened with the web browser. Clicking on Web Layout under View menu sets the Web layout view as shown below:



In this layout also the horizontal ruler is shown instead of both the rulers as in case of Normal view. But there will no page break displayed on the page in the Web layout view. The whole document looks as if it were a single page.

View → Print Layout

This layout is the default view layout. Print layout view gives you the view that will appear on the hard copy when printed. It includes both horizontal as well vertical rulers to tell you exact position of your text or picture in the document. It also shows you all the four, i.e., top, bottom, left, and right margins as well as the text you have typed in the header or the footer section of the document with light gray color. To change the view to Print layout, click on the Print Layout option under View menu.



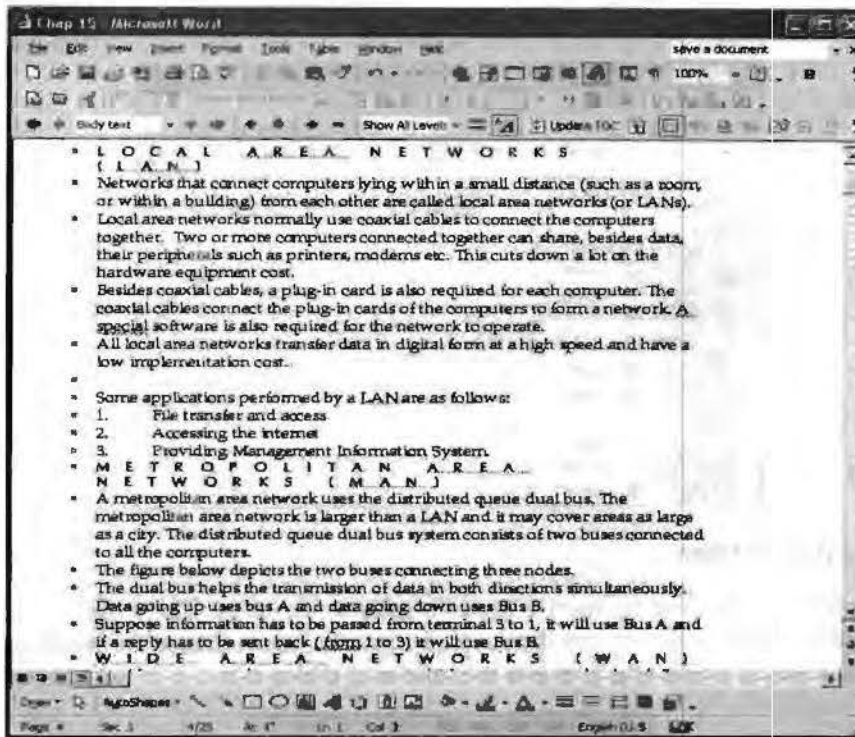
As you can see in the Print Layout view each and every page looks like a separate page of the notebook.

View → Outline View

Outline view displays the contents of your document in a traditional outline format, with text indented beneath headings in a hierarchical structure. In this view, you can display headings, or any level of detail beneath the headings that you wish. Notice that when you are in this view there is an additional toolbar that enables you to open and close headings to reveal more or less detail and to promote or demote headings to change their position in the outline hierarchy.

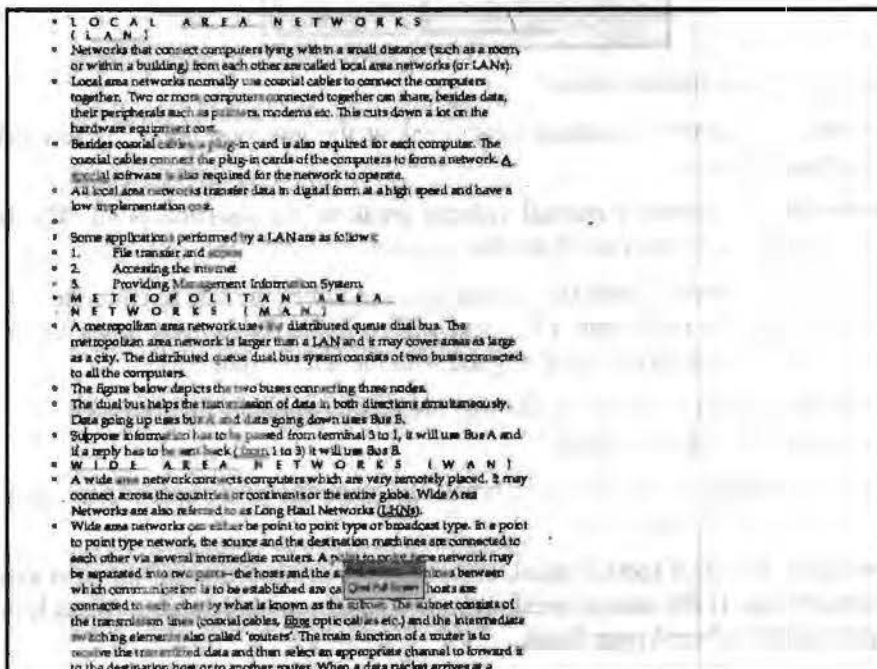
1. To change to outline view Select Outline from the view menu.
2. Move your mouse pointer to the plus symbol to the left of the main heading. The pointer changes to a four-way arrow.
3. Click the arrow symbol to select this heading and all of its subheadings.
4. Choose the Collapse button from the Outlining toolbar. The entire subheading disappears. They have temporarily been collapsed or hidden from view. The wavy line under the heading indicates there are collapsed heading underneath it.
5. Choose the Expand button. The subheading will appear again.
6. To restyle a heading to demote it one level or promote it one level, select it and then click the Promote or Demote buttons in the Outlining toolbar. Then click the appropriate heading style. For example, if you demote a heading formatted with the Heading 2 style, Word reformats it with the Heading 3 style.
7. To move a heading (along with all the subheadings and body text it contains) to a new location in the document, drag its plus sign. As you drag, a horizontal line

indicates where the heading will appear. When the line is in the right place, release the mouse button.



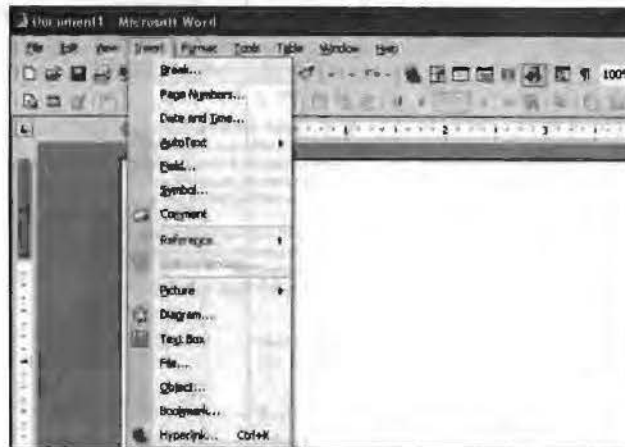
View → Full Screen View

If you like working in a completely spick and span environment, you'll like the Full Screen view. To switch to this view, choose Full screen option from view menu. Your document enlarges to cover the entire desktop. The title bar, menu bar, and toolbars in the MS-Word window are temporarily hidden to give you as much room as possible to see your text. If you want to issue a menu command, point to the thin gray line running across the top of your screen to slide the menu bar into view. To view your document in full-screen click the Full Screen in View menu. Full screen view of a document is given below:



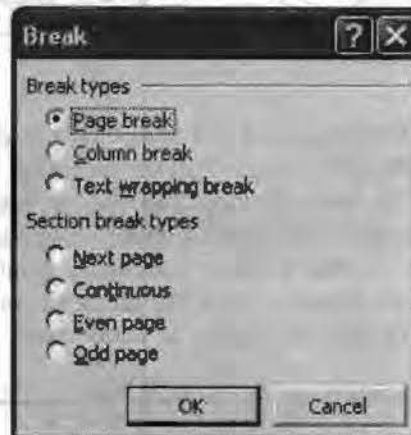
3.5.4 Insert Menu

Insert menu helps you to insert various word objects and components in between the word document. Insert menu has following options.



Insert → Break Option

Break option enables you to insert a break in between the page. This break can be of many kinds - page break, column break etc. To insert a break choose the Break option from Insert menu, which will give you the following dialog box.



Break dialog box has various choices.

1. **Page Break:** It inserts a manual page break at the insertion point. At this point another page begins.
2. **Column Break:** Inserts a manual column break at the insertion point. The text from this point becomes part of another column.
3. **Text Wrapping Break:** Ends the current line and forces the text to continue below a picture, table, or other item. (The text will continue on the next blank line that doesn't contain a picture or table aligned with the left or right margin.)
4. **Next Page:** Inserts a section break and breaks the page so that the next section starts at the top of the next page.
5. **Continuous Page:** Inserts a section break and starts the new section immediately, without inserting a page break.
6. **Even Page:** Inserts a section break and starts the next section on the next even-numbered page. If the section break falls on an even-numbered page, Word leaves the next odd-numbered page blank.

7. **Odd Page:** Inserts a section break and starts the next section on the next odd-numbered page. If the section break falls on an odd-numbered page, Word leaves the next even-numbered page blank.

Insert → Page Number Option

This option is available on the Header and Footer toolbar. It inserts the page number of the document in the header or footer, as required. The page number is automatically updated with the increment of pages in the document.

You can display or hide the page number on the first page of the document. To do so:

1. If your document is divided into sections, click in a section or select multiple sections in which you want to display or hide the page number on the first page.
2. On the Insert menu, click Page Numbers.
3. Select or clear the Show number on first page check box.

Insert → Date and Time Option

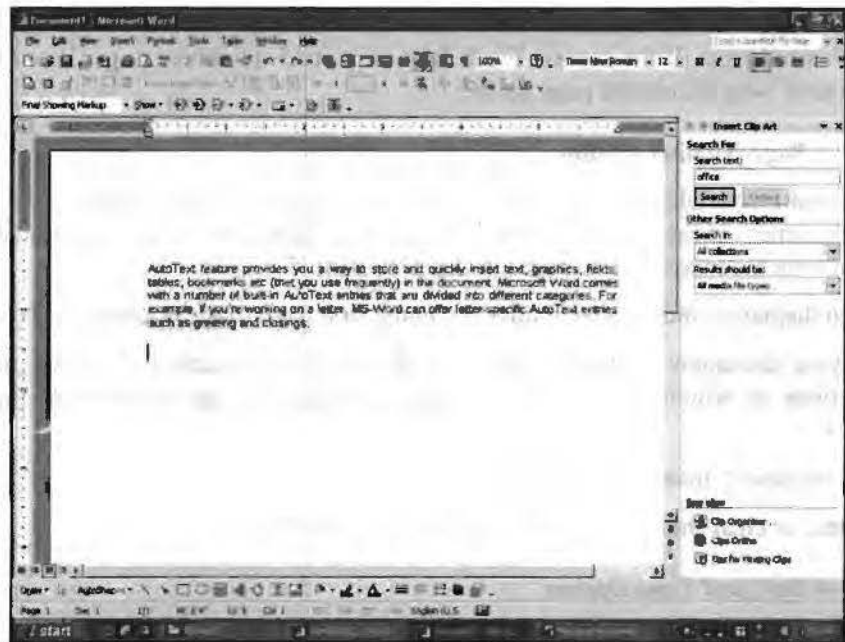
To insert the current date and time:

1. Click where you want to insert the date or time.
2. On the Insert menu, click Date and Time.
3. If you want to insert the date or time in a different language format, then click the language in the Language box. The Language box includes a list of the enabled editing languages. Additional date and time options may also be available, depending on the language that you selected.
4. In the Available formats box, click a date or time format.
5. Select whether you want the date to automatically update or to remain as originally inserted. Do one of the following:
 - ❖ To insert the date and time as a field that's automatically updated when you open or print the document, select the Update automatically check box.
 - ❖ To maintain the original date and time as static text, clear the Update automatically check box.

Insert → Inserting Pictures

You can insert into your document pictures, graphics etc. called clips. Word provides an in-built ClipArt gallery that contains many pre-designed clips. To find a clip:

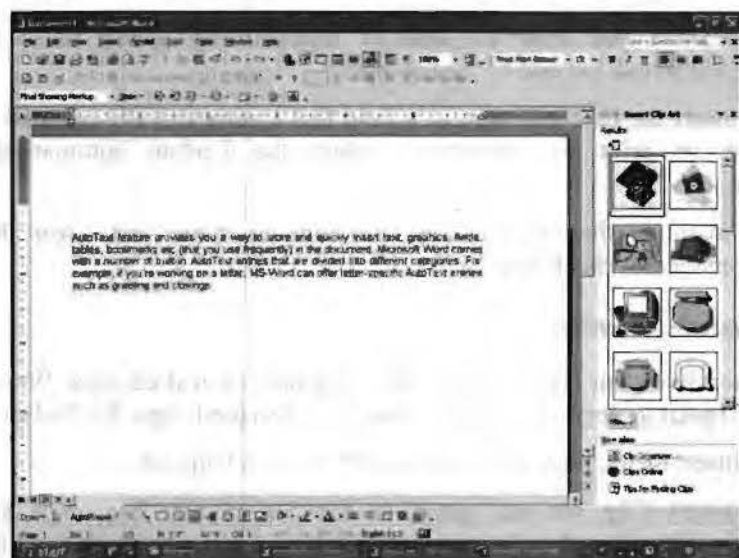
1. On the Insert menu, point to Picture, and then click Clip Art.
2. In the Insert Clip Art task pane, in the Search text box, type a word or phrase that describes the clip you want or type in all or some of the file name of the clip.



3. To narrow your search, do one or both of the following:

- ❖ To limit search results to a specific collection of clips, in the Search in box, click the arrow and select the collections you want to search.
- ❖ To limit search results to a specific type of media file, in the Results should be box, click the arrow and select the check box next to the types of clips you want to find.

4. Click Search.



To clear the search criteria fields and begin a new search, below the Results box, click Modify.

This will insert the selected clipart in your document at the specified place.

Insert → Inserting a Clip from the Clip Organizer

You can insert clips from the clip organizer. First you have to find the media clip you want to insert. To do so:

1. On the Insert menu, point to Picture, and then click Clip Art.

2. In the Insert Clip Art task pane, in the Search text box, type a word or phrase that describes the clip you want or type in all or some of the file name of the clip.
3. To narrow your search, do one or both of the following:
 - ❖ To limit search results to a specific collection of clips, in the Search in box, click the arrow and select the collections you want to search.
 - ❖ To limit search results to a specific type of media file, in the Results should be box, click the arrow and select the check box next to the types of clips you want to find.
4. Click Search.
5. Now, in the Results box, click the clip to insert it.

Insert → Inserting Image from A Desired Location

1. Place the cursor where you want to insert the image.
2. Choose From file option from Insert->Picture menu. The insert picture dialog box pops-up.
3. Select the desired folder.
4. Select the desired picture.
5. Click on the insert button.



Insert → Drawing Shapes

You can draw various types of shapes in a word document with the help of drawing toolbar or from the option Auto shapes from Insert->Auto shapes. These shapes can be rectangle, oval, arrows, callouts etc. To draw an auto shape:

1. Click the Auto shapes button on the Drawing toolbar. You will see the pop up menu shown on the next page.




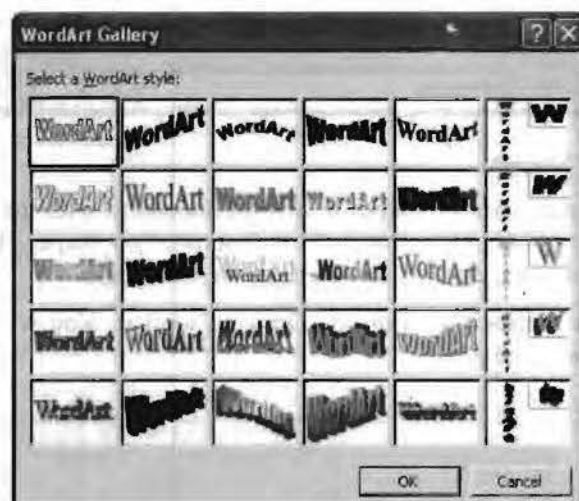
2. Select the auto shape you want to insert your document.
3. The selection will change the mouse pointer to plus shape.
4. Place it and drag it according to the size of auto shape you want.
5. Release the mouse button.

Word Art

WordArt lets you add fancy style to the fonts of your text. It provides a different look to your text as well document. It's perfect for creating flashy headings and titles.

To insert a word art in your document:

1. Click the place on the document where you want the WordArt image to be placed.
2. Choose Insert, Picture, WordArt or click on  icon. This will open the WordArt Gallery dialog box.



3. Choose the desired format and press Ok button.
4. Edit WordArt dialog box opens.
5. Write the desired text in place of Write your Text Here.
6. Select the desired Font and Font size.
7. Press Ok button.



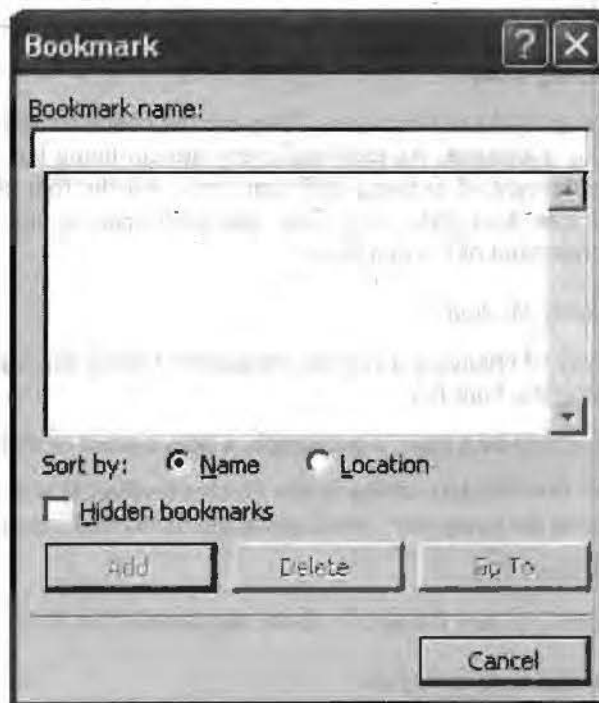
You can always double click at the wordart and modify its properties.

Insert → Inserting a Bookmark

A bookmark is an item or location in a document that you identify by a name for future reference. You can use bookmarks to quickly jump to a specific location, create cross-references, mark page ranges for index entries, and so on.

To add a bookmark:

1. Select an item you want a bookmark assigned to, or click where you want to insert a bookmark.
2. On the Insert menu, click Bookmark.

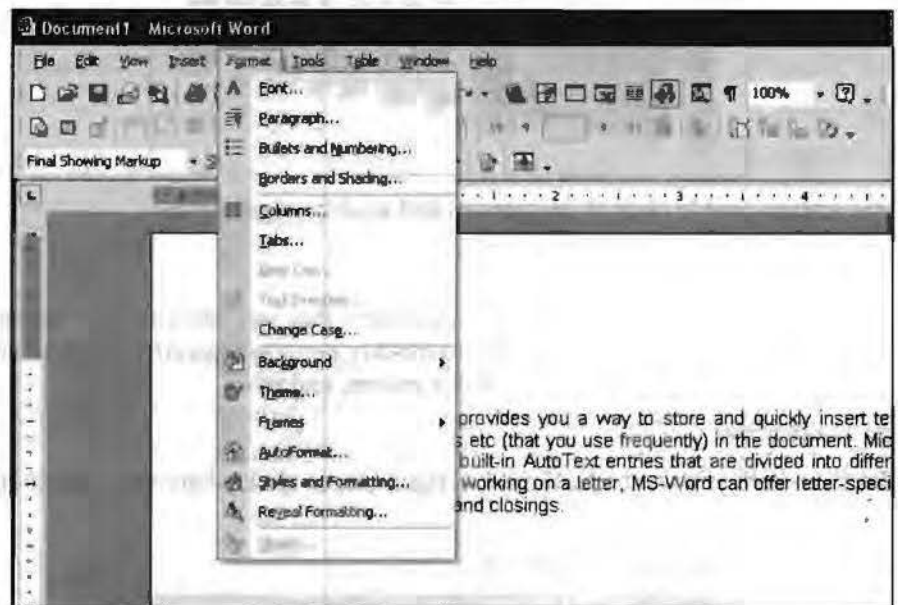


3. Under Bookmark name, type or select a name.
4. Click Add.

Bookmark names must begin with a letter and can contain numbers. You can't include spaces in a bookmark name. However, you can use the underscore character to separate words — for example, "My_heading." You can use bookmark with the go to command in edit menu.

3.5.5 Format Menu

Once the text of a document has been typed, you would like to give it the looks and layout suitable to your needs. This is referred to as formatting. Formatting affects the appearance of the document rather than its textual/graphical contents. MS-Word provide format menu to give a meaningful format of your document, so that a user can read and understand the document in an easy manner. Following are the options available in format menu.



Format → Formatting Font

Font means the design/looks of characters. They are the character sets that you used to type the text in your document. As each and every human being has a unique writing style, they may be thought of as using different fonts. All the font characteristics i.e. the font type, font size, font style, font color, character spacing etc. can be modified through the Font command of Format menu.

Changing of font using the font list

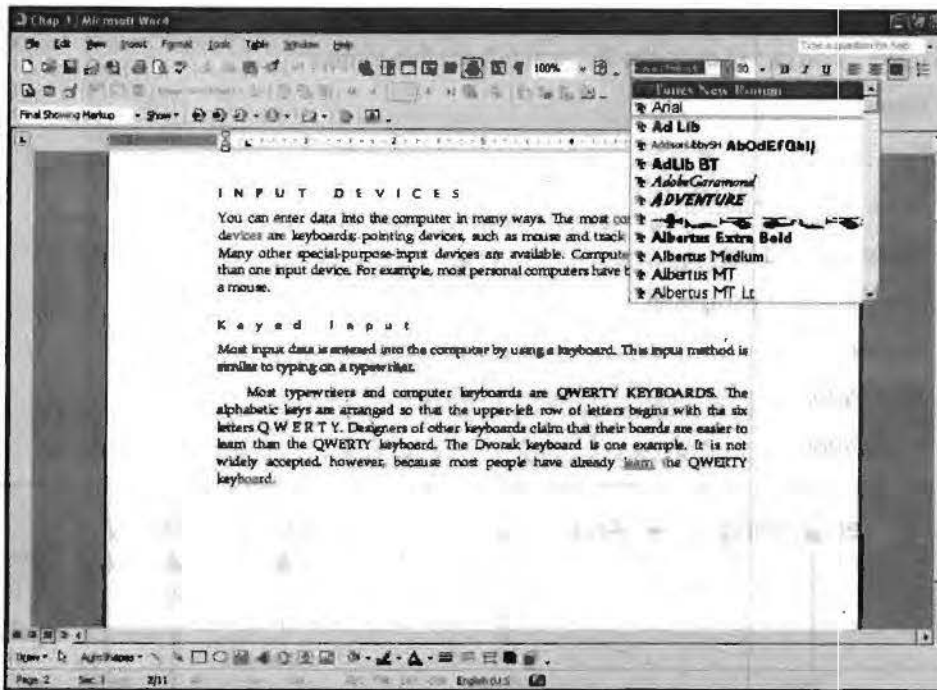
This is a quicker way of changing a font as compared of using the font dialog box. To change the font using the Font list:

1. Select the text. It can be a page, a paragraph, a line, a word or a character.
2. Drop down the Font list box sitting in the Format toolbar. It will show you all the fonts available on the computer. Scroll down the list to find out more fonts.
3. Click on the desired font.

Word places the fonts you use frequently above the double line in the Font list box.

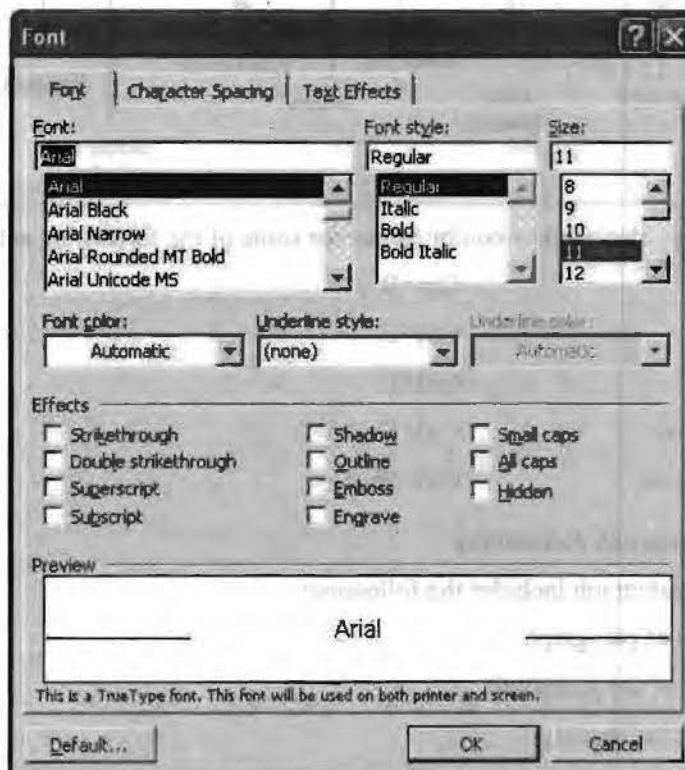
Changing of font using Font dialog box

Changing the font-using Font dialog box gives you the opportunity to see the result within the dialog box before applying it on the text. Other benefit of using the font dialog box is that you can apply several effects within at the same time affecting various characteristics of the font.



To do so:

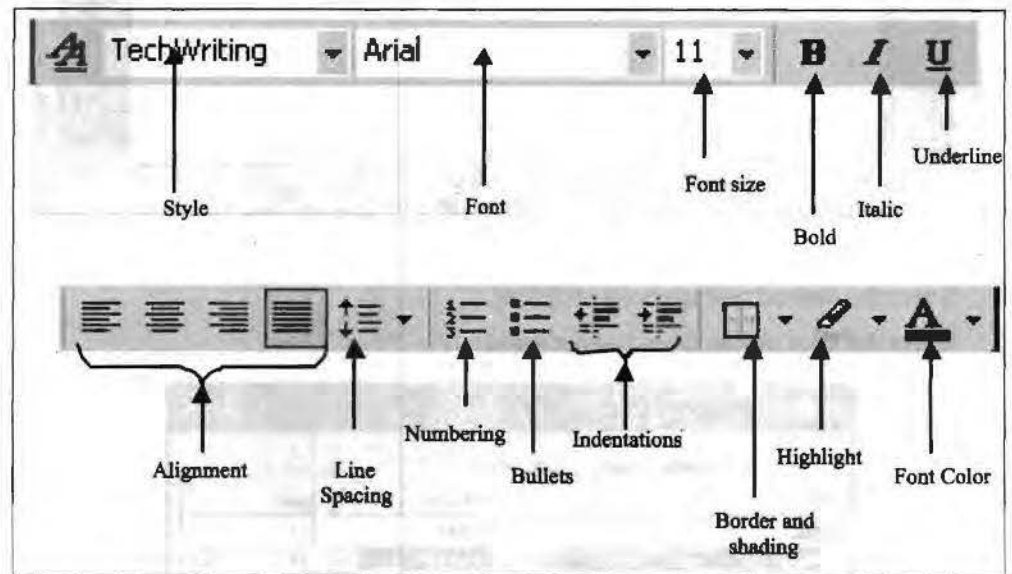
1. Select the desired text to change the font.
2. Select the Font option from Format menu.



3. Scroll through the Font list and click the font that you want.
4. Select the color; underline style and other effects of your choice.
5. Select the font style according to the text.
6. Click on Ok button when done.

You can use formatting toolbar for all these operations to make your task much easier and faster. You can change the following from this toolbar:

- Font
- Font Type
- Bold, Italic, Underline
- Make bulleted list
- Indentation of paragraph
- Border
- Text Color
- BackColor



Besides, you can also use key combinations for some of the formatting actions.

Bold:	Ctrl+B
Underline:	Ctrl+U
Italic:	Ctrl+I
Increase font size:	Ctrl+Shift+>
Decrease font size:	Ctrl+Shift+<

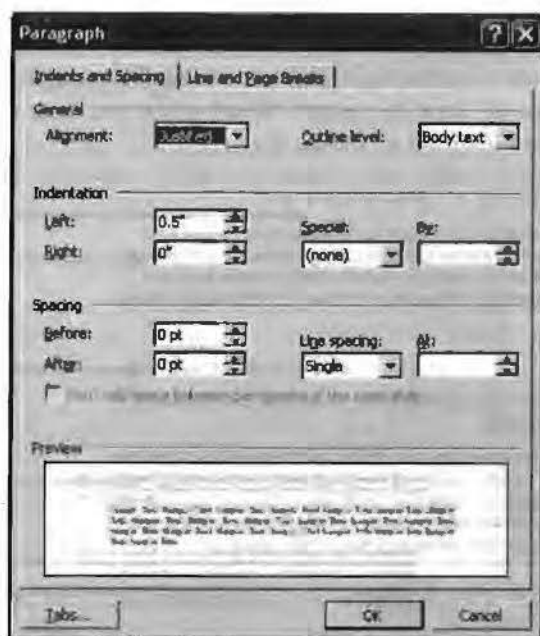
Format → Paragraph Formatting

Formatting of paragraph includes the following:

1. Indentation of paragraph
2. Alignment of the paragraph
3. Changing Line spacing
4. Tabs

To do the above you need to choose the Paragraph option under the Format menu.

When you click on the Paragraph option you will be able to see the following dialog box.



Indentation of Paragraph

Indent is the space left blank within the page margin. You can indent your paragraph from the left and right margins. You can also create first-line indent, which indents only the first line of a paragraph, or a hanging indent, which indents all of the lines in a paragraph except the first. Indentation can be set in various ways:

Indentation through Paragraph Dialog Box

Indentation through Paragraph dialog box is probably best method for you. To indent a paragraph:

1. Click in the paragraph which you want to indent.
2. Select Paragraph option under Format menu. This will bring up the above dialog box.
3. Click the Indent and spacing tab.
4. Under Indentation, type the measurement that you want to indent the paragraph in the Left or Right text boxes.
5. Click OK button.

Indentation through Increase Indent and Decrease Indent Button

If you want to set a left indent at a half-inch increment on the ruler, you can do it through the increase indent and decrease indent buttons on the formatting toolbar.

1. Click in the paragraph you want to indent.
2. Click the Increase indent button to increase indent and Decrease Indent button to decrease the indent.

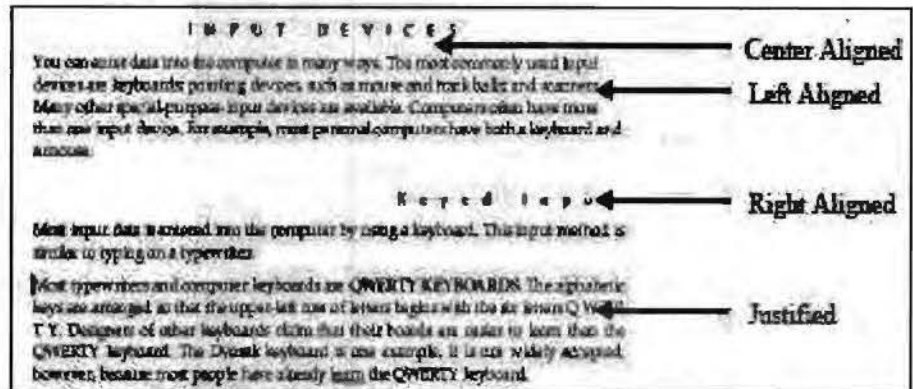
Set an Indent with Indent Marker

Follow these steps to set an indent by dragging the indent markers:

1. Click in the paragraph that you want to indent.
2. Point to the indent marker that you want to use.
3. Drag the indent marker to the right spot on the ruler, and release the mouse button.

Paragraph Alignment

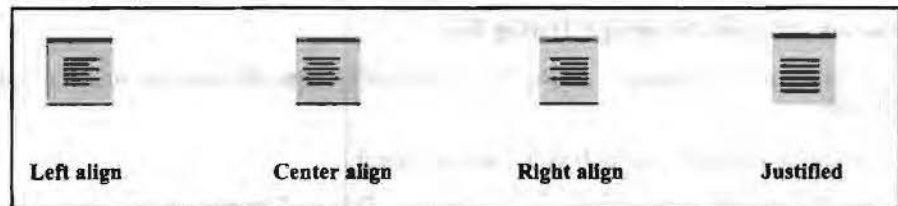
Alignment refers to the way the right and left edges of a paragraph line up along the right and left margins of your document. Word gives you four alignment choices – left, centered, right and justified as shown in the below:



By default, word keeps left alignment. To change the alignment of the paragraph:

1. Click on the paragraph in which you want to change the alignment.
2. Bring up the Paragraph dialog box as stated above.
3. Choose the alignment from alignment drop down list.
4. Press the Ok button.

Alternatively, you can align paragraph with the alignment button in format toolbar.

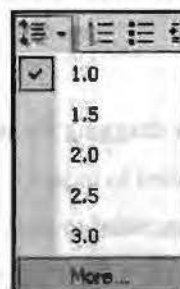


Changing Line Spacing

Line space is the space between two lines in a paragraph. By default it is single-spaced. To change the line space:






1. Click the paragraph in which you want to change line spacing.
2. Bring up the Paragraph dialog box.
3. In the line spacing list box select the space you want in between the lines or write the number in the text box if you want to choose the last three options under the Line spacing list box.
4. Click the Ok button.

Alternatively, you can use line spacing tool button in the format toolbar.



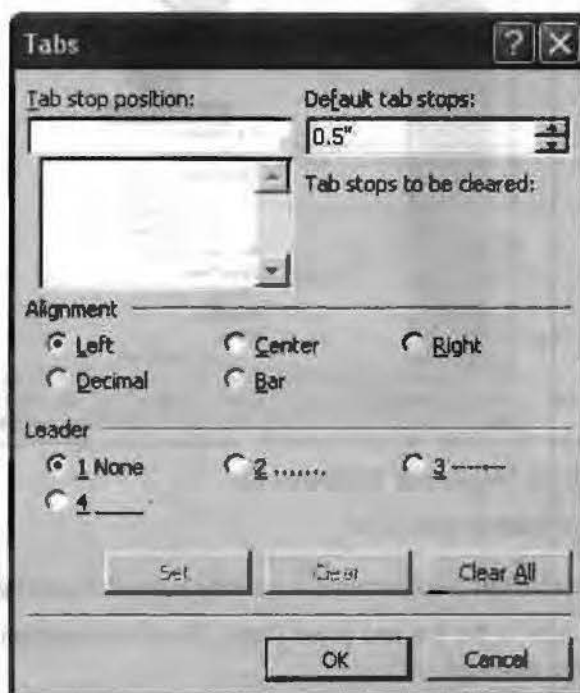
Format → Tabs

Tab is a position you set for placing and aligning text on a page. You can move on a line from one tab position to another by pressing Tab key. This approach does not require manual spacing that you would do otherwise to align lines in a column. Microsoft Word has a variety of tab stops, as shown below:

-  Left text extends to the right from the tab stop.
-  Center text is centered at the tab stop.
-  Right text extends to the left from the tab stop until the tab's space is filled, and then the text extends to the right.
-  Decimal text before the decimal point extends to the left, and text after the decimal point extends to the right.
-  Bar tabs generates a bar.

To set tabs:

1. On the Format menu, Click Tabs option.



2. In the Tab stop position box, type the position for a new tab, or select an existing tab stop.
3. Under Alignment section, select the alignment for text typed at the tab stop.
4. Under Leader, click the leader option you want, and then click set.

Leader is a character that fills the spaces between one tab position to another.

Leader	
1.	Chapter 1
2.	Chapter 2
3.	Chapter 3

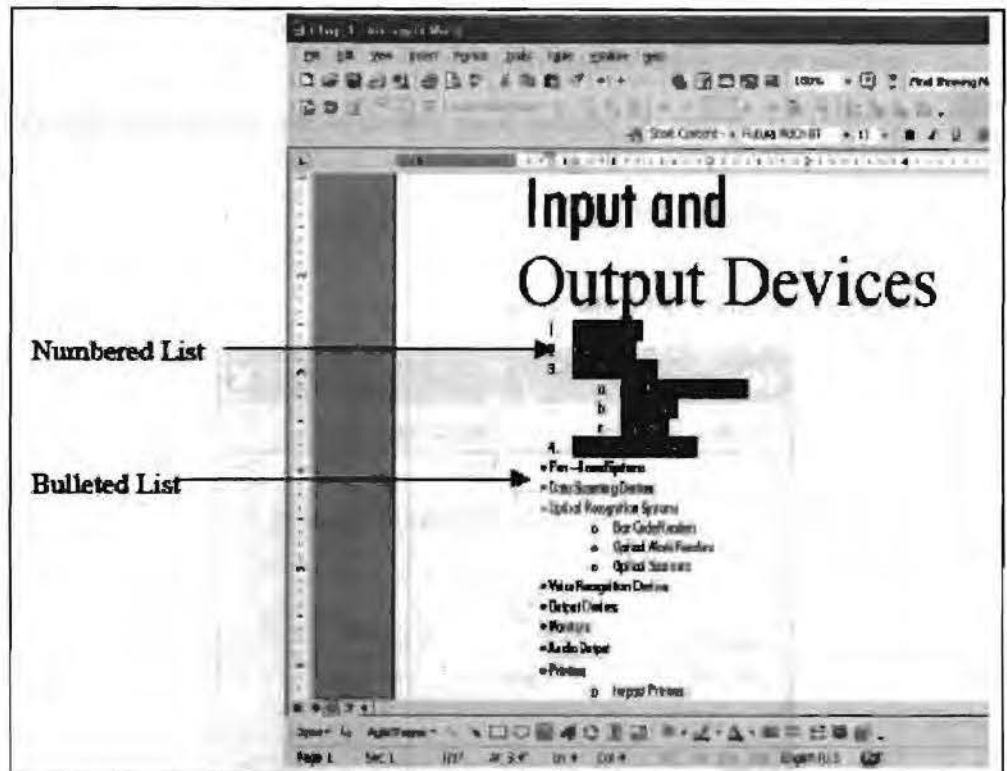
Format → Bullets and Numbering

Word's bulleted and numbered list features add the bullets or numbers for you, and they create hanging indents so that when text in an item wraps to the next line, it doesn't wrap underneath the number of bullet.



Word enables you to create single level lists as well as multilevel lists.

Single Level Lists

Single level lists are shown below:



To create a single-level bulleted or numbered list:

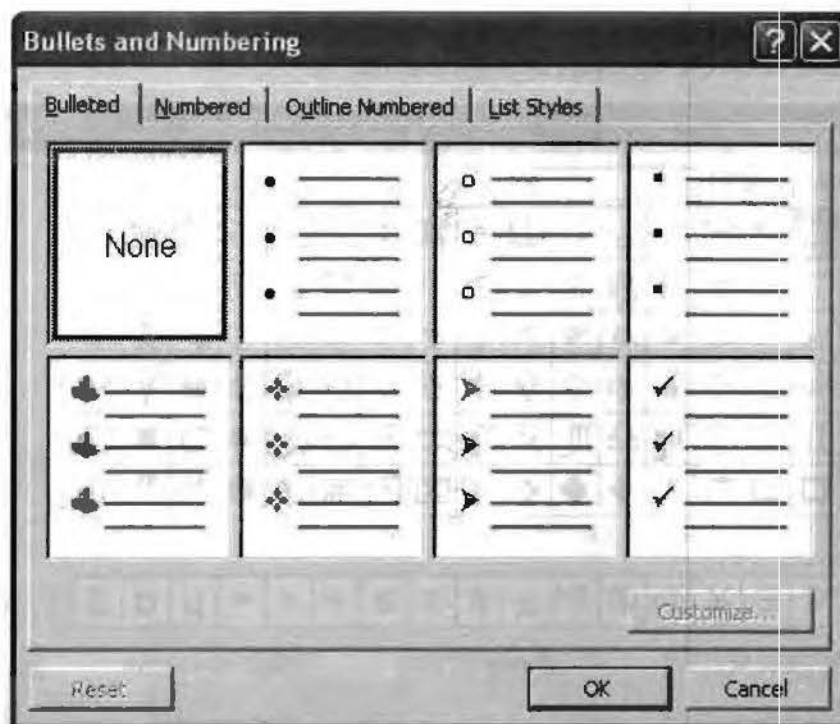
1. Click where you want to start a list.
2. Click the Bullets  or Numbering  button on the Formatting toolbar.
3. Type the first item in the list and press Enter. Word automatically inserts a bullet or number on the next line for you.
4. After the last item press Enter twice to turn off the bullets or numbers.

Instead of turning on the bulleted or numbered list feature and then typing the list, you can also type the list first, select it, and then click the Bullets or Numbering toolbar button.

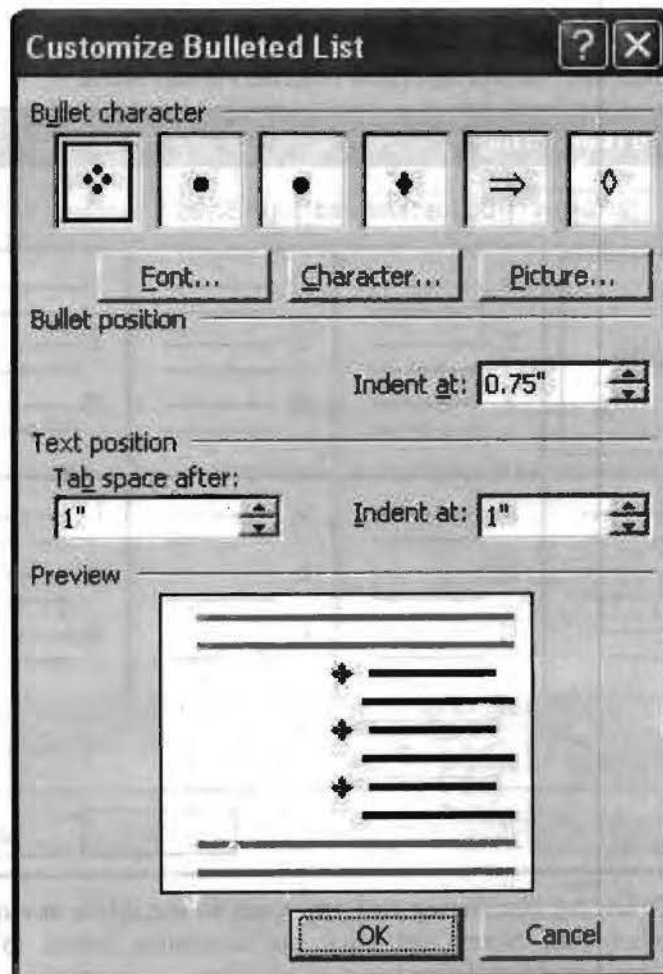
Changing the Appearance of Bullets and Number

To change the appearance of the bulleted list:

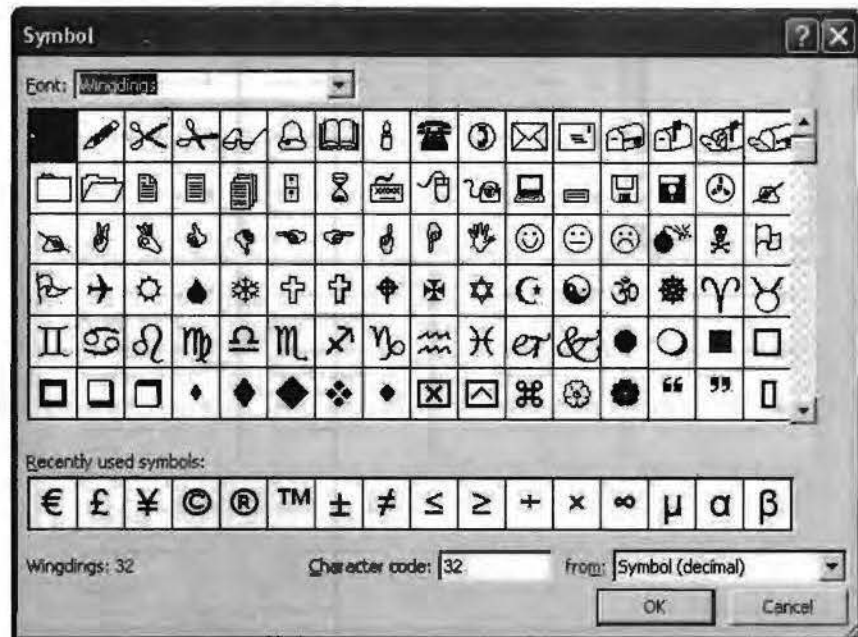
1. Click where you want the bulleted list to start.
2. Click on the Bullets and Numbering option in Format menu to display the Bullets and Numbering dialog box.



3. If you don't want to use a bullet given in the dialog box, click any of the seven gallery positions (Other than None), and click the Customize button to display the Customize Bulleted list dialog box.



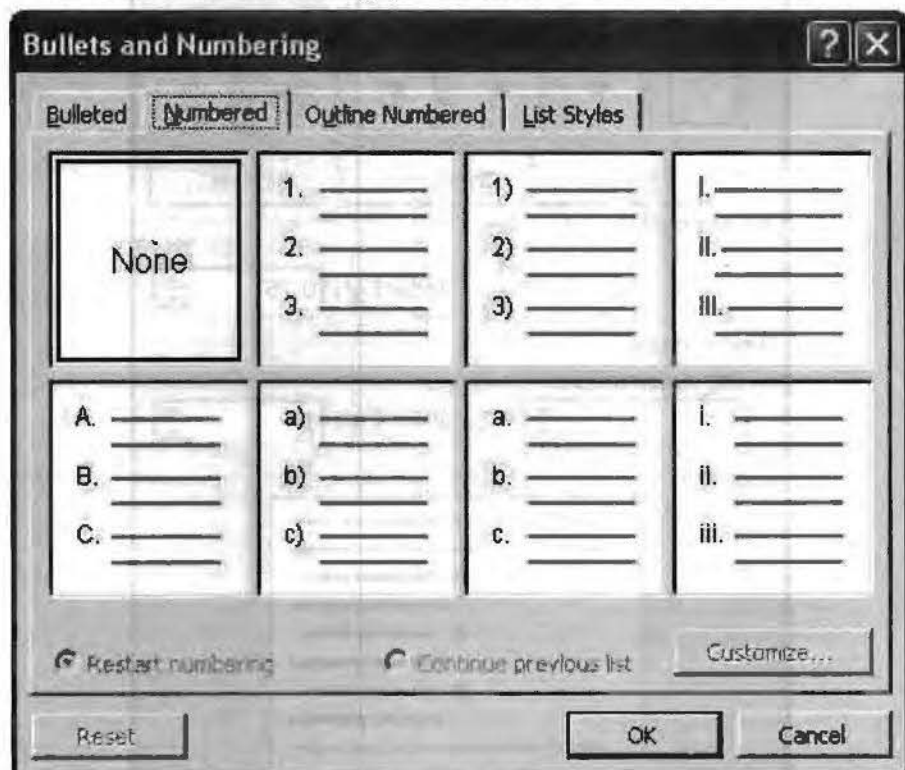
4. Click the Characters button to display the Symbol Dialog box. Select the desired symbol or choose the others from the font list.



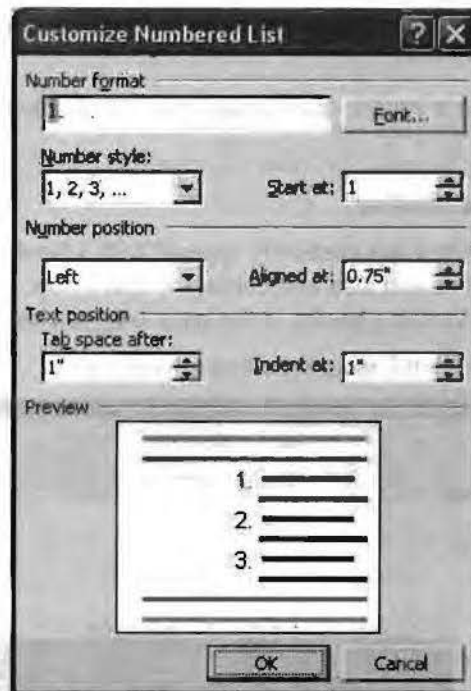
5. Click the OK button.

Change the Appearance of Numbering in Number list

1. Click where you want the numbered list to start.
2. Choose Bullets and Numbering option from the Format Menu.



3. If you don't see the Numbering that you want to use, click any of the gallery positions other than None, and click the customize button to display the Customize Numbered List dialog box.



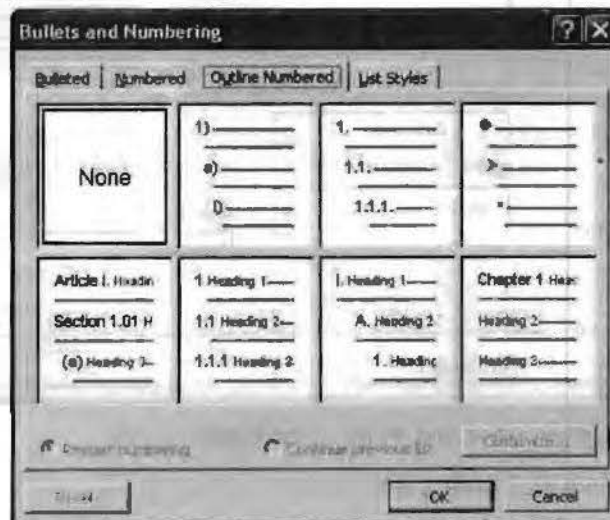
4. If you want to revise the format of the numbers, type the change in the Number Format text box. Choose the Number style from Number Style list box etc. when you finished click OK button.

Creating Multilevel List

A list created by using the Bullets and Numbering command (Format menu) to apply a hierarchical structure to any list or document, including a legal or technical document. A document can have up to nine levels, and Microsoft Word does not apply built-in heading styles to the items in the list.

Outline numbered lists can have up to nine levels.

1. On the Format menu, click Bullets and Numbering, and then click the Outline Numbered tab.
2. Click a list format that does not contain the text "Heading 1", and then click OK.
3. Type the list, pressing ENTER after each item.
4. To move an outline numbered item to the appropriate numbering level, do one of the following on the Formatting toolbar:



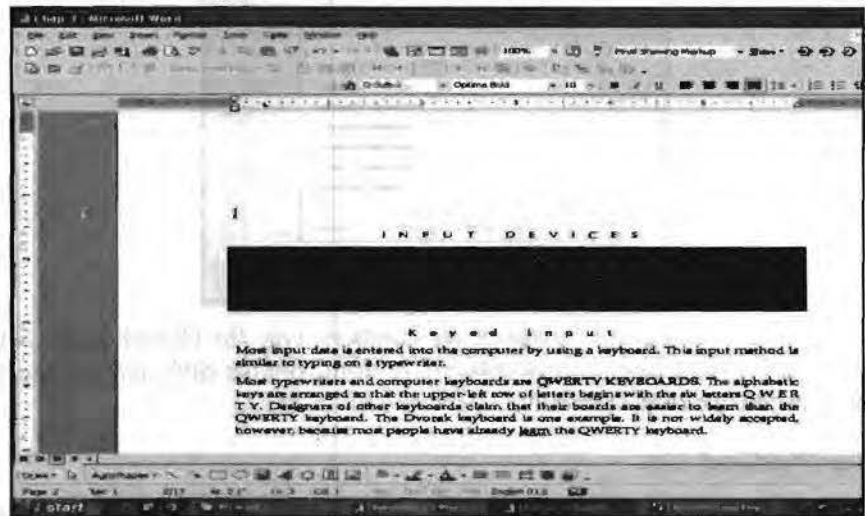
To denote the item to a lower numbering level, click anywhere in the item and click Increase Indent.

To promote the item to a higher numbering level, click anywhere in the item, and click **Decrease Indent**.

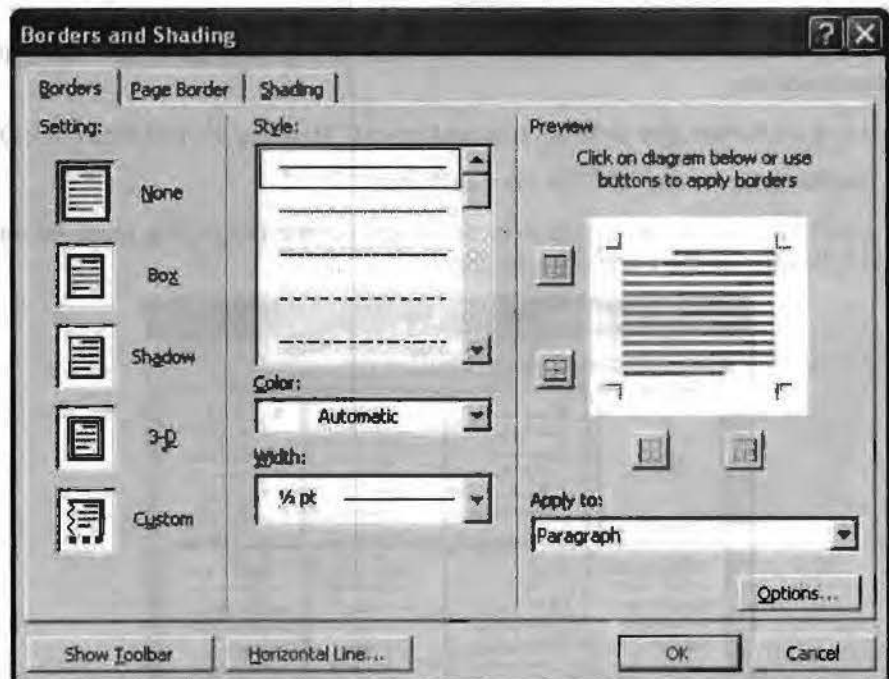
Format → Borders and Shading

When you draw an object, it automatically appears with a border around it—a thin line that defines its shape. You can also add borders to text boxes, pictures, and important art. You can change or format a border in the same way you change or format a line.

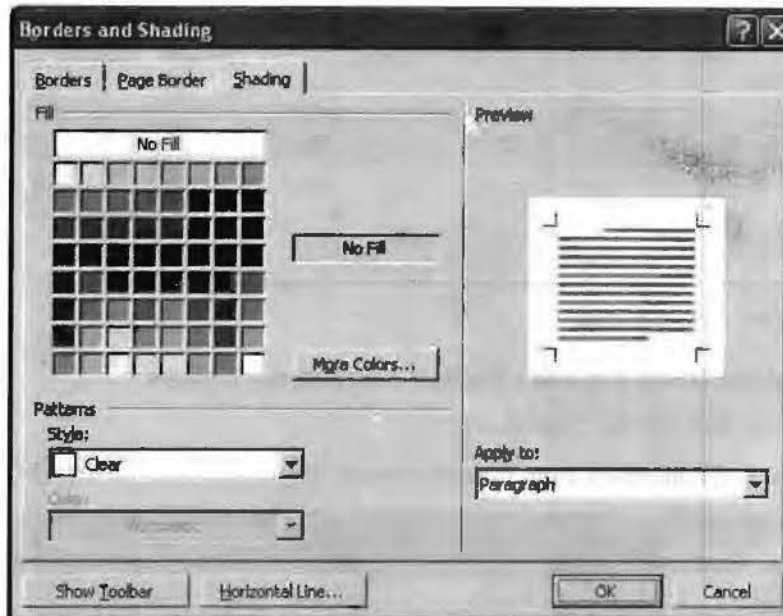
Follow these steps to add borders and shading to your text:



1. Click on the paragraph or text around which you want border.
2. Click the Border and Shading option of Format menu. You will find the following dialog box.



3. Select Setting, style, color and width of the border.
4. For shading click the Shading tab.



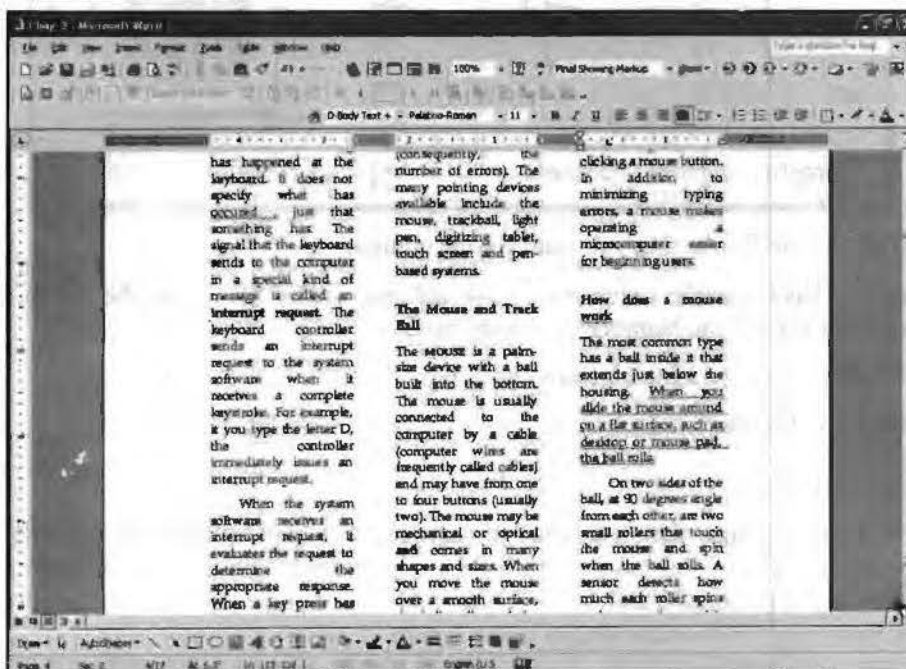
5. Choose the desired shade.

6. Press the OK button.

You can also do it with the help of format toolbar.

Format → Working with Columns

You can use columns to create documents such as newsletters or book pages. The column option controls the width and number of columns. Narrower column widths make your text easier to read. Often, creating columns enables you to fit more text on a single page. Columns work particularly well where you have several shorter topics making up a larger document, as with a newspaper.



To create columns:

1. Select the text which you want to convert in column.
2. Click on the column button in the Standard toolbar.

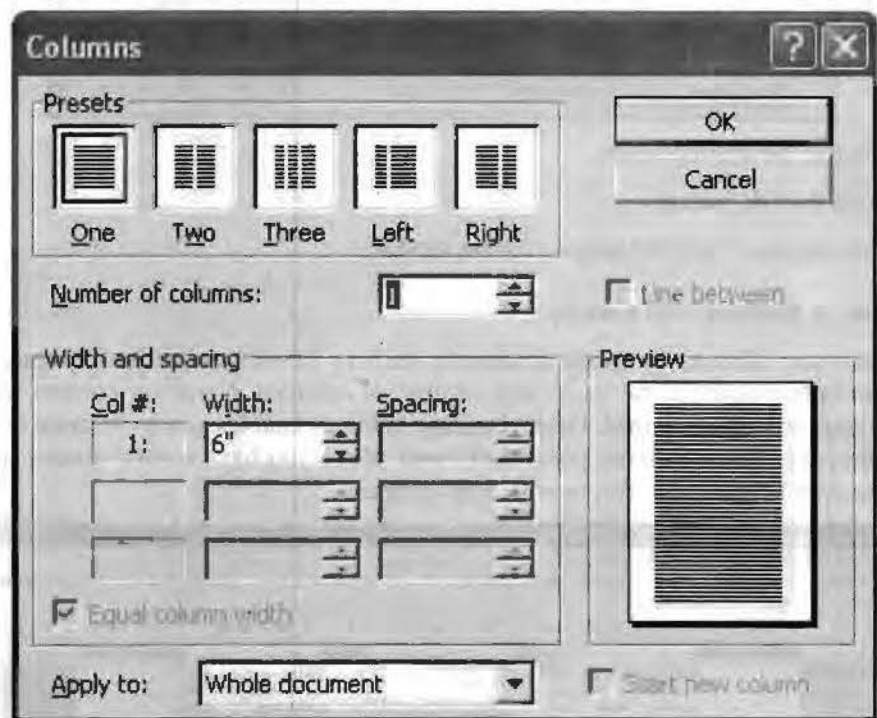
3. A drop-down list appears with four columns across it. Click on the first column in the drop-down list and drag across to highlight desired number of columns.



4. Leave the mouse button.

Adjust Column Width and Add a Vertical Line between Columns

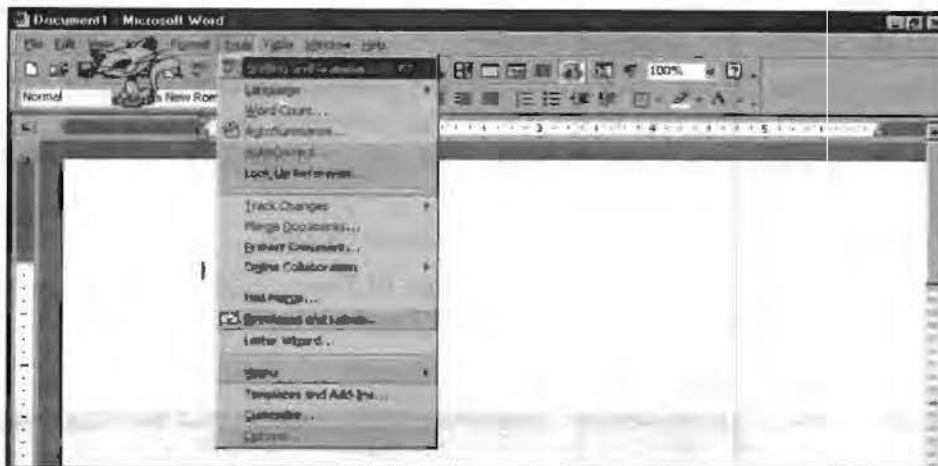
1. Click anywhere in the column-text.
2. Choose Column option from Format menu to display the column dialog box.



3. Click on the format that you want for the column.
4. If you have specific requirements for column widths fill it into the Width and spacing and fill the Number of column box.
5. For line check the Line between check box.
6. Press Ok Button.

3.5.6 Tools Menu

MS-Word is equipped with a number of software tools and utilities that enhance the user's work and provides extra word-processing power to the user. They help users make their work accurate and faster. These tools and utilities are grouped into Tools menu bar of the Ms-Word as shown in the Figure.



Spelling and Grammar

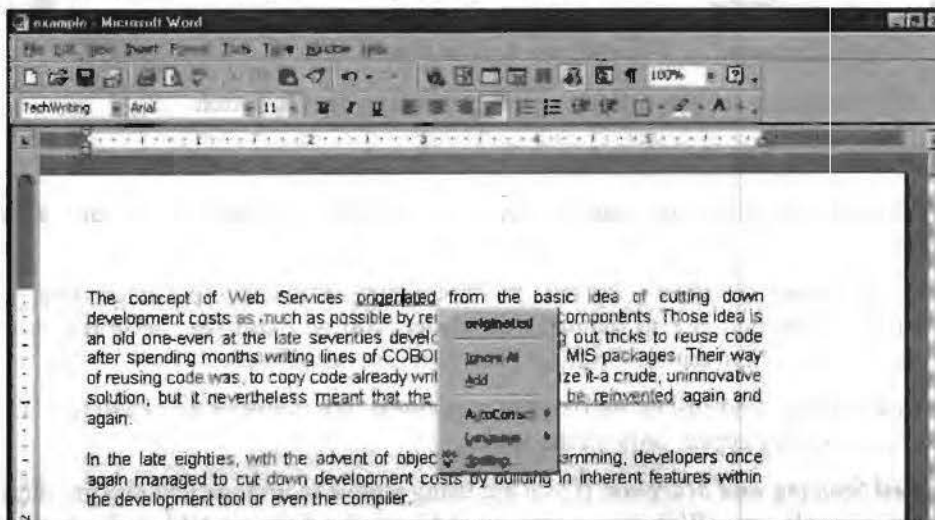
This utility, as the name suggests, helps users identify spelling and grammatical mistakes in the document. Moreover, it offers suggestion(s) for possible corrections, from which users may choose the right one. For this MS-Word maintains internal dictionaries. At one time one dictionary is active.

Online Spelling and Grammar Checking

As you type, Word automatically checks your document and underline possible spelling and grammatical errors. Spelling errors by default are underlined in RED color and grammatical errors are underlined in GREEN. Note that the incorrectness of a word only means that the particular word is not available in the active dictionary.

To correct the Spelling of words and Grammar:

1. Right click at the word to check. A context menu will appear with a list of suggested correct spellings nearest to the word concerned. It also has a list of command options.
2. Select the best suitable spelling or grammar. The misspelt word is replaced by the word you chose.
3. If you think that the word you typed is correct then you would like to add it in the active dictionary so that Word will treat it as correct word thereafter. You can add that word in the active dictionary using Add option.



4. If you don't want to add the word and yet you want Word not to treat it as incorrect, you can ignore it.

Using the Spelling and Grammar Checker

The spell checker lets you check the spelling and grammar of an entire document all at once. You won't really need to use it if you use automatic spelling checking to fix your spellings. However, if you are working on a rather larger document, the spelling and grammar checker comes handy.

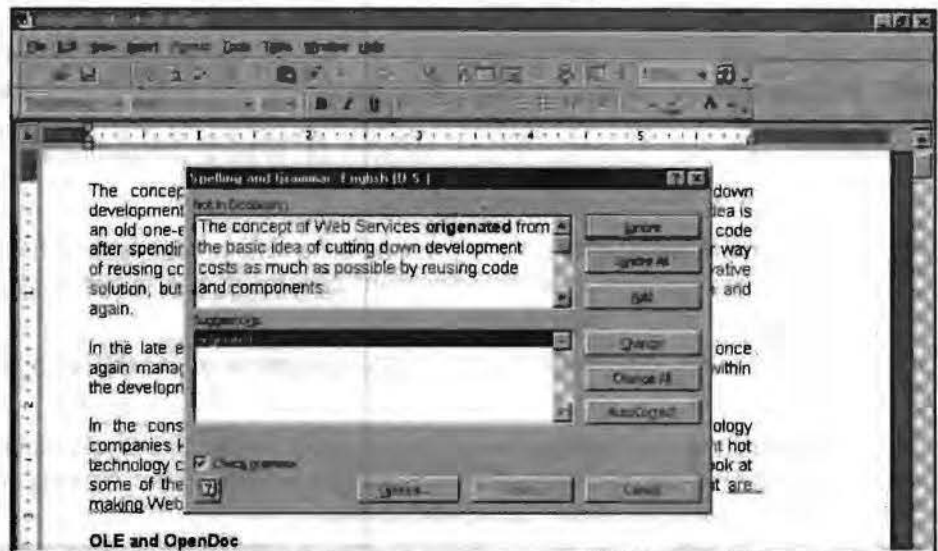
To check your document with spelling and Grammar checker:

1. Click on the Spelling and Grammar button of Format toolbar, or Spelling and Grammar option on Tools menu, or press F7 key.

Spelling and Grammar



2. MS-Word will bring you the following dialog box with the first error it encounters within the red color text and the suggestions in the next window.
3. Sometimes, Word doesn't offer the correct spelling or the grammar for a misspelt word. If this happens, select the word in the top half of the dialog box and type the correct grammar or the word there.
4. If the word is rightly spelled, then click the Add button to add it to the dictionary.



5. To leave the word as it is, click the Ignore button.
6. After finishing spell and grammar cbeck click on the Ok button.

3.5.7 Table Menu

A table is made up of rows and columns of cells which can be filled with text and graphics.

- **Borders and Gridlines:** By default, tables have a black ½-pt, single-line, and solid-line border. If you remove this border, you will still see the gridlines that form the cell boundaries. Gridlines, however, are not printed.
- **End Marks:** End-of-cell and end-of-row marks are nonprinting characters. Like gridlines, they appear only on the screen.
- **Cell Spacing and Margins:** If you are using a table to arrange text and graphics – for example, on a Web page – you can add spacing between table cells. You can also add cell 'padding' (spacing between the boundary of the cell and the text inside the cell) by changing the cell margin.


- **Nested Tables:** If you use a table to layout a page, and you want to use another table to present information inside the first one, you can insert a nested table – a table within a table.
- **Table Move Handle and Resize Handle:** Use the table move handle to move the table to another place on a page, and use the table resize handle to change the size of a table.

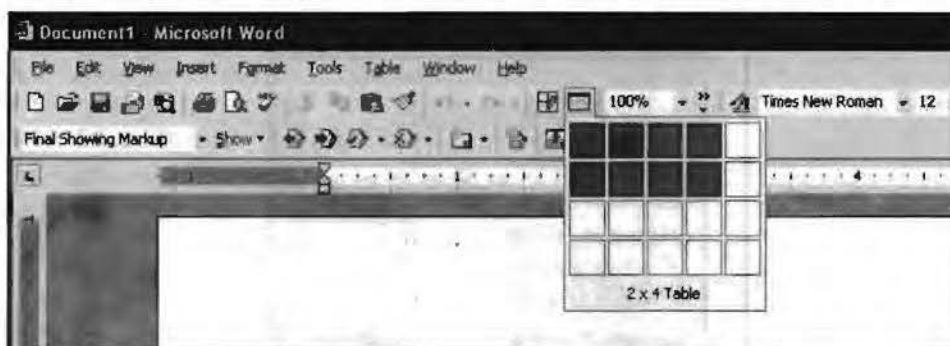
Table → Creating a Table

Word provides three methods for creating tables:

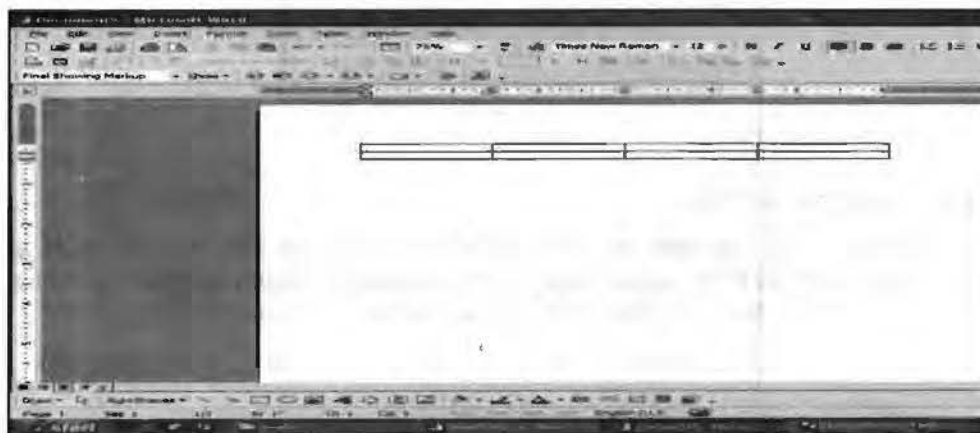
1. Create table using Insert Table button in Standard toolbar.
2. Create table using Insert Table option From Table Menu.
3. By Drawing Method.

Creating a Table with the Standard Method

1. Place the cursor where you want to create the table.
2. Click on the Insert Table button  on Standard toolbar.
3. Drag the mouse over the grid that appears while holding down the mouse button and highlight 4 × 2 table to create a table having four columns and two rows.

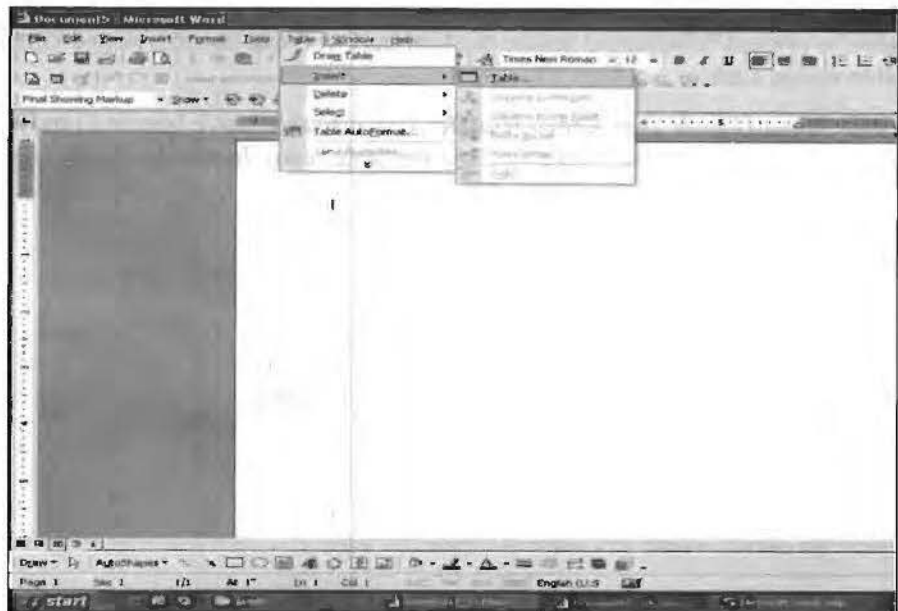


4. Word will insert an empty table when you release the mouse button at the cursor point.

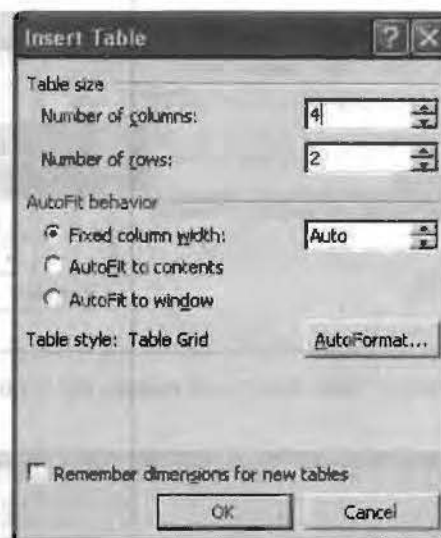


Create Table using Insert Table Option From Table Menu

1. Place the cursor where you want to place the table.
2. Choose Table option from Insert option of Table menu.



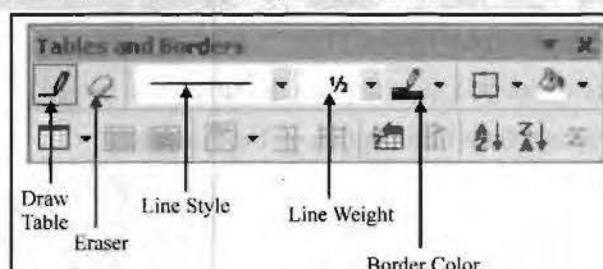
3. Enter the desired number of columns and rows for table in the dialog box that appears.



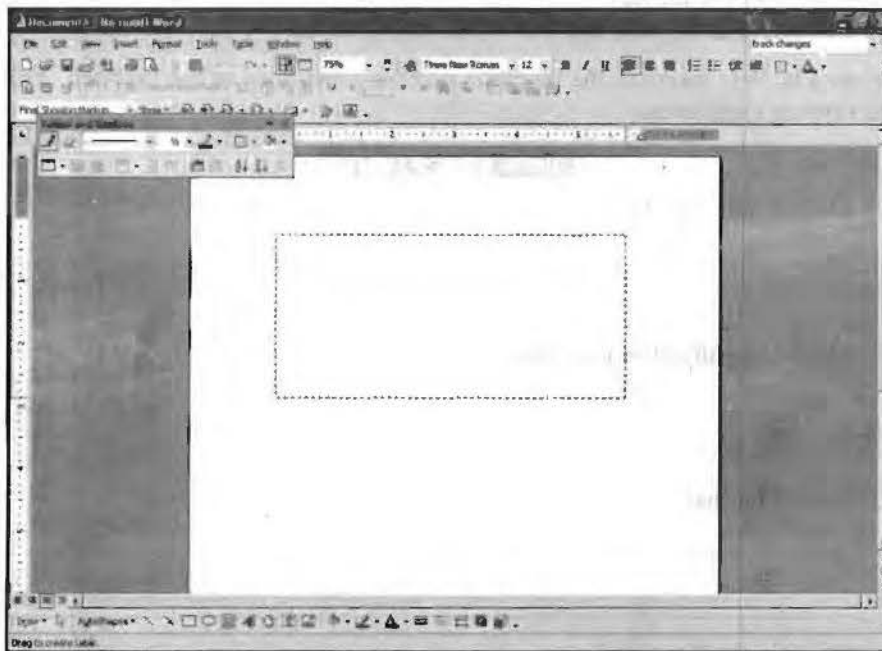
4. Press the OK button.

Table → Drawing a Table

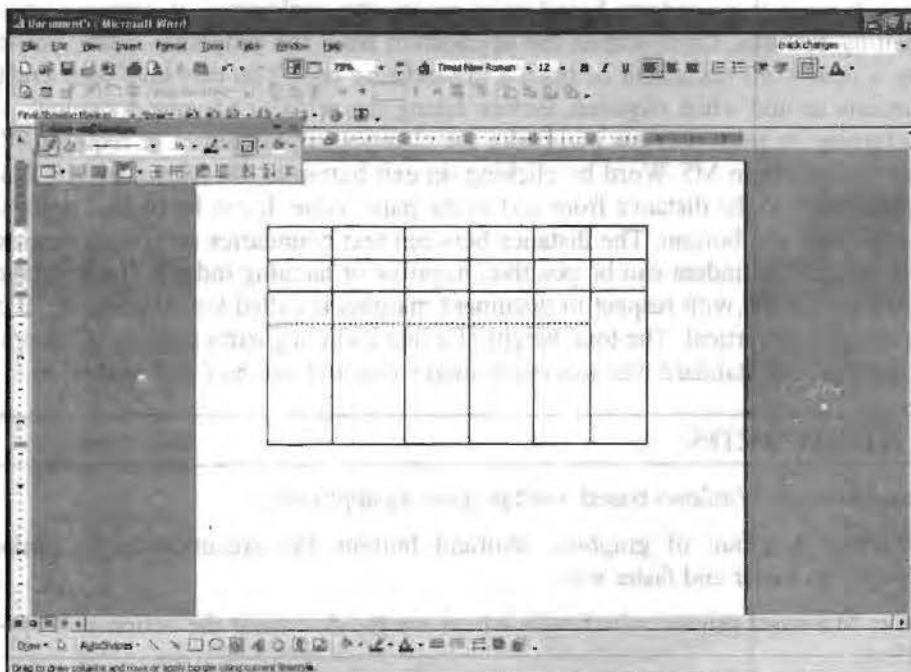
1. Make sure that you are in print layout view, (Tables and Borders menu is available only in Print Layout view) and then click the Tables and Borders button on standard toolbar to display the Tables and Borders toolbar.
2. Click the Draw Table button. Your mouse pointer will look like a small pencil.
3. Choose the Line Style and Line weight as desired.



4. Choose the Border Color as desired.
5. Starting from the upper-left corner, drag diagonally down and to the right, releasing the mouse button when the outline is of the right size.



6. Now draw the inside lines for rows and columns.



7. Use eraser to delete any unwanted lines.

Entering and Editing Text in a Table

1. Enter text in table just as it is entered in the MS-Word document. Use mouse or arrow keys to position the insertion point in a cell and then type the text.

MS-Word will automatically wrap the text within the cell as you reach the right edge.

2. To move from cell to cell within the table, use mouse or the Tab or Shift + Tab keys to move to the next or previous cell. If Tab is pressed in the last cell of the last row, MS-Word creates a new row.
3. Since we use the tab key to navigate within a Table, we cannot use Tab to enter tab characters in the cell, use Ctrl + Tab keys instead.
4. When a table is inserted, the insertion point is positioned in the first cell. You can start typing right away.

Check Your Progress

1. Define spell checker.

.....
.....

2. Define alignment of paragraph.

.....
.....

3. Define toolbar

.....
.....

3.6 LET US SUM UP

Microsoft word is a windows based word processing application. It supports various formatting features. Once started the application from the programs menu, you can create a new word document or open a pre-existing one. You can save your created documents as and when required. Before taking the printout of your document, you can examine its print preview and make the changes in page setup, if required. You can easily exit from MS-Word by clicking on exit button in file Menu. In MS-Word, Margins refers to the distance from text to the paper edge. It can be of four types viz. left, right, top and bottom. The distance between text boundaries and page margins is called indent. The indent can be positive, negative or hanging indent. The text layout within a paragraph with respect to document margins is called text alignment. It can be horizontal or vertical. The total height of a line including extra spacing is known as line spacing. The standard line spacing is single, one-and-one half and double.

3.7 KEYWORDS

Microsoft word: Windows based word processing application.

Toolbar(s): A group of graphical shortcut buttons for executing menu options/ commands in easier and faster way.

Cursor: MS-word pointer, which tells where are the document the action will appear or affect.

Scroll Bars: Sliders that can be moved using mouse to scroll through the document, exposing, different regions of the document.

Indent: The space left blank within the page margin.

Alignment: The way the right and left edges of a paragraph line up along the right and left margin of the document.

Tab: A position set for placing and aligning text on a page.

Style: A set of formatting characteristics that can be applied to text in a document quickly change its appearance

3.8 QUESTIONS FOR DISCUSSION

1. Differentiate between “save” and “Save as” file menu options.
2. How is page margin affected by Gutter Setting?
3. What is the use of various print options in word 2000?
4. How different margins are numerically related to each other and to the page size?
5. Write a short note about paragraph formatting.
6. How to set tabs?
7. What are column and where are they used?

Check Your Progress: Model Answer

1. The spell checker lets you check the spelling and grammar of an entire document all at once.
2. Alignment refers to the way the right and left edges of a paragraph line up along the right and left margins of your document.
3. A group of graphical shortcut buttons for executing menu options/ commands in easier and faster way.

3.9 REFERENCE/ SUGGESTED READINGS

Sanjeev Gupta and Shameena Gupta, *Computer Aided Management* (Using MS-Office 2003 Tools), Excel Books.

Manoj Kumar, M. Shamir Bhudookan, *Information Technology for 'O' Level*, Editions De L'Ocean Indien.

Joseph W. Habraken, *Microsoft Office 2003 All-In-One*, Que Publishing.

Jennifer Ackerman Kettell, Guy Hart-Davis, Curt Simmons, *Microsoft Office 2003: The Complete Reference*, McGraw-Hill Professional.

Laurie Ann Ulrich, *How to do Everything with Microsoft Office 2003*, McGraw-Hill Professional.

UNIT 4

WORD SPREADSHEET SOFTWARE

CONTENTS

- 4.0 Aims and Objectives
- 4.1 Introduction
- 4.2 Microsoft Excel 2003
 - 4.2.1 Data Entry in MS-EXCEL
- 4.3 How to Start Microsoft Excel 2003?
- 4.4 A Sample Session with Excel 2003
- 4.5 Data Entry and Editing
- 4.6 Range Operations
- 4.7 Working with Worksheets
- 4.8 Database Functions in Spreadsheet
- 4.9 Let us Sum up
- 4.10 Keywords
- 4.11 Questions for Discussion
- 4.12 Reference/ Suggested Readings

4.0 AIMS AND OBJECTIVES

After studying this lesson, you should be able to:

- Explain MS-Excel 2003
- Describe how to start excel 2003
- Describe range operations in excel
- Explain working with worksheet

4.1 INTRODUCTION

In the today's information age, no one can deny the role and importance of computers in everyone's life. Behind this importance of computers, there lies an important role played by various computer software. Spreadsheets are one of them. In this lesson, we are going to discuss one very popular spread sheet MS-Excel.

4.2 MICROSOFT EXCEL 2003

MS-EXCEL is a very powerful and easy-to-use spreadsheet package; perhaps the most commonly used these days. It is a member-application included in MS Office suite. It works very well with numbers and their complex calculations.

Excel helps prepare your data in an organized, orderly and meaningful fashion. Excel finds its major application in creating reports, using formulas and performing

calculations. It is best suited for scientific and statistical analysis. Excel can also be used to prepare Profit and Loss accounts, Balance sheet, and other Tax statements. It works well for both simple and complicated numbers. It can be used for preparing analytical reports including statistical analysis, forecasting and regression analysis. Good looking and attractive charts can be created which depict data in clear and meaningful fashion. Excel can also be used to create relationships between different types of data.

Excel can do all the work of a full-fledged word-processor but it lacks the advanced features of desktop publishing. It also supports high level features of object linking and embedding, which means in simple terms, that data from Word (so also from any other program of Office 2003 suite), can be safely and easily put and linked with data in Excel and vice versa.

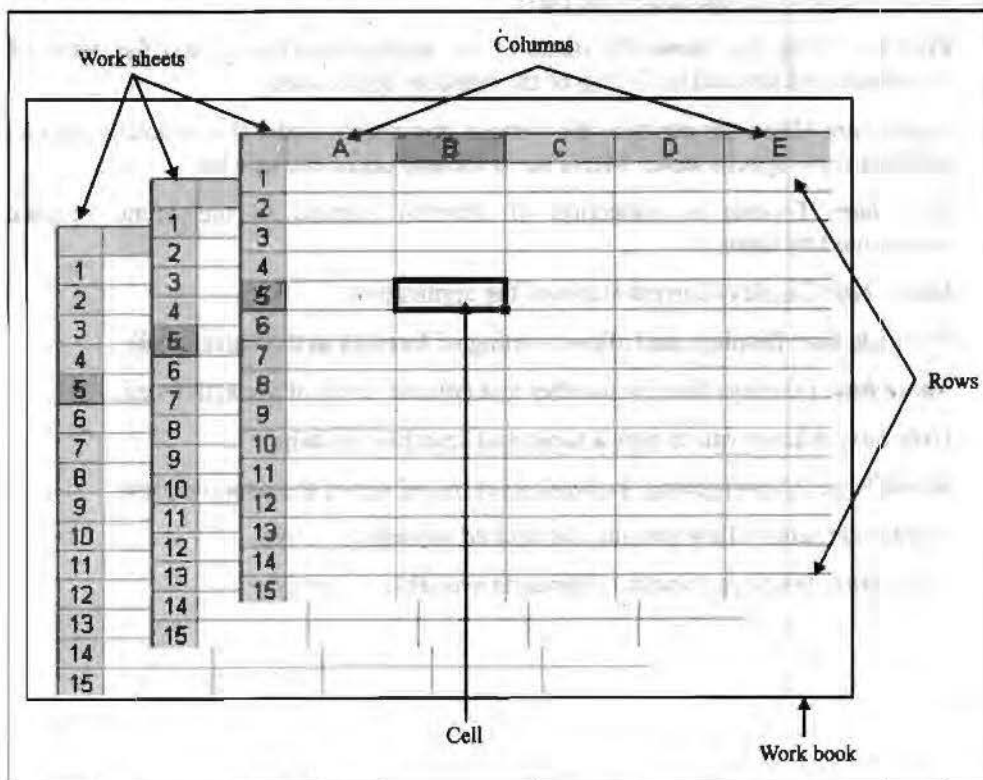
4.2.1 Data Entry in MS-EXCEL

The smallest unit of addressable data container in Excel is a cell. A cell is the room created by the intersection of a row and a column. Each row has a unique row number in a worksheet – 1, 2, 3,65536; each column has a unique column name in a worksheet – A, B, C.....Z, AA, AB, AC.....IV; and therefore each cell has a unique cell address in a worksheet – D13, etc.

A worksheet is rectangular collection of many cells. A single Excel worksheet contains as many as 65536 rows, 256 columns and therefore 16777216 (65536×256) cells. Each worksheet in a workbook has a unique name – Sheet1, Sheet2 etc.

A workbook is a collection of one or more worksheets. It is a workbook that is saved as a file on the secondary storage. Each workbook is stored in a file having unique name – sales.xls. Note that xls is the default file name extension of the Excel workbook files. Each Excel workbook can have maximum 255 worksheets.

The relationship is shown below:



4.3 HOW TO START MICROSOFT EXCEL 2003?

To start Excel:

1. Click on the Start button at windows taskbar.
2. Select Program option.
3. Click at Microsoft Excel option as shown below:

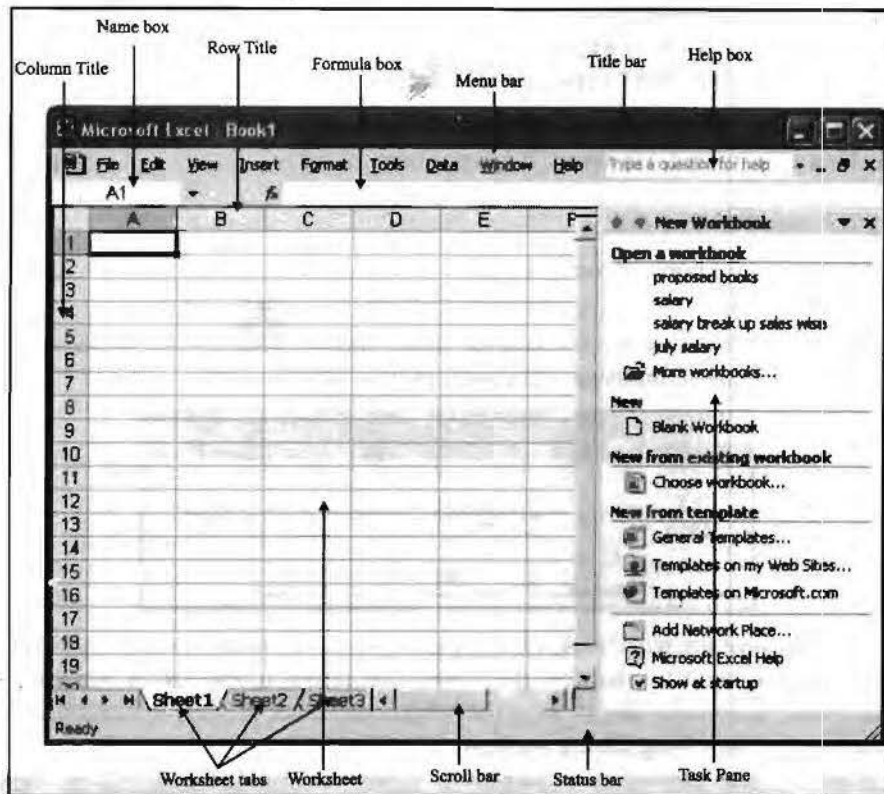


Components of Excel Window

A typical Excel 2003 window is displayed below. It may seem different in a different installation because the components of Excel window are customizable.

The Excel window has the following parts:

1. **Title bar:** Title bar shows the name of the application (Excel) and the name of workbook and situated in the top of the window application.
2. **Menu bar:** Menu bar contains the various commands under the various topics to perform some special tasks. Menu bar is located under the title bar.
3. **Tool bar:** Toolbar is collection of shortcut buttons to the Menu options represented by icons.
4. **Status bar:** Displays current status of the application.
5. **Formula bar:** Displays and allows editing of formula in the current cell.
6. **Name box:** Displays the row number and column name of the active cell.
7. **Help box:** Allows you to type a topic and searches for help.
8. **Scroll bars:** Allow moving the worksheet in and out of the window view.
9. **Worksheet tabs:** Allow making the desired worksheet active.
10. **Task pane:** Displays various commands available currently.



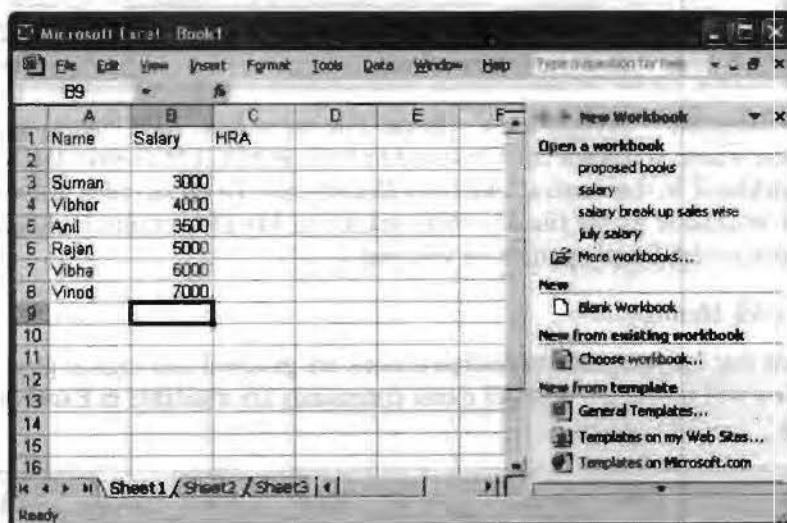
4.4 A SAMPLE SESSION WITH EXCEL 2003

Before we deal with the details of Excel, let us have a short session with it so that you get a hang of what a session with Excel looks like.

Creating a Workbook

Let us start our session with creating a simple workbook. Note that when Excel starts a blank workbook opens its name by default being – Book1. It has three worksheets–Sheet1, Sheet2 and Sheet3. If you end the Excel session without entering anything in these sheets, Excel ends without prompting any message. However, when you enter any data in the worksheet and then end the session, Excel prompts you with an option for saving the changes. Here you can provide the name of the workbook file.

Let us enter some data in the cells of the worksheet – Sheet1. Click at the cell and type the data value as shown below:




If you want to modify the data entered into a cell, double click it and type the value again or press F2 function key on your keyboard. Once modified click the mouse elsewhere in the worksheet to update the value in the cell.

You have thus created a workbook. Whenever you enter some data into a workbook, the workbook is created. However, it has not been saved.

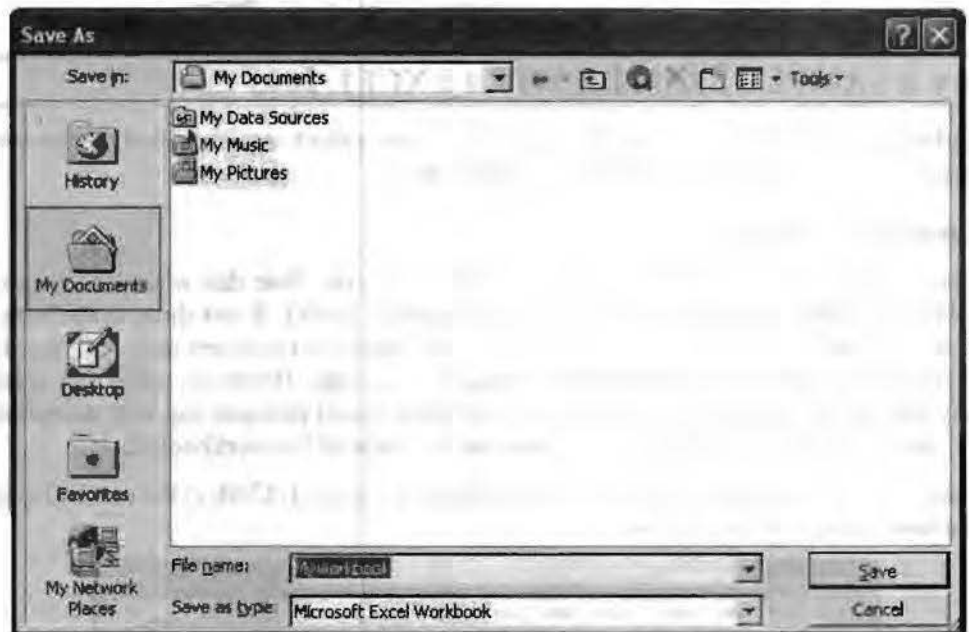
Saving a Workbook

You can save a workbook in many ways.

Close the Excel window by clicking at close button  of the window. If the workbook has anything unsaved, Excel will prompt for the same:



If you want to save the workbook, click Yes; if you do not want to save the workbook, click No; if you want to abandon the action and return to the Excel window, click Cancel. Since we would like to save the workbook, click at Yes. In response, Excel presents you the following dialog window:



Enter the file name – Myworkbook – in the File name box. Also choose appropriate folder name where you want the file saved in Save in box. Let us save the workbook file Myworkbook in the current folder My Documents. To do so, click at Save. Excel saves this workbook as the file Myworkbook.xls in My Documents folder. After the file has been saved, Excel application will end.

Working with Menus

Commands that let you perform desired actions are grouped into logical groups called menus. You will now learn what all menu commands are available in Excel 2003. The menus are:

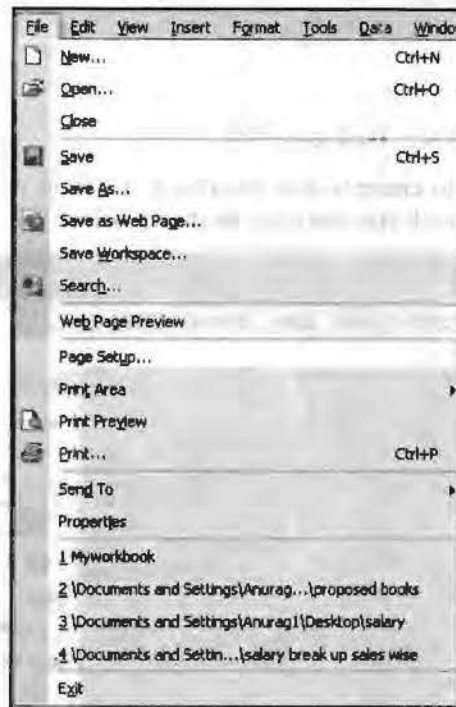
File Edit View Insert Format Tools Data Window Help

These menus provide groups of related commands. Thus, File menu contains all the commands related to file or workbook manipulation.

These menus can be opened by clicking at them. Another way to open these menus is to press Alt+(Undelined letter of the menu name). Thus, Alt+F will open File menu and Alt+O will open Format menu.

File Menu

The Excel file menu has following options:



Working with menus is actually very easy. All you have to learn is meaning of each of the menu options. Observe the description of the menu commands. Generally this is how menu commands look like in all the Microsoft application packages. The symbols have specific meaning, as described:


- | | | |
|-------------------|---|---|
| Command name | : | The name of the command (usually self-explanatory) is given in words. Thus, New command opens a new workbook, Open command opens an existing workbook, Print command initiates printing, etc. |
| Option shortcut | : | Notice that a letter in each menu commands a name which is underlined – like O in Open. You can, thus, open a file by pressing F+O while Alt key pressed. This is particularly convenient for users who prefer to work with keyboards instead of mouse. |
| Icons | : | Some commands are preceded by icons that represent the respective commands. These commands can also be executed by clicking at tool buttons identified by the icon. |
| Ellipses | : | Some commands are followed by ellipses (...). By clicking at these commands dialog boxes will appear where you may choose options. |
| Keyboard shortcut | : | Some commands are followed by key combinations like. Ctrl+O for Open. These are called keyboard |

shortcuts. You can directly execute a command by pressing the keyboard shortcut, if any.

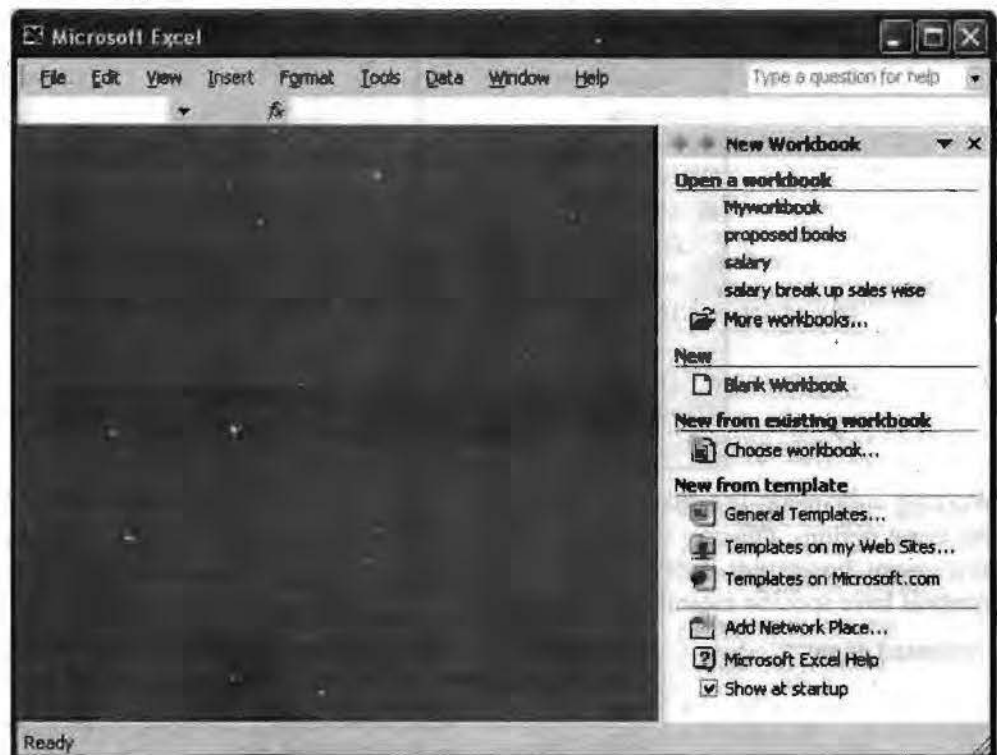
Sub-menu : Some commands are followed by the symbol ►. It means that this word is not a command but is a sub-menu of commands instead. By clicking it, the sub-menu opens up.

You can apply various methods of invocation of the commands. We will now study various frequently used commands in more detail.

File → New


Keyboard shortcut: Ctrl+N :: Tool icon: 

This command is used to create a new workbook. Click at it and the task pane will show the types of workbook you can open as shown below:



Click at Blank workbook option. A blank workbook opens in the Excel window.

File → Open

Keyboard shortcut: Ctrl+O :: Tool icon: 

This command is used to open an existing workbook. Execute it and Excel prompts you to specify the workbook you wish to open. Navigate through the folders and select the workbook you want to open. Then click OK. Excel opens the specified workbook. You can open as many workbooks at a time as you want.

Let us open the workbook – Myworkbook. Press Ctrl+O to open the Open dialog box.




Select the file - Myworkbook. Click Open. The workbook will open.

File → Close

Keyboard shortcut: None :: Tool icon: None

This command closes the active workbook. If any data is unsaved since last save, Excel prompts you with saving options. Excel session does not end, it is only the workbook that closes.

File → Save

Keyboard shortcut: Ctrl+S :: Tool icon: 

This command saves the active workbook. If you are saving the workbook for the first time, you will have to specify the name and location where you want to save the file. Excel appends .xls extension to name you specify.

If on the other hand, this is not the first time you are saving the workbook, it will simply save the unsaved portion into the already named workbook.

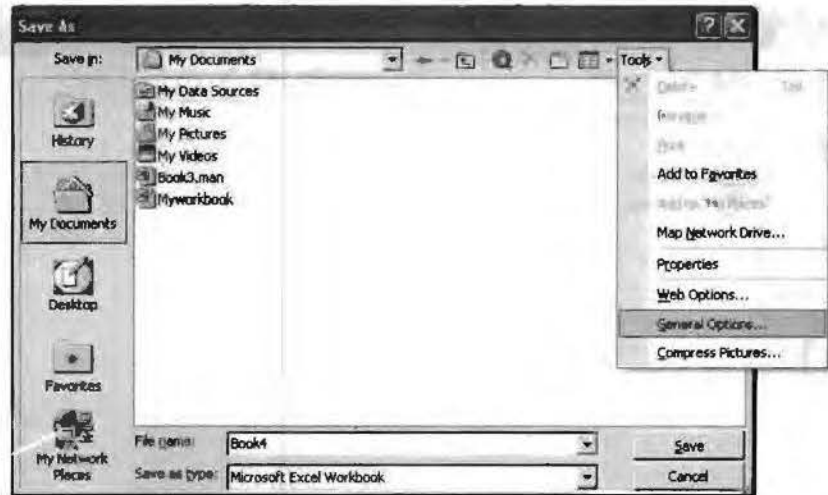
While saving a workbook you can also specify in what format your workbook should be saved. The various formats make the workbook compatible to other spreadsheet packages. For instance, you can save the workbook as HTML Web page that can later be opened in a web browser.

File → Save As

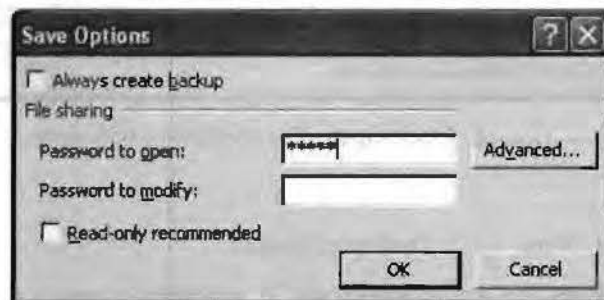
Keyboard shortcut: None :: Tool icon: None

This command serves all the purposes of save command. Besides, it also lets you save the workbook by another name that you specify.

While saving using either command, you can protect your workbook with a password by clicking at the General options in Tool menu of the Save As dialog box as shown:



This command will open another dialog box as shown below:

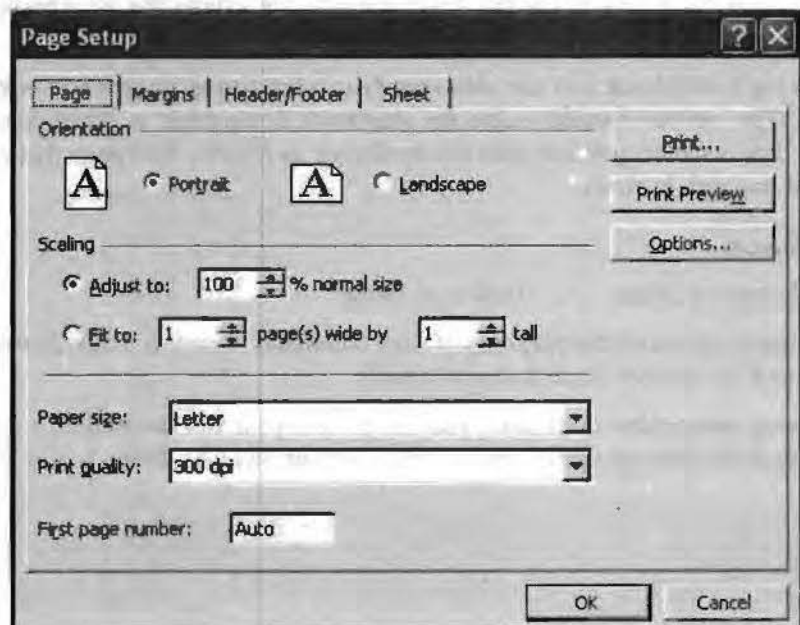


Enter a password to open the workbook and a password for modifying the workbook. The password is encrypted and is not displayed in readable form. Click OK to enable the protection.

File → Page Setup

Keyboard shortcut: None :: Tool icon: None

Page setup command allows you to setup the page layout as you would like the worksheet to be printed. It is actually preparation of the worksheet for printing. On executing this command, the Page Setup dialog box appears.



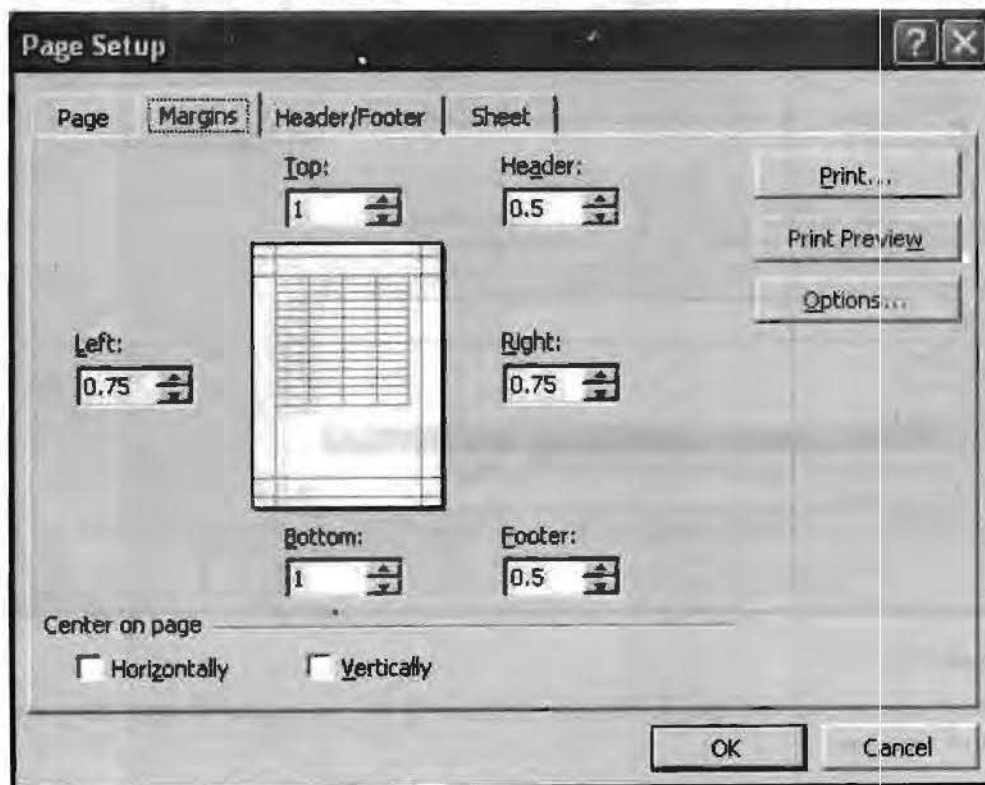
Notice various options that you can set. These options are presented in logical groups on four tabs. A brief overview of these options is detailed below:

File → Page Tab

1. **Orientation:** Whether you would like to print the worksheets in Portrait (top to bottom of the page) or in Landscape (left to right) fashion.
2. **Adjust to:** This setting will reduce or enlarge the printed worksheet. Select the Adjust to check box, and then enter a percentage value in the % normal size box. You can reduce the worksheet to 10 percent of normal size or enlarge it to 400 percent of normal size.
3. **Fit to:** This setting reduces the worksheet or selected part when you print, so that it fits on the specified number of pages. Select the Fit to check box, enter a number in the page(s) wide by box, and enter a number in the tall box. To fill the paper width and use as many pages as necessary, type 1 in the page(s) wide by box and leave the tall box blank.
4. **Paper size:** You can select the paper size that you are using for printing such as – A4, legal etc. – in this option.
5. **Print quality:** You can select the desired print quality through this option. The dpi (dots per inch) is the measurement of print quality. The higher the dpi, the better the print quality, while the more the consumption of ink.

Margins Tab

These options allow you to adjust different margins to the worksheets when printed.

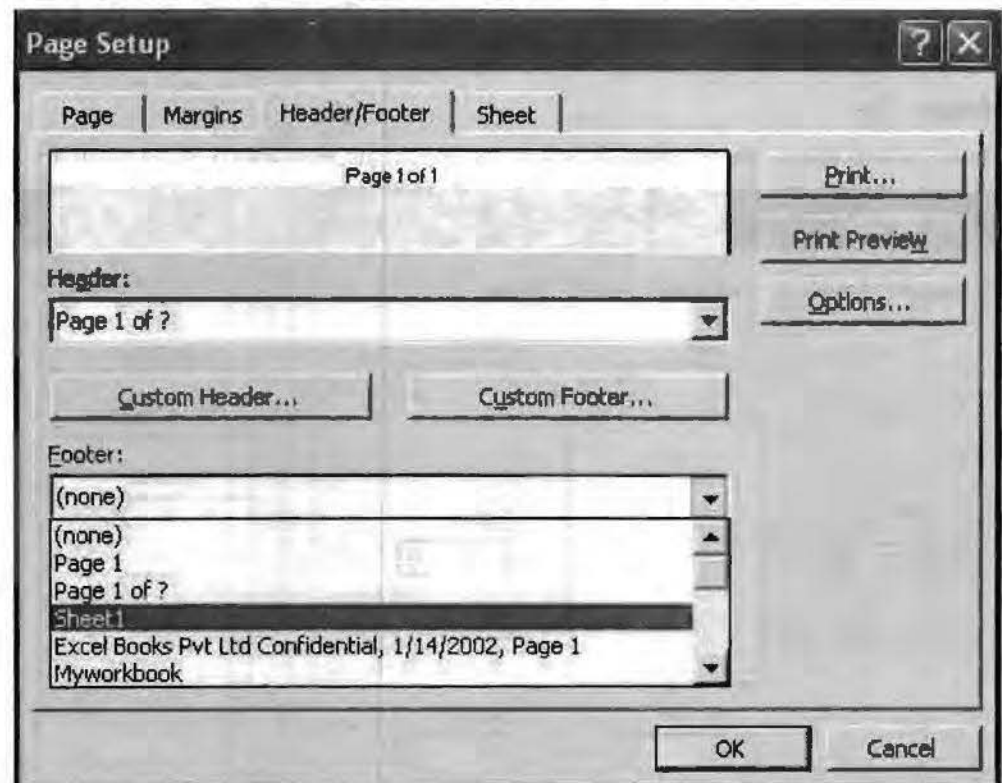


1. **Top:** Enter the distance you want between the top of the page and the top of the first line on the page in this box.
2. **Bottom:** Enter the distance you want between the bottom of the page and the bottom of the last line on the page in this box.

3. **Left:** Enter the distance you want between the left edge of the page and the left edge of unindented lines in this box.
4. **Right:** Enter the distance you want between the right edge of the page and the right end of a line with no right indent in this box.
5. **Header:** Enter the distance you want from the top edge of the paper to the top edge of the header. If the Header setting is larger than the Top setting, Excel prints the body text below the header.
6. **Footer:** Enter the distance you want from the bottom edge of the paper to the bottom edge of the footer. If the Footer setting is larger than the Bottom setting, Excel stops printing the body text above the footer.
7. **Center on page:** Select whether the worksheet will be centered horizontally, vertically or both, on the page.

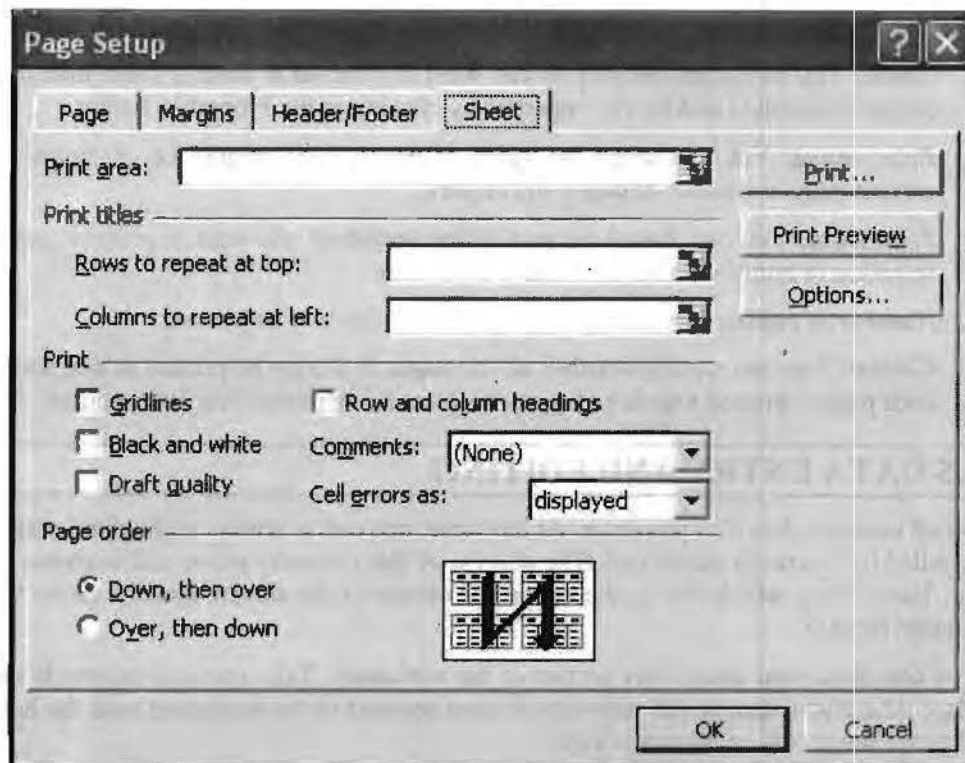
Header/Footer Tab

These options let you set the header and footer to your worksheet. A header and footer appear on the pages being printed even if you type them in a single page. There are many designs of headers and footers available in-built. You can also design your own headers and footers by clicking at Custom Header/Footer.



Sheet Tab


These options let you specify how the worksheets will be printed in case there are more than one.



The options are self explanatory. You should try them on your own.

Whatever page setup option you apply, you can see its effect using Print Preview.

File → Print

Keyboard shortcut: Ctrl+P :: Tool icon: 

This command lets you set the printer options just as Page setup did for setting page options.



The various print options are summarized below:

1. **Name:** You can select the printer you want to print on if there is more than one printer is installed and set its properties by clicking at the Properties button.
2. **Print range:** You can select the range of pages to be printed i.e. all pages or current page or number of pages you require.
3. **Print what:** You can choose the part of the worksheet you want to print i.e. some selection or entire workbook or active sheet only.
4. **Number of copies:** You can specify number of copies to be printed.
5. **Collate:** You can specify whether all the pages of a copy be printed as one set or each page is printed together as many times as the number of copies specified.

4.5 DATA ENTRY AND EDITING

A cell contains data that you enter. At any time, one cell is always highlighted which is called the currently active cell. The address of this currently active cell is shown in the 'Name' box, which lies in the upper left corner of the screen, exactly above the column letter A.

You can place your data in any portion of the worksheet. Take your cell pointer to the place where you want to put your data in (any portion) of the worksheet with the help of either the mouse or the arrow keys.

You can enter a variety of values in a cell such as:

1. **Numeric value:** To enter a number just make the cell active and type the value.
2. **Text:** To enter text value, make the cell active and type the text. Even if the text goes beyond the confines of the cell it remains in that cell only.
3. **Formula:** You can enter a formula in a cell in the same way. A formula is an expression that evaluates to some value. Excel calculates the value of the formula and inserts the same in the cell.
4. **Comment:** You can enter a comment in a cell to remind you some important fact about the cell.

4.6 RANGE OPERATIONS

There may be any situation when you have to perform a task on a single cell. This action is very simple just put the cursor on the cell and perform the task. But consider the situation when you have to perform the same action with a group of cells.

For example let us consider deleting data in a group of cells. To delete such a group of cells you can go to each cell and press the key until the text in all the cells are deleted. This is a very tedious and time-consuming exercise. A better solution is to group the cells into a unit called range and then perform a task onto the range with one command, i.e. if you have to delete then make the range of the cells and press key. A range may be of any type including:

1. Group of cells
2. Rows
3. Columns
4. Whole worksheet

To Select a Group of Cells

1. Place the mouse pointer on the first cell from where you want to start the range.
2. Press the left button of mouse and drag it till the last cell up to which you want the range and then release the button.

OR

Place the cursor on the first cell from where you want to start the selection and then press shift+arrow key till the last cell up to which you want the range.

To Select a Row

1. Point the mouse pointer on the row number.
2. Click the left mouse button only once.

To Select a Column

1. Point the mouse pointer on the column Name.
2. Click the left mouse button only once.

To Select Whole Worksheet

1. Point the mouse pointer on the common point of row and column, i.e., before starting of rows and before starting of columns.
2. Click the left mouse button only once.

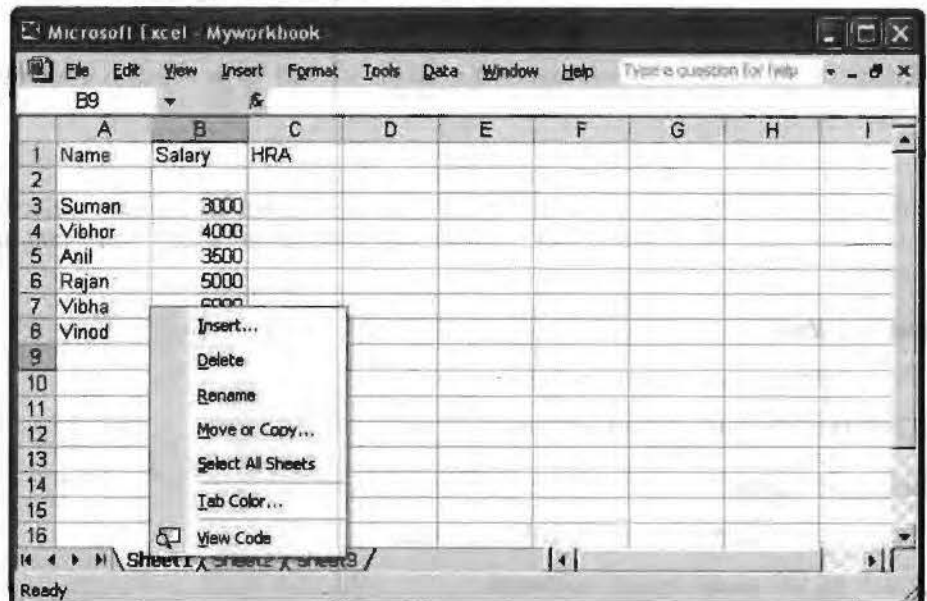
	A	B	C
4	Vibhor	4000	
5	Anil	3500	
6	Rajan	5000	
7	Vibhor	5670	
8			
9			
10			
11			

4.7 WORKING WITH WORKSHEETS

By default, Excel inserts three worksheets in the workbook you create: Sheet1, Sheet2 and Sheet3. You can, however change this default as you desire.

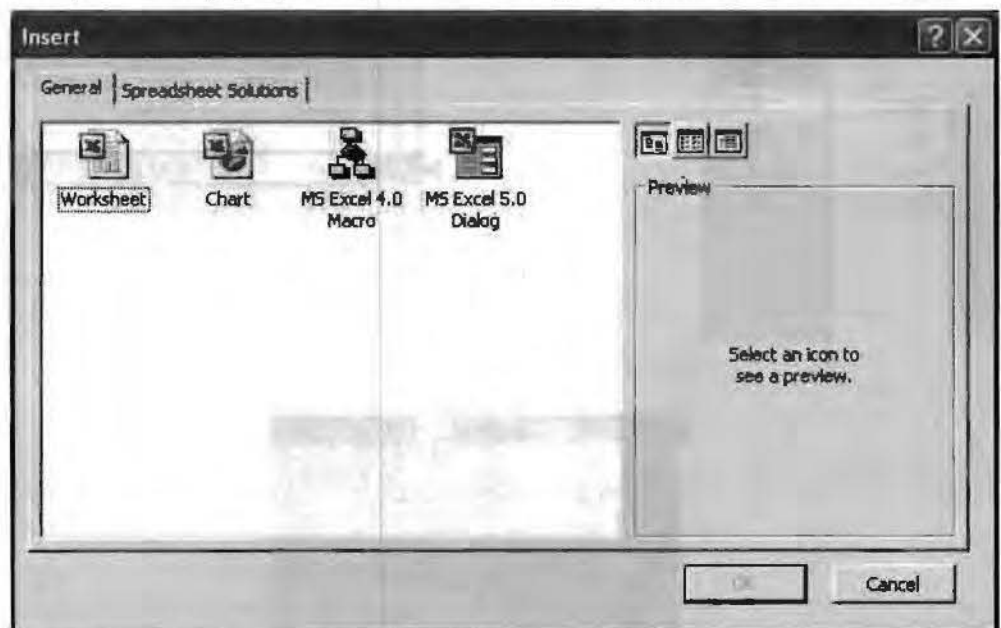
Only one of the worksheets remains active at a time. To make any other sheet active just click at the sheet in the sheet tab.

The commands to manipulate sheets as a unit are grouped into a pop-up menu which you can invoke by right clicking at the sheet tab as shown below:



The actions you can perform with sheets are:

1. **Inserting a sheet:** You can insert a sheet in your workbook. Right click at the sheet tab before which you want to insert a new worksheet. Click at the Insert option in the pop-up menu. The Insert dialog box appears as shown below:



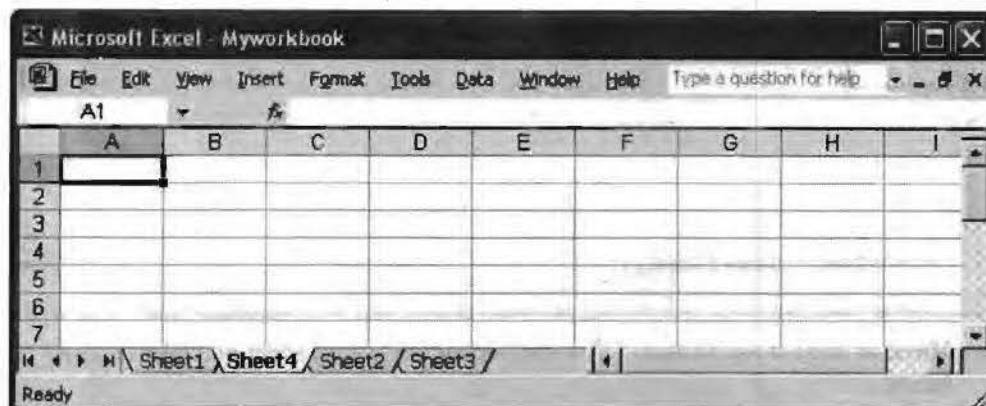
Note all that you can insert in a sheet. Select Worksheet to insert a blank worksheet; Chart to insert a worksheet with chart; and so on. Some built-in sheets are also available from which you can select. To view these sheets, click at the Spreadsheet solution tab.

After you have made your choice, click at OK. The selected sheet will be inserted before the sheet at which you right clicked.

Let us insert a blank worksheet before Sheet2.

(a) Right click at Sheet2.

- (b) Click at the Insert option in the pop-up menu.
- (c) Select the Worksheet option in the Insert dialog box.
- (d) Click at OK. A blank sheet (with name Sheet4) is inserted before Sheet2 as shown below:



The cell A1 in the newly inserted sheet (Sheet4) will become active.

2. **Deleting a sheet:** To delete a sheet from the workbook:

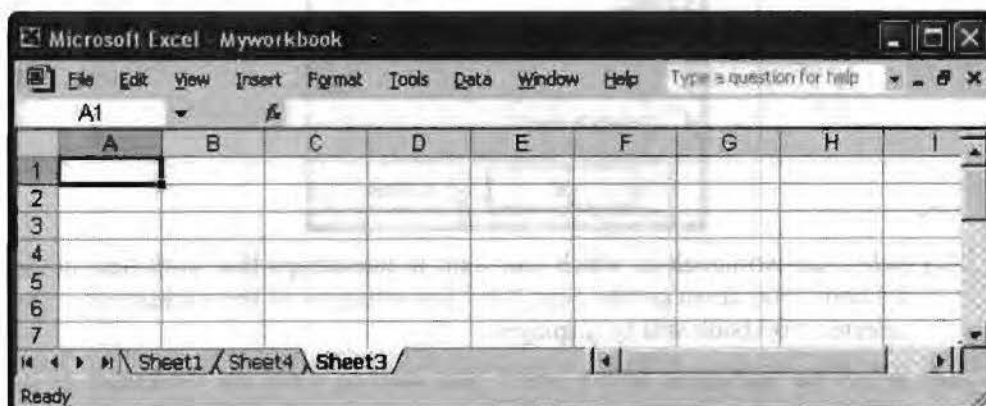
- (a) Right click at the sheet you want to delete.
- (b) Click at Delete option in the pop-up menu.

The sheet will be deleted.

Let us delete Sheet2 from our workbook.

- (a) Right click at Sheet2.
- (b) Click at Delete option in the pop-up menu.

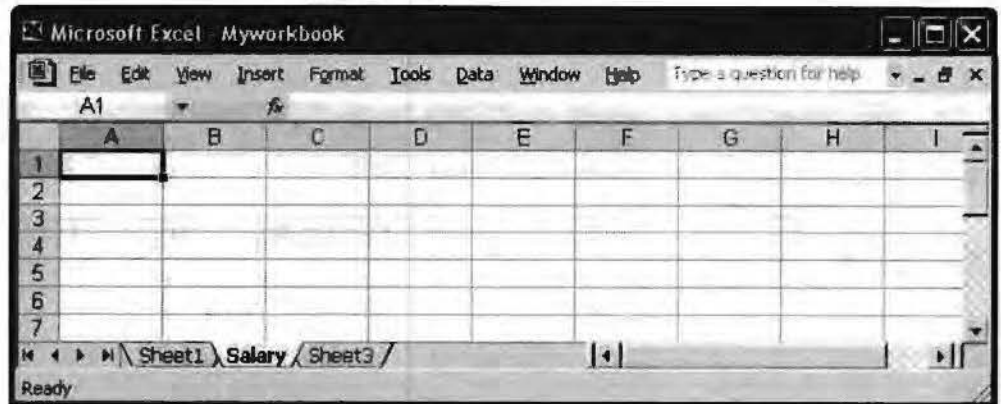
Sheet2 is deleted as shown below:



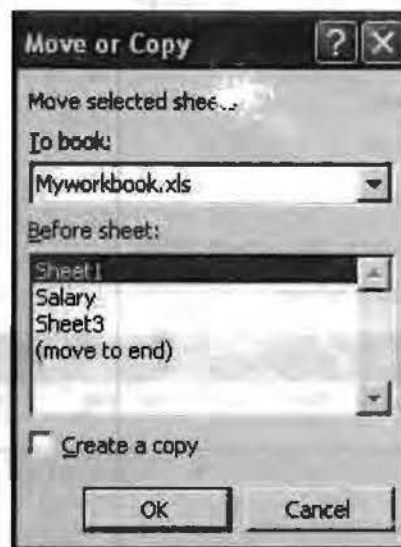
3. **Renaming a sheet:** You can change the name of a worksheet whenever you want. To do so:

- (a) Right click at the sheet which you want to rename.
- (b) Click at Rename option in the pop-up menu.
- (c) The name of the sheet will be highlighted.
- (d) Type the name you want to give to the sheet, say salary.

- (e) Click anywhere at the worksheet. The new name will be assigned to the worksheet as shown below:



4. **Move or copy a worksheet:** You can reposition a worksheet or make its copy as follows:
- (a) Right click at the worksheet you want to move or copy.
 - (b) Click at Move or Copy option in the pop-up menu. The Move and Copy dialog box appears as shown below:

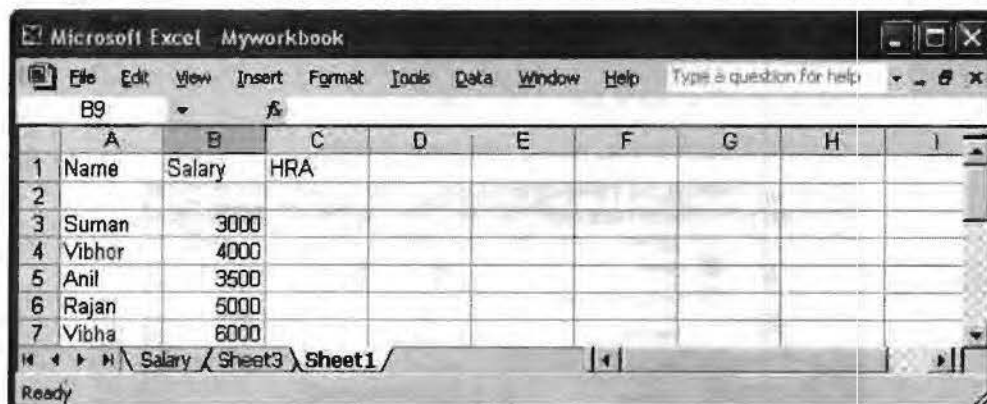


- (c) Select the workbook in which you want to move/copy this worksheet in the To book drop down combo box. After this selection all the worksheets of the selected workbook will be displayed.
- (d) Select the worksheet before which you want to place the worksheet or its copy.
- (e) If want a copy to placed at the destination, click on the Create a copy option box.
- (f) Click OK. The intended action will take place.

Let us move Sheet1 to the end of all the sheets in the current workbook.

- (a) Right click at Sheet1.
- (b) Click at Move or Copy option in the pop-up menu.
- (c) In the Move or Copy dialog box select (move to end) option.

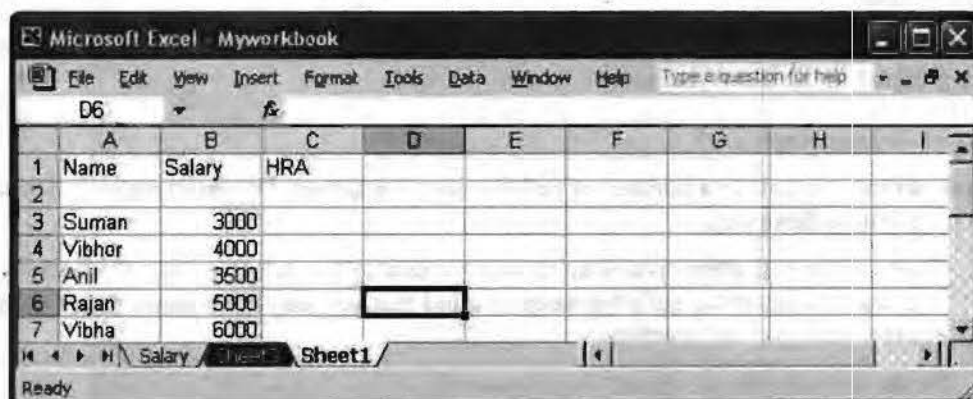
(d) Click OK. Sheet1 will be moved to the end of all the sheets as shown below:



A still easier way of moving a sheet to a desired location is to drag and drop. Just move the sheet to the location by dragging while holding down the left mouse button.

5. **Changing the color of a worksheet tab:** You can change the color of a worksheet tab. Let us change the color of worksheet Sheet3. To do so:

- (a) Right click at Sheet3.
- (b) Click at Tab color option in the pop-up menu. The Format tab color dialog box appears.
- (c) Select the color.
- (d) Click OK. The tab color changes to the selected one as shown below:



View Menu

View menu commands allow users to choose what components of the Excel window should be visible and what should not be. We will discuss only important commands of this menu. Rest, you can experiment on your own.

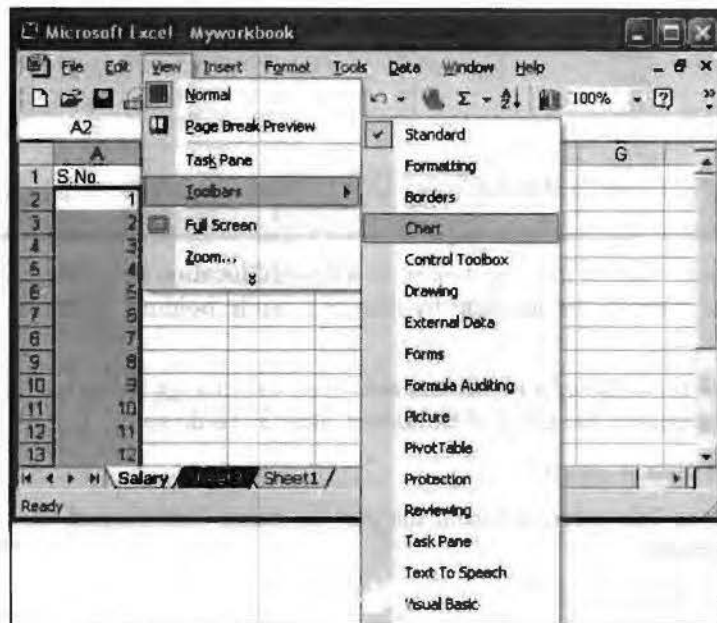
View → Working with Toolbar

Toolbars are a quicker way to issue a command. Excel comes with many in-built toolbars. By default it displays only two toolbars, i.e. standard toolbar and formatting toolbar. One can display or hide toolbars to suit the need.

To display or to hide a toolbar:

1. Click on the View menu.
2. Select the Toolbar option.

3. This will display all the toolbar names. Toolbars that are currently displayed have check marks in front of them and those, which are hidden; they don't have any check mark.
4. Check mark the toolbar name which you want to use.
5. Remove the check mark name, which you want to hide.



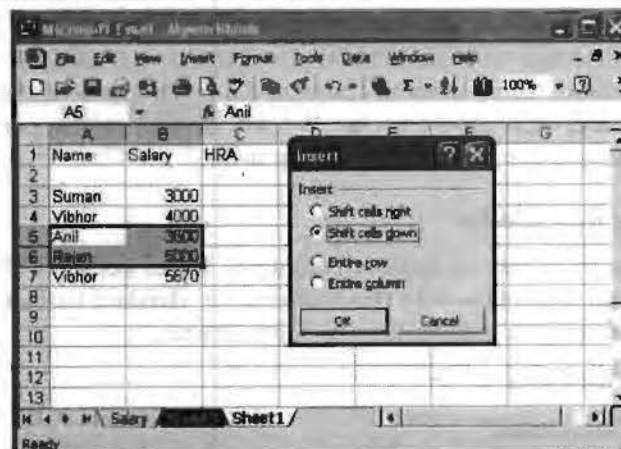
Insert Menu

Excel lets you enter a variety of objects in a worksheet. All the required commands are grouped in the Insert menu.

Insert → Inserting a Cell

You can insert a cell or a number of cells in your worksheet. For inserting cell(s) you have to follow these steps.

1. Click on the cell where you want to insert a new cell or select group of cell where you want to insert the cells but keep in mind that you can insert those many cells equal to selected cell numbers.
2. From the insert menu, choose the option cell.



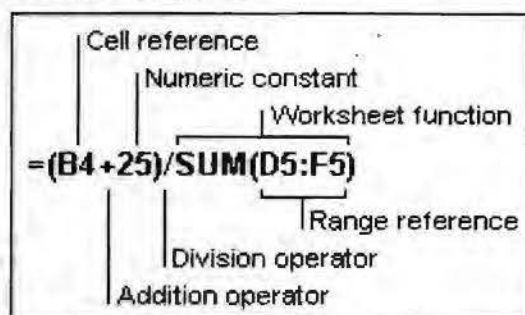
3. Click shift Cells right or Shift cells down according to your requirement.
4. Click the Ok button.

Similarly you can insert a row and a column too. Just select the Rows or Columns option from the Insert menu.

Insert → Inserting Formulae

A formula is an expression that performs operations on worksheet data. Formulae can perform mathematical operations, such as addition and multiplication, or they can compare worksheet values or join text. Formulae can refer to other cells on the same worksheet, cells on other sheets in the same workbook, or cells on sheets in other workbooks.

The following example adds 25 to the value in cell B4 and then divides the result by the sum of the values in cells D5, E5, and F5.



To enter a formula in a cell, begin it with an equal sign (=). The equal sign tells Excel that the succeeding characters constitute a formula. Following the equal sign are the elements to be calculated (the operands), which are separated by calculation operators. Excel calculates the formula from left to right, according to a specific order for each operator in the formula. You can change the order of operations by using parentheses.

In the example given below, the parentheses around the first part of the formulae force Excel to calculate `B4+25` first and then divide the result by the sum of the values in cells D5, E5, and F5.

`=(B4+25)/(D5+E5+F5)`

The structure or order of the elements in a formulae determines the final result of the calculation. Formulae in Microsoft Excel follow a specific syntax or order, that includes an equal sign (=) followed by the elements to be calculated (the operands), which are separated by calculation operators. Each operand can be a value that does not change (a constant value), a cell or range-reference, a label, a name, or a worksheet function.

Excel performs the operations from left to right – according to the order of operator-precedence – starting with the equal sign (=). You can control the order of calculation by using parentheses to group operations that should be performed first. For example, the following formula produces 11 because Excel calculates multiplication before addition.

`=5+2*3`

The formula multiplies 2 by 3 and then adds 5 to the result.

In contrast, if you use parentheses to change the syntax, Excel adds 5 and 2 together and then multiplies the result by 3 to produce 21.

`=(5+2)*3`

Insert → Order of Evaluation of Operators

Excel evaluates a formula in a particular order determined by the precedence number of the operators being used and the parentheses placed in the formula.

Table 4.1

Precedence	Operator	Description
1	:	Range of cells
2	Space	Intersection of cells
3	,	Union of cells
4	-	Negation
5	%	Percentage
6	^	Exponentiation
7	*	Multiplication
7	/	Division
8	+	Addition
8	-	Subtraction
9	&	Concatenation
10	=	Equal to
10	<	Lesser than
10	>	Greater than
10	<=	Lesser than or equal to
10	>=	Greater than or equal to
10	<>	Not equal to

A formula can refer to constant values and to other cells. The cell that contains the formula is known as a dependent cell when its value depends on the values in other cells. For example, cell B2 is a dependent cell if it contains the formula =C2.

A constant is a numeric or text value that you type directly into a cell or formula, or that is represented by a name. For example, the date 10/9/96, the number 210, and the text "Yearly Profit" are all constants. A formula or a value that results from a formula is not a constant.

Whenever a cell referenced by a formula changes the dependent cell also changes automatically. For example, if a value in any of the following cells changes, the result of the formula =B2+C2+D2 also changes.

If you use constant values in the formula instead of references to the cells (for example, =30+70+110), the result changes only if you modify the formula yourself.

Formulae can also refer to ranges of cells or to names or labels that represent cells or ranges.

Insert → Cell and Range References

A reference identifies a cell or a range of cells on a worksheet and tells Microsoft Excel, where to look for the values or data you want to use in a formula. With references, you can use data contained in different parts of a worksheet in one formula or use the value from one cell in several formulae. You can also refer to cells on other sheets in the same workbook, to other workbooks, and to data in other programs. References to cells in other workbooks are called external references.

Insert → Reference Styles

The A1 Reference Style

By default, Excel uses the A1 reference style, which refers to columns with letters (A through IV, for a total of 256 columns) and refers to rows with numbers (1 through

65536). These letters and numbers are called row and column headings. To refer to a cell, enter the column letter followed by the row number. For example, F4 refers to the cell at the intersection of column F and row 4. To refer to a range of cells, enter the reference for the cell in the upper-left corner of the range, a colon (:) and then the reference to the cell in the lower-right corner of the range. The following are examples of references.

Table 4.2

To refer to	Use
The cell in column A and row 10	A10
The range of cells in column A and rows 10 through 20	A10:A20
The range of cells in row 15 and columns B through E	B15:E15
All cells in row 5	5:5
All cells in rows 5 through 10	5:10
All cells in column H	H:H
All cells in columns H through J	H:J
The range of cells in columns A through E and rows 10 through 20	A10:E20

The R1C1 Reference Style

You can also use a reference style where both the rows and the columns on the worksheet are numbered. The R1C1 reference style is useful for computing row and column positions in macros. In the R1C1 style, Excel indicates the location of a cell with an "R" followed by a row number and a "C" followed by a column number.

Relative vs. Absolute References

Depending on the task you want to perform in Excel, you can use either relative cell references, which are references to cells relative to the position of the formula, or absolute references, which are cell references that always refer to cells in a specific location. If a dollar sign precedes the letter and/or number, such as \$A\$1, the column and/or row reference is absolute. Relative references automatically adjust when you copy them, while absolute references do not.

When you create a formula, references to cells or ranges are usually based on their position relative to the cell that contains the formula. In the following example, cell B6 contains the formula =A5; Microsoft Excel finds the value one cell above and one cell to the left of B6. This is known as a relative reference.

	A	B
5	100	
6	200	=A5
7		

When you copy a formula that uses relative references, Excel automatically adjusts the references in the pasted formula to refer to different cells relative to the position of the formula. In the following example, the formula in cell B6, =A5, which is one cell above and to the left of B6, has been copied to cell B7. Excel has adjusted the formula in cell B7 to =A6, which refers to the cell that is one cell above and to the left of cell B7.

	A	B
5	100	
6	200	=A5
7		=A6

If you don't want Excel to adjust references when you copy a formula to a different cell, use an absolute reference. For example, if your formula multiplies cell A5 with

cell C1 (=A5*C1) and you copy the formula to another cell, Excel will adjust both references. You can create an absolute reference to cell C1 by placing a dollar sign (\$) before the parts of the reference that do not change. To create an absolute reference to cell C1, for example, add dollar signs to the formula as follows:

=A5*\$C\$1

If you created a formula and want to change relative references to absolute (and vice versa), select the cell that contains the formula. In the formula bar, select the reference you want to change and then press F4. Each time you press F4, Excel toggles through the combinations: absolute column and absolute row (for example, \$C\$1); relative column and absolute row (C\$1); absolute column and relative row (\$C1); and relative column and relative row (C1). For example, if you select the address \$A\$1 in a formula and press F4, the reference becomes A\$1. Press F4 again and the reference becomes \$A1 and so on.

Insert → Functions

A function is a predefined formula that takes zero or more input values (also known as arguments) and produces (or returns) a result. The arguments can be either constant quantities or reference to cells or ranges; as long as data types of all the participating values are consistent.

The general structure of a function is given below:

Function_name (comma separated Argument list)

For example, SUM is an in-built function that may be used as follows:

SUM(A1, B1:B4, 30)

The result will be the sum of values stored in cells A1, B1, B2, B3, B4 and 30.

Excel 2003 includes a rich variety of in-built functions that you can use in your spreadsheet. For convenience they have been grouped into logical categories such as:

Mathematical	-	SUM, EXP, POWER, LOG, etc.
Statistical	-	AVERAGE, COVAR, FISHER, etc.
Logical	-	AND, OR, NOT, etc.
Date and time	-	DATE, DAY, HOUR, etc.
Text	-	LEFT, LEN, MID, etc.

In most of the cases, these functions will suffice your need. If you do not find an in-built function suitable to your need, you can create your own functions in Visual Basic and then use them in your worksheet. This, however, is out of scope of the present context. In this section only in-built functions will be used in the worksheet.

Inserting a Function

Inserting a function in a cell is very easy as Excel assists you while using built-in functions. Broadly, there are two ways of inserting a function:

1. Manually
2. Using function wizard

Let us calculate the total of the salary using SUM function. To insert a function in a cell manually:

Click on the cell in which you want to insert the function.

Enter the formula =SUM(D3:D7) in the cell D9. Now press ENTER. You will see the total appear in the cell D9.

The screenshot shows the Microsoft Excel interface with the title bar 'Microsoft Excel - Myworkbook'. The menu bar includes File, Edit, View, Insert, Format, Tools, Data, and Window. The toolbar contains various icons for file operations and editing. The active cell is D9, and the formula bar shows '=SUM(D3:D7)'. The spreadsheet data is as follows:

	A	B	C	D	E	F
1						
2		S No.	Name	Salary		
3		1	Suman	INR 4,000.00		
4		2	Vibhor	INR 5,000.00		
5		3	Vinod	INR 2,300.00		
6		4	Anil	INR 4,300.00		
7		5	Rajan	INR 5,670.00		
8						
9			Total	INR 21,270.00		
10						

To appreciate how useful Excel is, try changing the salary of Vibhor from 5000 to 8000. The total which depends on Vibhor's salary (cell D4) will be automatically updated.

The screenshot shows the same Microsoft Excel interface, but the active cell is now D5, and the formula bar shows '2300'. The spreadsheet data is updated as follows:

	A	B	C	D	E	F
1						
2		S No.	Name	Salary		
3		1	Suman	INR 4,000.00		
4		2	Vibhor	INR 8,000.00		
5		3	Vinod	INR 2,300.00		
6		4	Anil	INR 4,300.00		
7		5	Rajan	INR 5,670.00		
8						
9			Total	INR 24,270.00		
10						

As you type the function, Excel provides you with the structural and usage information of that function. If you have understood the information well, you can complete the function without any problem.

Let us compute average of the salaries in the cell D10. You can either use a formula

=SUM(D3:D7)/5

or you can use the in-built function

=AVERAGE(D3:D7)

To see how Excel helps inserting the in-built functions, type =AVERAGE(in the cell D10. Excel immediately shows you information about AVERAGE function, as shown:

	A	B	C	D	E	F
1						
2		S.No	Name	Salary		
3		1	Suman	INR 4,000.00		
4		2	Vibhor	INR 8,000.00		
5		3	Vinod	INR 3,300.00		
6		4	Anil	INR 4,200.00		
7		5	Rajan	INR 5,670.00		
8						
9			Total	INR 24,270.00		
10			Average	=average(
11				AVERAGE(number1, [number2], ...)		
12						
13						

Notice how Excel promptly offers its help. It shows you that you can use as many numeric arguments you want but they should be separated by comma.

Not only this if you now move the mouse a selection band moves along with it. You can use this band to click and drag to select the range or can use arrow and shift keys for the purpose.

	A	B	C	D	E	F
1						
2		S.No	Name	Salary		
3		1	Suman	INR 4,000.00		
4		2	Vibhor	INR 8,000.00		
5		3	Vinod	INR 3,300.00		
6		4	Anil	INR 4,200.00		
7		5	Rajan	INR 5,670.00		
8						
9			Total	INR 24,270.00		
10			Average	=average(D3:D7)		
11				AVERAGE(number1, [number2], ...)		
12						
13						

If you want to include any more range, type comma and repeat the process. Close the parenthesis to indicate that you have finished the range selection. Press ENTER to see the result.

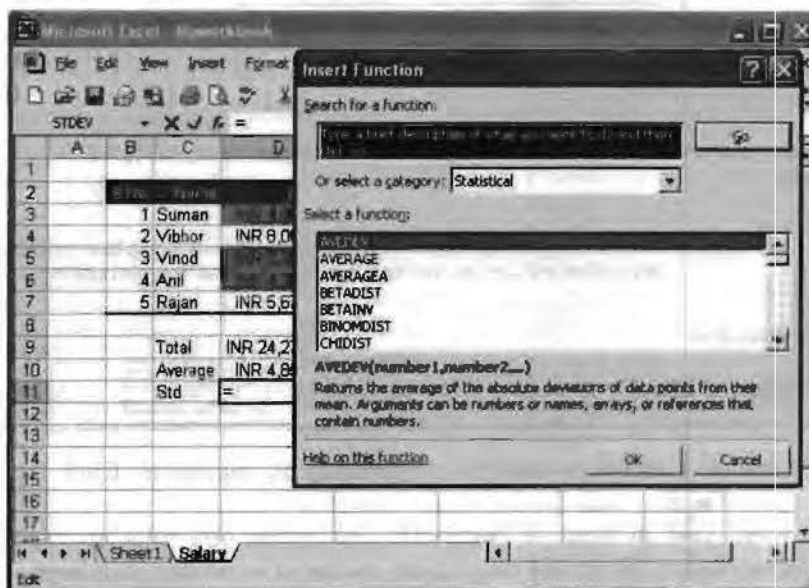
The screenshot shows the Microsoft Excel interface with the following data in the spreadsheet:

	A	B	C	D	E	F
1						
2		S.No.	Name	Salary		
3		1	Suman	INR 6,000.00		
4		2	Vibhor	INR 8,000.00		
5		3	Vinod	INR 2,300.00		
6		4	Anil	INR 4,700.00		
7		5	Rajan	INR 5,670.00		
8						
9			Total	INR 24,270.00		
10			Average	INR 4,854.00		
11						
12						

The formula bar at the top shows: `=AVERAGE(D3:D7)`

You can also insert functions using function wizard. This is particularly convenient when you do not have much idea of that function. To invoke function wizard select the cell in which you want to put the formula. Then click at the function command in Insert menu.

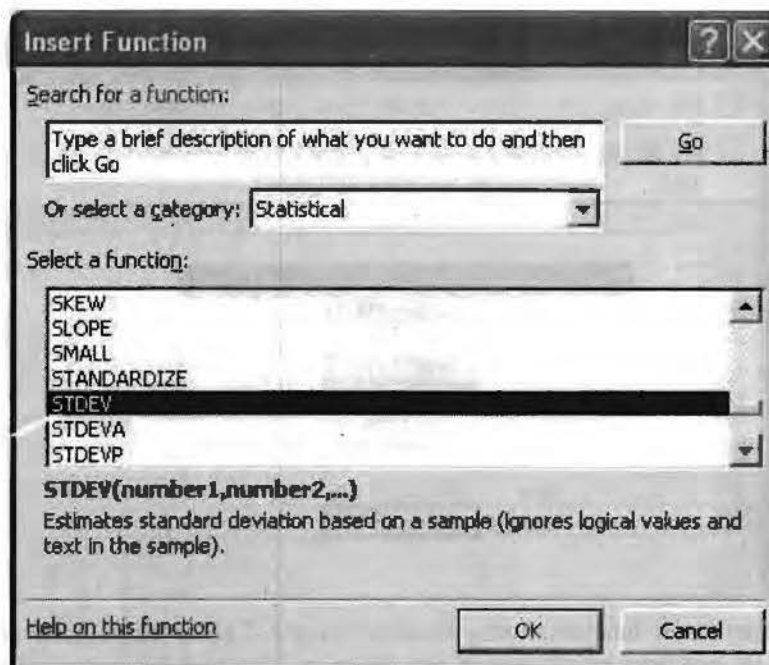
Let us insert a function for finding standard deviation of salaries in the cell D11. Select the cell D11. Then click at the function command in Insert menu. The Insert function dialog box appears.



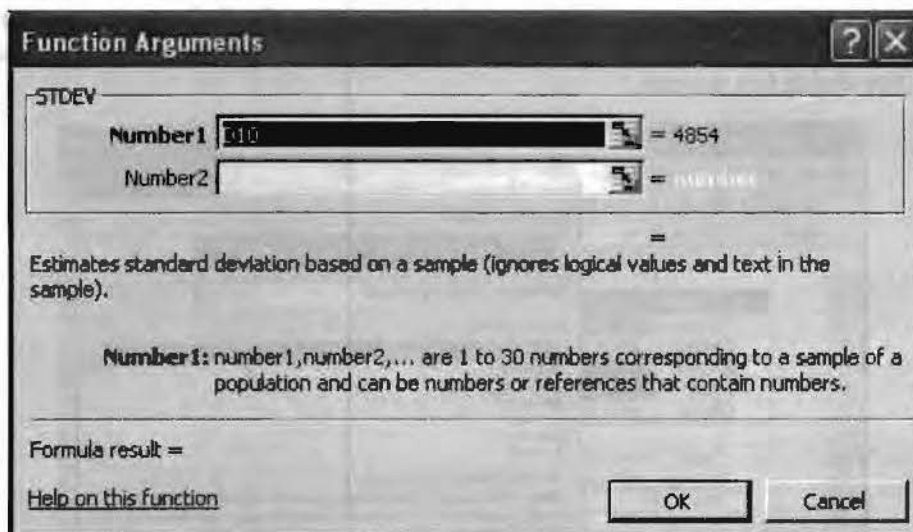
Study this dialog box carefully. You can search the details of the function you want to use by typing the function name in the Search for a function box and then by pressing Go button.


If you do remember the function's name or are not sure which function you want, select a category in the Select a category box. All the functions of the selected category are displayed in the Select a function box. Select the desired function and Excel guides you through.

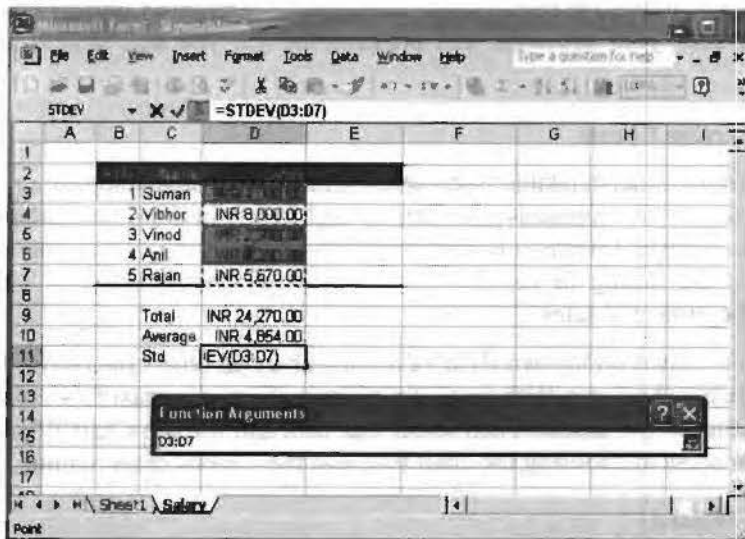
For the current purpose, select the Statistical category and observe the functions listed.




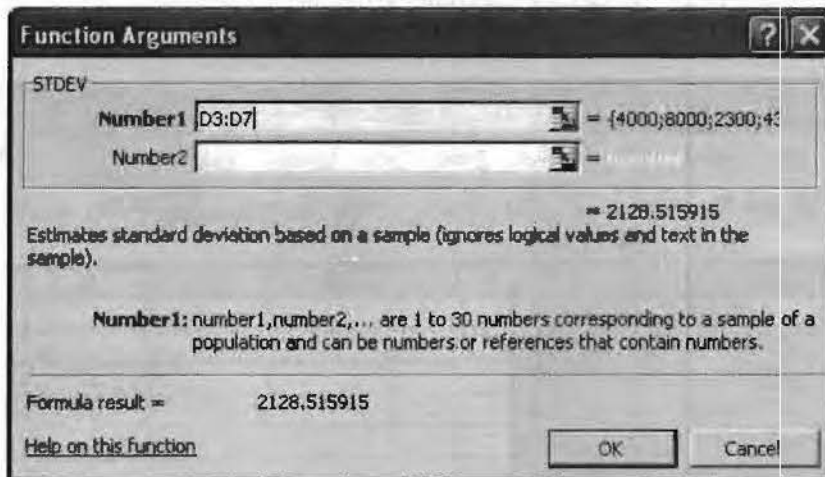
Select the STDEV function and click Ok to proceed. Function arguments dialog box opens up as shown below:



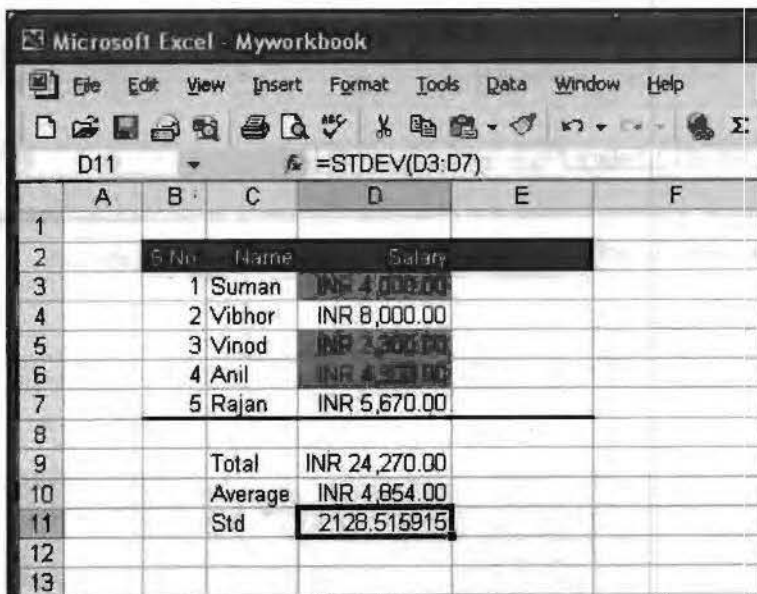
Select the numbers to be included in the function as arguments. Click the number selection icon  in front of Number1. The dialog box rolls up exposing the cells of the worksheet. Select the range using mouse or arrow and shift keys as shown:



After you have selected the range, roll down the Function argument dialog box by clicking at the Roll down icon . The dialog rolls down.



Notice how the selection has been made for you. Click OK. Excel enters the function in the cell.



You are strongly advised to spend some time making familiarity with various in-built functions. In both your academic and professional life you will benefit a lot from them.


Insert → Inserting Charts

Pictures are more understandable than words. Charts are visually appealing and make it easy for users to see comparisons, patterns and trends in data. For instance, rather than having to analyze several columns of worksheet numbers, you can see at a glance whether sales are falling or rising over quarterly periods or how the actual sales compare to the projected sales.

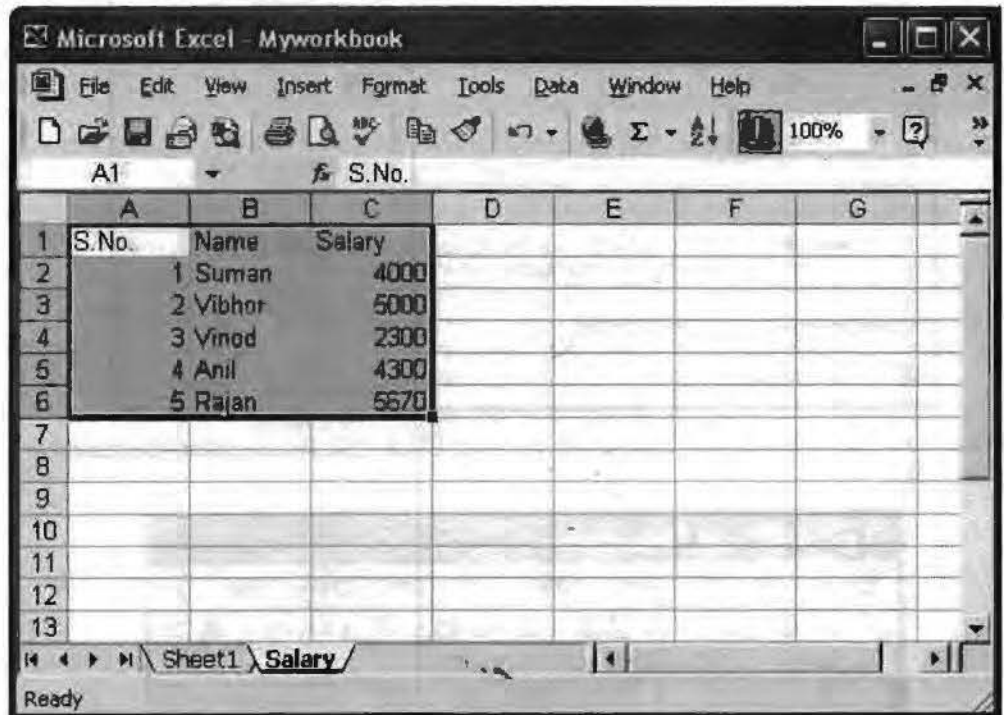
You can create a chart on its own sheet or as an embedded object on a worksheet. You can also publish a chart on a Web page. To create a chart, you must first enter the data for the chart on the worksheet. Then select that data and use the Chart Wizard to step through the process of choosing the chart type and the various chart options.

Using Chart Wizard

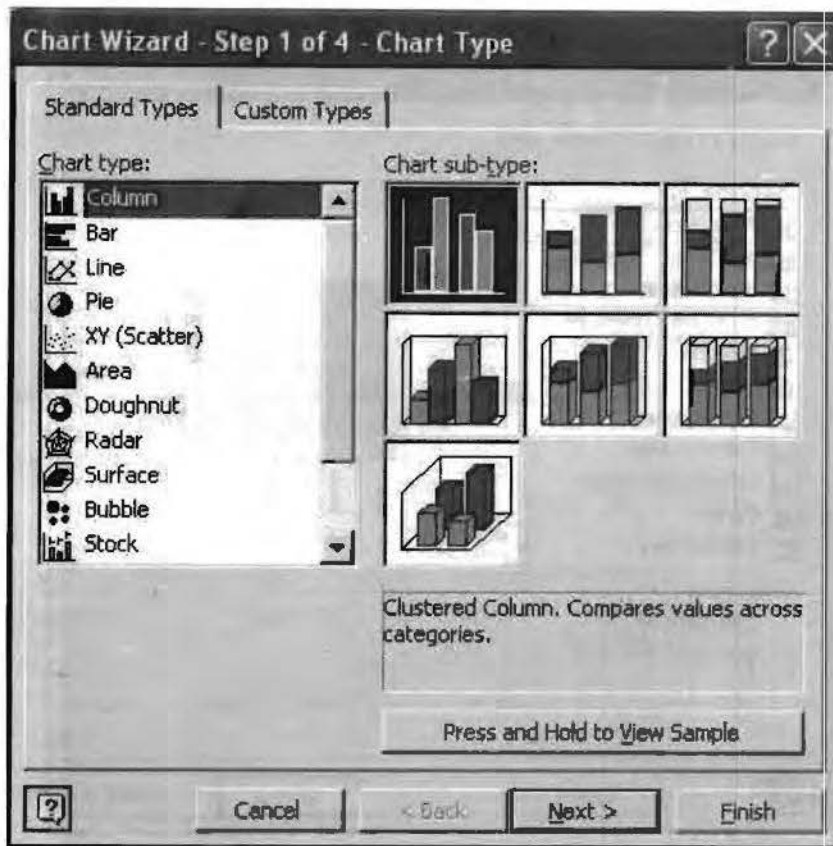
One of the easiest ways to generate a chart from data you enter in a worksheet is by

using Chart wizard. Chart wizard sits in the tool bar as  icon. Chart wizard is a simple four-step process of making selections to produce a finished chart.

1. Select the range of data on which you want to make a chart.



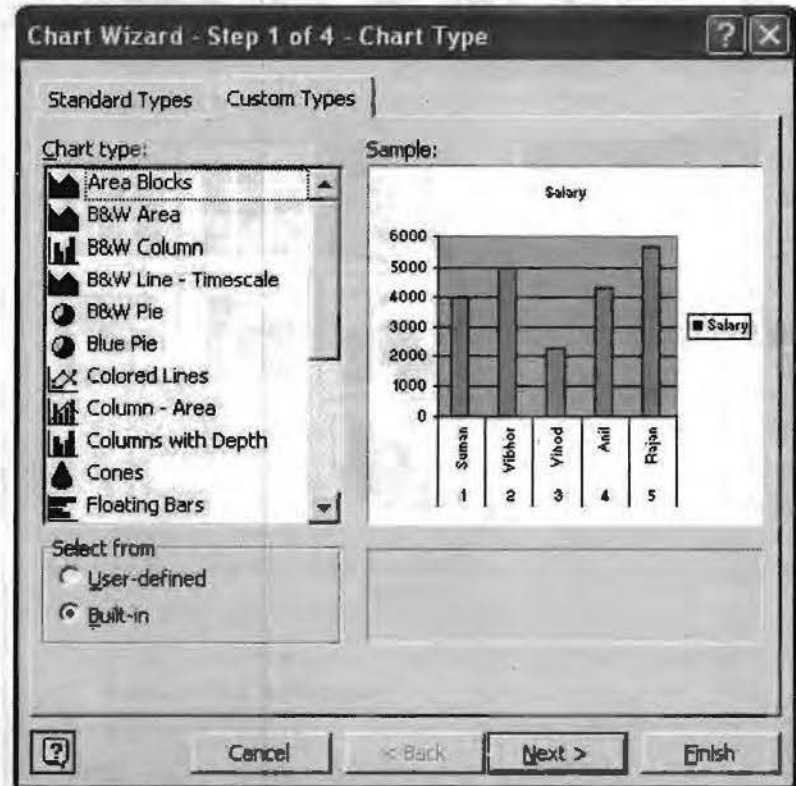
2. Select the option chart from insert menu, following dialog box appears.



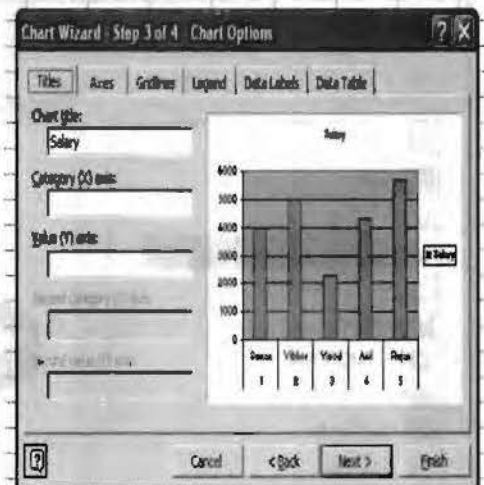
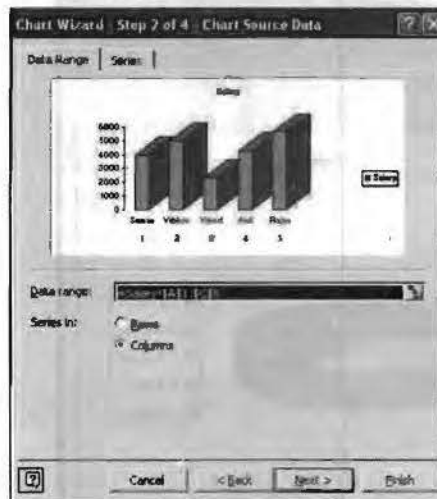
3. Select the type of chart you want. Click on the Press and Hold to view Sample button to preview your chart. Suppose you select pie chart as shown below:



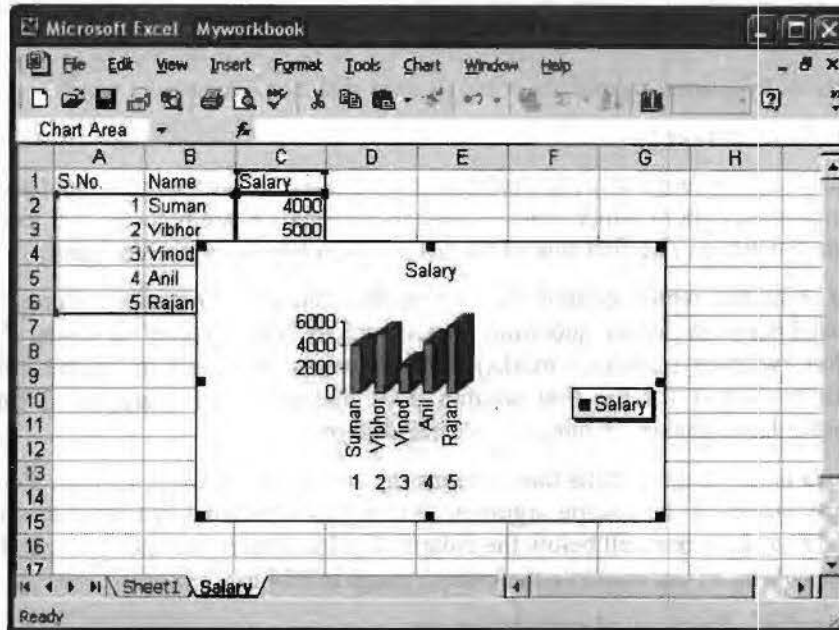
4. If the given charts are not of your choice then click on the Custom Type tab.



5. Select the graph type and Click on the Next button.
6. If you have forgotten to select the data range or you want to change the data range then you can select the data range from here by clicking the button next to Data range combo box.



7. Click Finish to insert this chart into the worksheet.

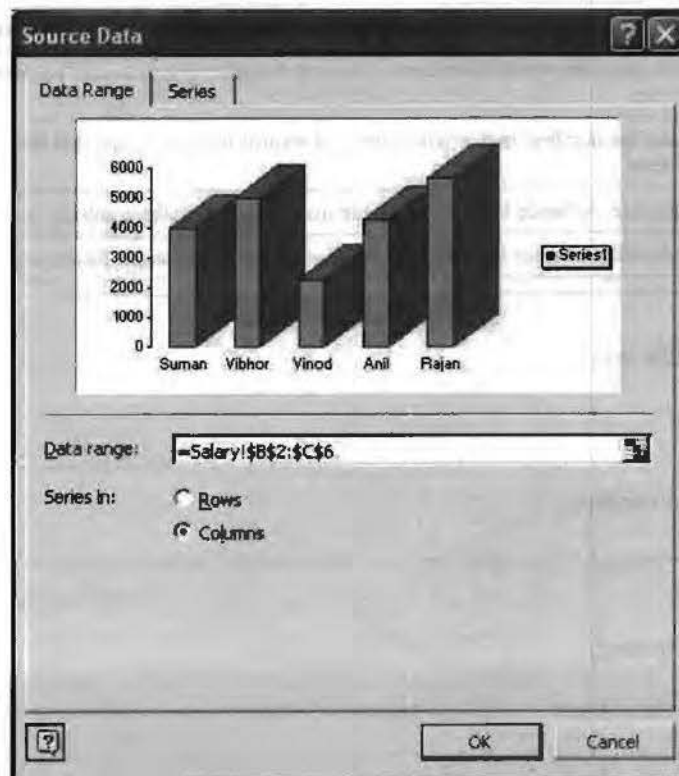


You should note that all the components of a chart can be modified. Right click and choose the command from the pop-up menu.

Let us modify some of the features of this chart.

1. You can resize the chart by clicking at it and dragging the size handles.
2. Suppose you wish to remove the serial number column from the chart. Right click in the chart area, click at data source from the context menu.

Click at range and select the range not including S.No. column. Close the source data window to see the effect as shown below:



4.8 DATABASE FUNCTIONS IN SPREADSHEET

Database functions in Excel are powerful analytical and calculation tools.

The functions take three arguments or parameters and then execute the result.

The three parameters are:

- **Database** is the range of cells that makes up the list or database. A database is a list of related data in which rows of related information are records, and columns of data are fields. The first row of the list contains labels for each column.
- **Field** indicates which column is used in the function. Enter the column label enclosed between double quotation marks, such as "Designation" or "Salary" or a number (without quotation marks) that represents the position of the column within the list: 1 for the first column (Designation in our example), 2 for the second column (Salary in our example), and so on.
- **Criteria** is the range of cells that contains the conditions that you specify. You can use any range for the criteria argument, as long as it includes at least one column label and at least one cell below the column label in which you specify a condition for the column. In our example the criteria range is B14 to C15.

Various database functions of spreadsheet are:

DAVERAGE	Returns the average of selected database entries
DCOUNT	Counts the cells that contain numbers in a database
DCOUNTA	Counts nonblank cells in a database
DGET	Extracts from a database a single record that matches the specified criteria
DMAX	Returns the maximum value from selected database entries
DMIN	Returns the minimum value from selected database entries
DPRODUCT	Multiplies the values in a particular field of records that match the criteria in a database
DSTDEV	Estimates the standard deviation based on a sample of selected database entries
DSTDEVP	Calculates the standard deviation based on the entire population of selected database entries
DSUM	Adds the numbers in the field column of records in the database that match the criteria
DVAR	Estimates variance based on a sample from selected database entries
DVARP	Calculates variance based on the entire population of selected database entries

Check Your Progress

1. Define title bar.

.....

.....

2. Define Worksheet.

.....

.....

3. Define copying.

.....

.....

4.9 LET US SUM UP

MS-Excel is a spreadsheet software included in MS-Office 2003 suite. A worksheet in MS-Excel is a grid of cells made up of horizontal rows and vertical columns. A workbook is a group of worksheets. Three types of data can be entered in a worksheet (i) Number, (ii) Text, (iii) Formulas. Cells can be edited by overwriting or by partially modifying the cell contents.

A range of cells can be selected using mouse or keyboard. A range can be copied either through *copy* and *paste* operations or by dragging the fill handle. A range can be moved through cut and paste operations or by dragging the range border.

To erase everything from a worksheet, select all the cells in the worksheet and then use Edit—clears—All. To save a workbook, use file—Save command. You can fill in a series of numbers, dates, or other Items using Auto fill. A predefined format can be set to you table using Auto format Option.

4.10 KEYWORDS

Worksheet: A grid of cells made up of horizontal rows and vertical Columns.

Workbook: A group of worksheets.

Cell: Unit of worksheet formed by intersection of a row and a column.

Range: Group of contiguous cells that form a rectangular shape.

Value: Numbers and formulas which can be used for Calculations.

Copying: Duplicating the contents of the documents at some other desired place.

4.11 QUESTIONS FOR DISCUSSION

1. Differentiate between the Normal, Print and Web views of an Excel 2000 worksheet.
2. Describe the protection mechanism in Excel 2000.
3. Is there a limitation on number of worksheets in a workbook? If yes how many?
4. Explain the purposes of options available for printing a worksheet. How can the worksheet be printed without the cell gridlines?
5. Explain the purposes of Custom header and footer.
6. Can a range of cells formed with non-rectangular selection of cells? How?
7. Differentiate between clearing content and clear format commands.
8. What purpose is served by Auto fill command?
9. Explain the difference between deleting cells and a complete row.

Check Your Progress: Model Answer

1. Title bar shows the name of the document and is situated in the top of the window application
2. Worksheet is the working area in which you can work. Each worksheet of a single workbook has its own identity and is separate from other worksheet.
3. Copying means duplicating the contents of the documents at some other desired place.

4.12 REFERENCE/ SUGGESTED READINGS

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BLOCK – III

UNIT 5

MANAGERIAL APPLICATIONS OF COMPUTER

CONTENTS

- 5.0 Aims and Objectives
- 5.1 Introduction
- 5.2 Managerial Applications of Computers
- 5.3 Computer and Management Functions
 - 5.3.1 Financial Decision-making
 - 5.3.2 Personnel Decision-making
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 - 5.4.1 Accounting Information Systems
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- 5.7 Computers and Inventory
- 5.8 Let us Sum up
- 5.9 Keywords
- 5.10 Questions for Discussion
- 5.11 Reference/ Suggested Readings

5.0 AIMS AND OBJECTIVES

After studying this lesson, you should be able to:

- Explain managerial applications of computer
- Describe computer based financial system
- Define the computer based inventory system

5.1 INTRODUCTION

Computers are used for all aspects of running a business. Computer use in a business enhances productivity and provides results that might not otherwise be possible. Businesses use computers to keep records, develop budgets and forecasts, prepare marketing documents, research and stay in contact with other employees and

customers. Businesses should look at their operation and ensure that they are using their computers to the fullest extent.

5.2 MANAGERIAL APPLICATIONS OF COMPUTERS

Computer is used every where in the world in every field of life. There are many applications of computer for example.

Computer can perform any kind of calculations in no time; where as a human being would take months and years to do the same calculations. Now a day's computer is used in almost every day application of life. For example, in:

- **Banking:** Before when there was no computer, every where manual system was followed which was a very complicated and hard work but now with the coming of computer every thing is in a very systematic way. Every bank is now using a computerized system because it is very fast and user friendly. ATM cards are used every where now which let us bank any time we want. PC banking (Personal Computer banking) let us view our bank balance, request transfers between accounts and pay bills electronically etc.
- **Traffic light control:** In traffic light control the computer is being employed to drive the traffic light. There are some programmed codes like " turn off the red light" or "turn on the red light" to control the traffic light and to carry out the instructions that follows.

Another most important application of computer in real life is:

- **Sports:** In sports computers are used wildly in conjunction with video cameras. These are used to record the motion of all the sports men. 3D programs are used later on to help the trainers see there movements and could improve there styles of playing.
- **Schools and Colleges:** There are many uses of computer in schools and collages, for example.

Every student details need to be stored so a computer program could help in this way.

Multimedia, animations, graphics and charts could be used to teach the students and many boring topics can be made interesting using multimedia. Students could access internet for online help and courses for more information.

5.3 COMPUTER AND MANAGEMENT FUNCTIONS

The common experience in the Indian scene has been a plethora of transaction-processing systems which have been abiding for long. Left to themselves, computer professionals have usually been good at planning, designing, developing and implementing the transaction-processing systems, due to their inherent advantages of recurring qualitative data and decisive logic base. On the other hand, MIS at a corporate level always needs involvement of the user-manager in an intensive way and this has shown a tardy growth.

There are many functional relationships between computer and management and these are:

- Financial Decision-making
- Personnel Decision-making
- Marketing Decision-making
- Production Decision-making

- Materials Decision-making
- Maintenance Decision-making

5.3.1 Financial Decision-making

At corporate level MIS would still need the database comprising the transaction-processing inputs, such as, cash transactions, receipts, issues, return, foreign exchange earned or spent, rejections, interests, depreciation, etc. The other inputs are in the nature of the various accounting rules and procedures, apart from the scales of payment.

Based on the above, the financial management decisions are made with monthly and annual final accounts, profit and loss accounts, balance sheet, etc. In addition, cash accounts are needed by management, apart from the cost accounting for pay-roll accounting, suppliers ledger and preparation of capital and operations budget.

To build up a corporate-level MIS for a tourism organisation, one can look at such selective data as bills payable and bills receivable, and segregate them commodity-wise, establishment-wise, region-wise and agent-wise. This immediately gives a management decision-making capability to examine and take remedial action on the differences and deviations from the set pattern. The analysed data for financial decision-making can have various management ratios and management trends leading on to managerial forecasts. Linked data can be of the form of inter-related items between finance and inventory, between finance and marketing, between finance and production costing, and between finance and personnel. Integrated data can take the form of obtaining a picture for total credit, total sales turn over, total profit and so on.

The corporate areas to be helped would be cash planning, credit planning, profit planning, and facility planning. For instance, cash inflow and outflow are of great interest for most organisations and much monumental bankruptcy takes place in organisations due to the faulty cash-flow adjustments. Similarly, the credit planning takes care of voluntary and involuntary credit, in establishment where voluntary credit is often deliberately introduced to push new products, to lift accumulated stock or to provide relief to bulk customers. In all such areas, decision-making is facilitated by an appropriate MIS, as has been experienced in many organisations.

In service organisations, investment planning and budget planning are additional features. Interestingly, budget planning can be a common feature in both production and service organisations. The tourism organisations have shown a tremendous scope for corporate MIS in terms of trends, analysis and forecasts arising out of various reconciliation processes such as inter-branch, inter-agents or even for such instruments as travellers cheques and so on. Financial data can be generated and stored for hotel tariffs, package tour costs, commissions to distributors, volume of business provided by distributors, etc.

In the domain of public administration, commercial tax data-base has been built up in some of the Indian states for various categories of taxes on commodity-wise, establishment-wise, region-wise and year-wise bases. Such a data-base has given rise to a capability of concentration upon tax evasion cases selectively, to strengthen the inspection machinery for tax non-realisation cases, to keep track of recovery of diverse installments in court-injunction cases and generally to streamline pursuit of the outstandings.

5.3.2 Personnel Decision-making

Personnel pay rolls have been an old bat in transaction-processing systems. In a number of organisations, pay-rolls have been extended to cover the entire gamut of employee service, namely, income-tax assessment and recovery, provident fund accumulation and withdrawal, compulsory deposits (when they existed) and statutory

reports and returns. A comprehensive database for personnel decision-making would require not merely such financial data but also other categories of pre-recruitment and post-recruitment personnel data.

Examples of comprehensive personnel data would include prior qualifications, experience, categories and grades of posting, places of transfer, experience gained, new qualifications, acquired, training undertaken, disciplinary actions, merit rewards and performance appraisals, etc. Such a data-base can be used for retrieval of selective data to assess grade-wise, year-wise and region-wise personnel inflow and outflow, for deciding upon recruitment planning as well as promotion planning. A similar approach can be undertaken to match availability of persons experience-wise, location-wise and duration-wise with the demand of such persons in new locations with appropriate grades and experiences for purposes of personnel plan. Career development planning can also be done while looking at the grade-wise, experience-wise and qualification-wise profile and decide on fresh areas of training and education.

Finally, retirement planning can be done by looking at the selective aggregation of data on personnel wastage, so that recruitment can be undertaken and the bulk of retirement benefits can be released rightaway pending the settlement of accounts.

Personnel decision-making based on corporate MIS has become quite common in a number of large organisations in the country. In addition, states like Andhra Pradesh and Madhya Pradesh have often done personnel planning for doctors and teachers respectively using comprehensive database approach. Bhilai Steel Plant has planned total human resource management with creation of complete data-base including history and skills of personnel; and manpower planning and administration, including establishment functions; training needs as identified in the appraisal reports and so on.

In tourism many jobs are seasonal and in certain cases outside people are hired (like guides, escorts) to carry specific jobs. Any good organisation will keep a database of such persons with quality rankings and their rates for the services. This data needs constant upgradation.

5.3.3 Marketing Decision-making

Sales invoicing and sales accounting have been the early transaction-processing systems in most organisations. The inputs can be the deciding of a tour package, inspection of all the places of concern and despatch of documents on tours arranged and despatched apart from the price schedules, some occasional returns. Such data can be built into a comprehensive data-base which can help eventually the market planning and the publicity (advertisement) planning on one hand and linkages with order-processing on the other.

Both market planning and publicity planning depend on the creation of a number of profiles with full particulars such as customer profile, product profile and user industry profile. The seasonality of orders, the trends in market fluctuations, the philosophy of industrial indents and the ebb and flow of relevant markets can be assessed and taken care of in such a planning process.

Destination data, customer profile data, costs data etc. come handy in designing the product/service mix along with the product line. Similarly data on competition is also useful for marketing planning.

On the other hand, linkages with order-processing gives a vital control on the quantity of tours to be arranged or suspended to meet live and dead orders, respectively. Such a dynamic inter-facing can help to eliminate a lot of infructuous order execution and finished tours inventory creation.

5.3.4 Production Decision-making

The production of goods is a general term used very often in most of the organisation. In the service sector it can be thought as a substitute for the service to be rendered or specifically in the tourism sector, for example, it can be a term used to specify all the tour packages specially designed every year as the goods produced.

The basic inputs are the salient production data collected periodically from all the production units or designing units as and when the main events occur. The corporate MIS would involve: performance review on a periodic basis (daily, monthly and annually), monitoring of in-process inventory, other performance statistics, comparison of the current production with the past performance, receipt and consumption of services and energy resources and daily analysis of performance.

Corporate production decision-making involves production planning and control (PPC) and this involves certain elements:

- The first element of PPC is the order processing involving maintenance of current status of orders and despatch programmes.
- The second element of PPC is the corporate production MIS indicated earlier.
- The third element of PPC is the material tracking including maintenance of detailed production schedules through various stages of operations (from initial idea up to the final finishing); in-process material and so on.
- The fourth element of PPC is the planning, including annual plans based on market demands; maintenance schedule and corporate plan requirements; quarterly and monthly plans based on annual plans and organisation targets; daily plans for fulfillment of monthly plans; comparison of plan versus performance at different time intervals; and preparation of subsidiary plans for requirement of raw-material, energy resources and finished inventory.

Many organisations have today incorporated PPC as part of their corporate MIS. This is very useful in hotel, airlines and tour operators.

5.3.5 Materials Decision-making

Materials accounting based on receipts, issues, returns, and rejections have been the part of transaction-processing system in all organisations so far. For the purpose of materials decision-making, comprehensive databases can have three components of purchasing, inventory, and materials review.

The purchasing data-base can help creating a corporate MIS for monitoring of purchase indents up to acceptance of tenders, monitoring of purchase orders against schedules of delivery, analysis of lead-time delays, vendor-rating (in terms of quality performance of delivery schedule), and monitoring payments against deliveries.

The inventory data-base can help increasing a corporate MIS for preparation of standard specifications for regular consumption items, prompt inspection and acceptance of delivered goods, preparation of receipts documents, monitoring of stock balance, purchase dues, and indents dues; monitoring of procurement of regular consumption items, decentralised control of consumption, analysis of consumption and movement (particularly for slow moving, non-moving and critical) of items for control forecasting and budgetary control of consumption and procurement and so on.

Materials review data-base can help in creating a corporate MIS for the on-going review of the various control parameters such as re-order level, re-order quantity, the phasing of deliveries for 'A' class items, the bulk purchasing of 'B' and 'C' class items and so on. Basically, materials review should look critically at all the expected norms of purchasing and inventory so that a dynamic adjustment is possible before the on-set of any crisis.

Materials review data is essential for hotels and tourist transporters along with others subsidiary products and services in tourism like emporiums, restaurants, etc.

5.3.6 Maintenance Decision-making

Maintenance management distinguishes between preventive maintenance and breakdown maintenance. While preventive maintenance can be planned, the breakdown maintenance is invariably unplanned.

As regards plant preventive maintenance, the experience with oil refineries, industrial blast furnace, dock facilities and thermal projects have all shown that a thorough planning and a scheduling of preventive maintenance can be immensely time-saving and cost-reducing. The same is applicable in case of tourism transport operations and hotels maintenance, vehicle breakdown or bad maintenance in hotels can adversely affect the business.

Transaction-processing systems have looked at the records of components, spare-parts, jugs, fixtures and tools as inputs, and consumption statements and maintenance accounts as outputs. These inputs can still be valid for building up a corporate MIS with such additional data as equipment conditions, history of failures, direct cost of maintenance, inventory values and materials movement, man-hours spent, over-time paid, other resource usage, maintenance of employee's performance, reliability and maintainability of equipment, and maintenance contribution to the finances.

From such a comprehensive database, one can generate MIS reports for transport control, such as vehicle register (to provide vehicle specifications and project details), vehicle history (to provide maintenance particulars), major failure report, forecast on maintenance (providing probable failure time and period), office non-availability, reliability and maintainability, and maintenance schedules (providing maintenance activities to be done during a specific period). One can also generate MIS reports on work control, such as, craft performance report (providing planned and actual performance of each craft), craftsman's performance report, maintenance planning efficiency report (providing an efficiency ratio on planned activities), overtime report, resource levelling report (providing analysis of resource required job-wise), delay cause report, etc. One can finally generate materials control reports and cost control reports providing management details of costs and material transactions involved in maintenance management.

5.4 COMPUTER BASED FINANCIAL ACCOUNTING SYSTEM

5.4.1 Accounting Information Systems

Accounting information systems are the oldest and most widely used information systems in business. Computer-based accounting information systems:

- Record and report the flow of funds through an organization on a historical basis and produce important financial statements such as balance sheets and income statements.
- Produce forecasts of future conditions such as projected financial statements and financial budgets.
- Operational accounting systems focus on transaction processing systems. They emphasize legal and historical record-keeping and the production of accurate financial statements. Typically, operational accounting systems include:
 - ❖ Order processing
 - ❖ Inventory control

- ❖ Accounts receivable
- ❖ Accounts payable
- ❖ Accounts payroll
- ❖ General ledger systems.
- Management accounting systems focus on the planning and control of business operations. They emphasize:
 - ❖ Cost accounting reports
 - ❖ Development of financial budgets and projected financial statements
 - ❖ Analytical reports comparing actual to forecasted performance.

You will have heard the term "double entry book keeping". This is an old established system of bookkeeping which forms the basis of all accounting systems. Today, of course, companies of all sizes usually use computerised accounting systems. Nevertheless, it is useful to learn a little about the double entry system as this will help you understand how a trial balance is drawn up.

Every "transaction" is supported by a business document. What do you understand by the term "transaction", and which documents are we talking about? I have listed some of the most common transactions below. Most transactions are related to the sale or purchase of goods, services, capital items and consumables.

If you are a seller and make a sale:

- You produce an invoice.
- You send the top copy of the invoice to the buyer.
- You retain the second copy of the invoice.

If you are a buyer and make a purchase:

- The seller produces an invoice
- You receive the top copy of the invoice
- The seller retains the second copy of the invoice.

If you are a seller who has goods returned:

- You produce a credit note.
- You send the top copy of the credit note to the buyer.
- You retain the second copy of the credit note.

If you are a buyer who returns some goods:

- The seller produces a credit note.
- You receive the top copy of the credit note.
- The seller retains the second copy of the credit note.

In this way everybody receives a document as a record of the transaction.

When purchasing capital items you will receive the top copy of the seller's invoice. In addition, you may also receive a deed (for premises) or a formal hire purchase agreement. When purchasing small quantities of consumables or other small items the document you will receive could be the till receipt. Alternatively, the proprietor may make out and sign an internal petty cash voucher to release the money from the petty cash account.

Some important subsystems of Accounting Information Systems are as follows:

- **Online Accounting Systems:** Accounting information systems are being affected by Internet and client/server technologies. Using the Internet, intranets, extranets, and other network changes how accounting information systems monitor and track business activity. The online, interactive nature of such networks calls for new forms of transaction documents, procedures, and controls. Many companies are using or developing network links to their trading partners through the use of the Internet or other networks for applications such as order processing inventory control, accounts receivable, and accounts payable.
- **Order Processing:** Order processing, or sales order processing, is an important transaction processing system that captures and processes customer orders and produces data needed for sales analysis and inventory control. In many firms, it also keeps track of the status of customer orders until goods are delivered. Computer-based sales order processing systems:
 - ❖ Provide a fast, accurate, and efficient method of recording and screening customer orders and sales transactions.
 - ❖ Provide inventory control systems with information on accepted orders so they can be filled as quickly as possible.
- **Inventory Control:** Inventory control systems process data reflecting changes to items in inventory. A computer-based inventory control system:
 - ❖ Record changes to inventory levels and prepares appropriate shipping documents.
 - ❖ May notify managers about items that need reordering and provide them with a variety of inventory status reports.
 - ❖ Helps a business provide high-quality service to customers while minimizing investment in inventory and inventory carrying costs.
- **Accounts Receivable:** Accounts receivable systems keep records of amounts owed by customers from data generated by customer purchases and payments. Accounts receivable systems:
 - ❖ Produce invoices to customers, monthly customer statements and credit management reports.
 - ❖ Stimulate prompt customer payments by preparing accurate and timely invoices and monthly statements to credit customers.
 - ❖ Provide managers with reports to help them control the amount of credit extended and the collection of money owed.
 - ❖ Help to maximize profitable credit sales while minimizing losses from bad debts.
- **Accounts Payable:** Accounts payable systems keep track of data concerning purchases from and payments to suppliers. Accounts payable systems:
 - ❖ Prepare checks in payment of outstanding invoices and produce cash management reports.
 - ❖ Help ensure prompt and accurate payment of suppliers to maintain good relationships, ensure a good credit standing, and secure any discounts offered for prompt payment.
 - ❖ Provide tight financial control over all cash disbursements of the business.
 - ❖ Provide management with information needed for the analysis of payments, expenses, purchases, employee expense accounts, and cash requirements.

- **Payroll:** Payroll systems receive and maintain data from employee time cards and other work records. Accounts payable systems:
 - ❖ Produce paychecks and other documents such as earning statements, payroll reports, and labor analysis reports
 - ❖ Product reports for management and government agencies
 - ❖ Help businesses make prompt and accurate payments to their employees, as well as reports to management, employees, and government agencies concerning earnings, taxes, and other deductions.
 - ❖ Provide management with reports analyzing labor costs and productivity.
- **General Ledger:** General ledger systems consolidate data from accounts receivable, accounts payable, payroll, and other accounting information systems. General ledger systems:
 - ❖ At the end of each accounting period, these systems produce the general ledger trial balance, the income statement and balance sheet of the firm, and various income and expense reports for management.
 - ❖ Help businesses accomplish accounting tasks in an accurate and timely manner.
 - ❖ Typically provide better financial controls and management reports and involves fewer personnel and lower costs than manual accounting methods.

Newer technologies play an important role in improving the effectiveness of internal financial information. For example, the cost-volume-profit (CVP) analysis technique and other methods of analyzing costs and margins give management the subtle information it needs to make short- to medium-term financial decisions. Activity-based costing (ABC) opens up a whole new approach to matching costs and resources to their true causes. A state-of-the-art financial information system lays the foundation for consistent and reliable reporting, regardless of the way the company analyzes the information.

5.4.2 Financial Management Systems

Computer-based financial management systems support financial managers in decisions concerning:

- The financing of a business.
- The allocation and control of financial resources within a business.

Major financial information system categories include:

- Cash and investment management.
- Capital budgeting
- Financial forecasting
- Financial planning

Cash Management

Cash management systems collect information on all cash receipts and disbursements within a company on a real-time or periodic basis. Cash management systems:

- Allow businesses to deposit or invest excess funds more quickly, and thus increase the income generated by deposited or invested funds.
- Produce daily, weekly, or monthly forecasts of cash receipts or disbursements (cash flow forecast) that are used to spot future cash deficits or surpluses.

- Mathematical models frequently can determine optimal cash collection programs and determine alternative financing or investment strategies for dealing with forecasted cash deficits or surpluses.

Online Investment Management

Many businesses invest their excess cash in short-term low-risk marketable securities or in higher return/higher risk alternatives, so that investment income may be earned until the funds are required. Portfolio of securities can be managed with the help of portfolio management software packages. Online investment management services:

- Are available from hundreds of online sources on the Internet and other networks.
- Help a financial manager make buying, selling, or holding decisions for each type of security so that an optimum mix of securities is developed that minimizes risk and maximizes investment income for the business.

Capital Budgeting

The capital budgeting process involves evaluating the profitability and financial impact of proposed capital expenditures.

- Long term expenditure proposals for plants and equipment can be analyzed using a variety of techniques. This application makes heavy use of spreadsheet models that incorporate present value analysis of expected cash flows and probability analysis of risk to determine the optimum mix of capital projects for a business.

Financial Forecasting and Planning

A variety of financial forecasting packages provide analytical techniques that result in economic or financial forecasts of national and local economic conditions, wage levels, price levels, and interest rates.

Financial Planning: Financial Planning systems use financial planning models to evaluate the present and projected financial performance of a business or of one of its divisions or subsidiaries. Financial planning systems:

- Help determine the financial needs of a business and analyze alternative methods of financing the business.
- Use financial forecasts concerning the economic situation, business operations, types of financing available, interest rates, and stock and bond prices to develop an optimal financing plan for the business.
- Frequently use electronic spreadsheet packages and DSS generators to build and manipulate models.
- Are used to answer what-if and goal-seeking questions in order to evaluate financial and investment alternatives.

Internal financial reporting traditionally means compiling and distributing generic reports that show a company's past, short-term financial performance. The financial reports at one company look the same as they would at any other company. And the information leaves management without insight, unable to link what happened yesterday with how the company will meet its financial targets of tomorrow.

Best Practices

Best practices in the area of providing financial information can be quite technical and complex. For example, the best practices address the fundamental assumptions and structure of internal financial reporting, the selection of performance measures at the company, approaches to financial analysis, and choices in the financial information system. As daunting as these best practices may appear, companies should keep in

mind that they have complete control and flexibility in the area of internal financial reporting. After all, it is internal reporting, so it is completely up to the company to decide what serves it best. In as much as these best practices are intricate and complex, a company in the end should select the approaches and technologies that support its own decision-making process. A list of the best practices is given below.

- Identify and understand the information needed by internal customers to execute the business strategy, satisfy customers, and evaluate business process performance.

Once the finance group understands management's financial information needs, the next step is to design, or redesign, the financial information systems to meet those needs. At this point, most companies shift from the traditional focus on historical financial data, which provides after-the-fact record keeping, to a new emphasis on information for decision making. For example, reports that include activity-based costing, target costing, and life cycle costing link financial performance with factors that affect revenues and expenses. These costing methods also uncover trends in financial performance and indicate the effects of the current trends on the company's attainment of strategic objectives.

- Measure and report profit contributed by appropriate segments, such as product line, customer, channel, division, and geographic location.

Meaningful internal financial information differentiates profitable customers and business segments from those that are not. To achieve this all-important goal, the company needs to structure financial reports appropriately, so that recipients of the reports can plainly grasp the profitability analysis. To collect the appropriate information to analyze, a company first needs to identify how to segment its business to reflect the flow of profits, such as by market segment, by distribution channel, by customer, or by division. Then the company assigns to each segment the appropriate revenues, variable costs, and fixed costs. For example, for a channel profitability analysis, costs would include channel management costs; channel maintenance costs; advertising, promotion, and marketing costs; trade show costs; and marketing staff costs. Through assigning the relevant revenues and costs to the business segments, the company may identify high-profit and high-loss segments, and then set objectives for avoiding costs relevant to high-loss segments.

- Integrate financial analysis with operational and industry analyses to identify opportunities for improving business performance.

Many companies could use more sophistication in their financial reporting, with techniques such as analysis of ratios and comparisons to industry and peer performance. These techniques give management insight into where the business may be vulnerable and where it might enjoy unique strengths. However, it's easy to go overboard with sophisticated financial analysis techniques; keeping the measures simple and relevant to strategic business issues is a reliable, powerful course of action.

Companies that apply best practices select a small number of key financial statistics and ratios to watch closely, keeping in mind the company's circumstances and objectives. Ratios and statistics are more meaningful if evaluated in terms of their trends over time. To broaden the focus of financial analysis, high-performance companies compare their numbers to those of competitors and best-of-class performers.

The balanced scorecard approach to financial reporting is particularly powerful. For a balanced scorecard, the company selects a short list of measures that not only indicates the operational and financial health of the business, but also its level of customer satisfaction and the creative health of the business. An example

of a balanced scorecard is one that chooses measures that focus on four critical issues:

- ❖ The customer perspective: how do customers see the company?
- ❖ The internal business perspective: what must the company excel at?
- ❖ The innovation and learning perspective: can the company continue to improve and create value?
- ❖ The financial perspective: how does the company look to shareholders?

Taking a balanced scorecard approach, a company creates performance measures to track all levels of the company that reflect these four critical issues. For example, on periodic internal reports, customer satisfaction metrics and statistics on the number of employees participating in coursework are reported right alongside finance and operations numbers. To create meaningful report content, employees from finance, operations, and other functional areas need to collaborate with one another.

- Use cost-volume-profit analysis, contribution margins, and relevant costs and qualitative factors to evaluate business opportunities.

Methods such as cost-volume-profit analysis, contribution margin calculation, and relevant cost calculation help a company to evaluate the impact of expected changes in the volume of sales on resulting costs and profits.

Special business opportunities require a company to look at short-term financial issues – such as revenues, expenses, and cash flow – as opposed to long-term financial issues such as equity distribution and indebtedness. Also, when evaluating special opportunities, in addition to looking at the numbers, companies need to consider qualitative factors. Market expectations and customer expectations should always play a role in a company's decision to accept a one-time special order or to outsource its core business. Will existing customer schedules be affected? Will the company lose expertise in a key skill area? Are there hidden costs, like training and supervising time, that do not appear in the original analysis?

- Use the attributes of world-class financial information systems to evaluate and improve the company's existing financial information systems.

At the foundation of effective internal financial reporting is a robust information system that collects and disseminates information flexibly and reliably. Best practices companies study the attributes of a world-class information system and look for computer hardware, software, and systems design for their business that deliver these attributes:

- ❖ *Standardized*: the system captures and processes information consistently throughout the company
- ❖ *Complete*: the system handles the information requirements of diverse groups of users
- ❖ *Appropriate*: the information is relevant, predictive, exception oriented, and at the right level of detail
- ❖ *Unified*: the system has information links to customers and suppliers, and changes to data in one area move through the whole system
- ❖ *Flexible*: applications may be tailored to the company's needs
- ❖ *Cost-effective*: the system makes efficient use of hardware and software licenses
- ❖ *Easy to use*: all types of users are comfortable with the system
- ❖ *Timely*: the system provides information when it's needed

- Ensure that key decision makers understand the strengths and weaknesses of internal financial information.

Internal information has its limitations. The information is more meaningful and relevant when decision makers understand its limits, how it is produced, and how it can help them.

The finance group can assist management in understanding internal financial information by explaining the processes that underlie it. For example, the finance group can explain how the financial system measures, records, and classifies transactions; how the finance group periodically summarizes and reports financial information; and the meaning and limitations on interpreting the information. One limitation of internal information is its bias toward analyzing the past and focusing on short-term profitability. Another is its tendency to focus on issues important only to the company, opposed to issues of concern to customers as well.

- Provide accurate and reliable activity-based cost information for resource allocation decision making.

Activity-based costing (ABC) is a powerful tool that companies use to determine which activities contribute to profitability. The concept of ABC is to distill a company's production process into a set of activities and then attribute and analyze costs by activity. With ABC, a company sees which activities cause its costs.

Implementing ABC lets a company allocate resources based on critical activities; eliminate redundant activities and costs; eliminate activities that do not add value to the customer; set budget levels in accordance with activities that cause costs; and place more reliable information on activities and processes into the hands of management.

5.5 COMPUTER BASED INVENTORY SYSTEM

"Inventory" to many business owners is one of the more visible and tangible aspects of doing business. Raw materials, goods in process, and finished goods, all represent various forms of inventory encountered in a manufacturing organization. Each type represents money tied up until the inventory leaves the factory as a purchased product. Likewise, merchandise stocks in a retail store contribute to profits only when their sale puts money into the cash register.

Inventory refers to stock of anything necessary to do business. These stocks represent a large portion of the business investment and must be well managed in order to maximize profits. In fact, many small businesses cannot absorb the types of losses arising from poor inventory management. Unless inventories are controlled they are unreliable, inefficient, and costly. In attempting to control inventories, managers usually lean towards keeping inventory levels on the high side, yet this greater investment (given a constant amount of profit), yields a lower return on the dollar invested. This is one of the contradictory demands made upon the manager with respect to keeping inventory, others include:

- Maintain a good assortment of products – but not too many;
- Increase inventory turnover – but only at a good profit level;
- Keep stocks low – but not too low;
- Make volume purchases to obtain lower prices – but don't overbuy; and
- Get rid of obsolete items – but not before their replacements have taken hold in the market.

Today, the use of computer systems to control inventory is far more feasible for small business than ever before, both through the widespread existence of computer services organizations (listed in the yellow pages of many telephone directories) and the decreasing cost of micro computers. Often the justification for such a computer-based system is enhanced by the fact that company accounting and billing procedures can also be handled on the computer.

Most computer manufacturers offer free, written information on the inventory management systems available for their computers. In addition, computer service companies often have material readily available describing the use of their particular computer "software" programs for inventory management. These companies provide a good source of information on general descriptions of particular inventory management techniques, as well as help on specific inventory management problems.

Whether a manual or computerized inventory management system is used, the important thing to remember is that inventory management involves two separate, but closely related elements: the first is knowing what and how much to order, when to order and what price to pay; the second is making sure that the items, once brought into inventory, are used properly to produce a profit.

5.6 INVENTORY CONTROL SYSTEM

Inventory control systems maintain information about activities within firms that ensure the delivery of products to customers. The subsystems that perform these functions include sales, manufacturing, warehousing, ordering, and receiving. In different firms the activities associated with each of these areas may not be strictly contained within separate subsystems, but these functions must be performed in sequence in order to have a well-run inventory control system.

In today's business environment, even small and mid-sized businesses have come to rely on computerized inventory management systems. Certainly, there are plenty of small retail outlets, manufacturers, and other businesses that continue to rely on manual means of inventory tracking. Indeed, for some small businesses, like convenience stores, shoe stores, or nurseries, purchase of an electronic inventory tracking system might constitute a wasteful use of financial resources. But for other firms operating in industries that feature high volume turnover of raw materials and/or finished products, computerized tracking systems have emerged as a key component of business strategies aimed at increasing productivity and maintaining competitiveness. Moreover, the recent development of powerful computer programs capable of addressing a wide variety of record keeping needs—including inventory management—in one integrated system have also contributed to the growing popularity of electronic inventory control options.

5.7 COMPUTERS AND INVENTORY

Automation can dramatically impact all phases of inventory management, including counting and monitoring of inventory items; recording and retrieval of item storage location; recording changes to inventory; and anticipating inventory needs, including inventory handling requirements. This is true even of stand-alone systems that are not integrated with other areas of the business, but many analysts indicate that productivity—and hence profitability—gains that are garnered through use of automated systems can be increased even more when a business integrates its inventory control systems with other systems such as accounting and sales to better control inventory levels. As Dennis Eskow noted in *PC Week*, business executives are "increasingly integrating financial data, such as accounts receivable, with sales information that includes customer histories. The goal: to control inventory quarter to quarter, so it doesn't come back to bite the bottom line. Key components of an

integrated system ... are general ledger, electronic data interchange, database connectivity, and connections to a range of vertical business applications."

Check Your Progress

1. Personnel pay rolls have been an old hat in
2. Sales invoicing and have been the early transaction-processing systems in most organizations.
3. systems keep records of amounts owed by customers from data generated by customer purchases and payments.

5.8 LET US SUM UP

Computer programs such as QuickBooks and other accounting programs allow businesses to keep detailed records. These programs track accounts payable, accounts receivable and sales. They also provide an easy and quick way for a business to send out invoices to customers and handle payroll functions. Back office productivity and accuracy can increase greatly when using an accounting program. There are a wide variety of programs that allow businesses to easily prepare dynamic marketing documents. Adobe Photoshop provides many templates that users can manipulate to produce eye-catching custom marketing materials. These programs make it easy for people who do not have a creative background to prepare professional-looking documents quickly and painlessly.

5.9 KEYWORDS

Computer Program: Set of instructions in a programming language along with data structure and documentation.

Business Process: A related group of steps or activities that use people, information, and other resources to create value for internal or external customers.

System: Set of interacting components that operate together to accomplish a common purpose.

5.10 QUESTIONS FOR DISCUSSION

1. Describe the managerial uses of computers.
2. Explain personal decision making.
3. Describe accounting information system in details.
4. Explain inventory control system.

Check Your Progress: Model Answer

1. transaction-processing systems
2. sales accounting
3. Accounts receivable

5.11 REFERENCE/ SUGGESTED READINGS

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BLOCK – IV

UNIT 6

MANAGEMENT INFORMATION SYSTEM

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6.0 AIMS AND OBJECTIVES

After studying this lesson, you should be able to:

- Describe Information System and its need
- Define Digital Convergence
- Identify the Change in Business Environment
- Understand the Information and Knowledge Economy
- Describe Contemporary Approach to Information System
- Acknowledge Information System Management Challenges
- Define the Ethical and Social Issues of IS

6.1 INTRODUCTION

Management Information System is an old management tool, which has been long used by people for better management and scientific decision-making.

Management Information System is mainly dependent upon information, which is a vital ingredient of any Management Information System. Information is the most critical resource of Management Information System. We all know that information is a vital factor for our existence. Just as our body needs air, water and clothes, we are as much dependent upon information. To make life more interesting and to achieve the feeling of being a part of the social system, we want to know our surroundings and for that we need information. Information is an important input for achieving our goals such as learning to help each other and to become integral part of society.

Actually, information system is not a new concept; it is as old as the hills. From biblical times, humans have been making the use of information generated through information systems in all times. There have been systems that generated and communicated information. Kings and rulers had their own ways of designing information systems to retrieve information. The main objective of these information systems was to ascertain the well being of their people in the kingdom and to effectively and efficiently manage the kingdom. The church had its own information system. In India, Tainali Rama, Akbar and many others had impressive management information systems in operation. Similarly, the merchants of Venice had their own fully functional appropriate management information system in place.

6.2 WHAT IS AN INFORMATION SYSTEM?

Now, it is time to see the real meaning and concept of Information Systems. Too often you hear someone say, "Oh yeah, I know how to use a computer. I can surf the Web with the best of them and I can play Solitaire for hours. I'm really good at computers." Okay. So that person can pound a keyboard, use a mouse at lightning speed, and has a list of favorite Web sites a mile long. But the real question is "Is that person's information literate?" Just because you can pound the keyboard it doesn't necessarily mean that you can leverage the technology to your advantage or the advantage of your organization. An organization can gather and keep all the data on its customers that a hard drive can hold. You can get all the output reports that one desk can physically hold. You can have the fastest Internet connection created to date. But if the organization doesn't take advantage of customer data to create new opportunities, then all it has is useless information. If the output report doesn't tell the management that it has a serious problem on the factory floor, then all that's been accomplished is to kill a few more trees. If you don't know how to analyze the information from a Web site to take advantage of new sales leads, then what have you really done for yourself today?

Most of us think only of hardware and software when we think of an Information System. There is another component of the triangle that should be considered, and that's the people side, or "liveware."

We talk about the input, processing, output and feedback processes. Most important is the feedback process; unfortunately it's the one most often overlooked. Just as we discussed above, the hardware (input and output) and the software (processing) receive the most attention. With those two alone, you have computer literacy. But if you don't use the "liveware" side of the triangle to complete the feedback loop, you don't accomplish much. Add the "liveware" angle with good feedback and then you have the beginnings of information literacy.

An information system differs from other kinds of systems in that its objective is to monitor/document the operations of some other system, which we can call a target system. An information system cannot exist without such a target system.

For example, production activities would be the target system for a production scheduling system, human resources in the business operations would be the target system of a human resource information system, and so on. It is important to recognize that within a vending machine there is a component/sub-system that can be considered an information system. In some sense, every reactive system will have a subsystem that can be considered an information system whose objective is to monitor and control such a reactive system.

6.3 THE NEED FOR INFORMATION SYSTEMS

Ask managers to describe their most important resources and they'll list money, equipment, materials, and people - not necessarily in that order. It's very unusual for managers to consider information an important resource and yet it is. This chapter will help explain why you need to manage this resource as closely as any other in your organization.

6.3.1 The Competitive Business Environment

For many years computer technology was relegated to the backrooms or basements of a corporation. Only the "techies" worried about it and were often the only ones who really knew how it all worked. Now computers are all over the organization - one on every desk. It's not enough for you to know how to pound a keyboard or click a mouse. It is not even enough for you to know how to surf the Web. Now every employee, including you, must know how to take advantage of Information Systems to improve your organization and to leverage the available information into a competitive advantage for your company.

6.3.2 Why Business Need Information Technology?

Information Technology is reshaping the basics of business, customer service, operations, product and market strategies, and distribution are heavily, or sometimes even entirely, dependent on IT. The computers that support these functions can be found on the desk, on the shop floor; in the store, even in briefcases. Information technologies, and its expense, have become an everyday part of business life.

The fundamental reasons for the use of information technology in business are:

- Support of business operations
- Support of managerial decision making
- Support of strategic competitive advantage.

6.3.3 Emergence of the Global Economy

Next time you purchase a product, any product, look at the fine print and see where it's made. It could be China, or the Philippines, or India, or even USA. You can disagree with many manufacturing jobs that are being moved from other U.S. to foreign countries. But look at the vast number of jobs that are being created in this country. Maybe they aren't the traditional factory jobs we're used to. In fact, many of our new jobs are in the information industry. Many of them service entirely new markets that didn't exist just a few years ago. There was no position called "Webmaster" in 1991 because the Web didn't exist. But now, that particular job category is one of the fastest growing in the overseas. The global economy I am talking about is being made possible by technology. And that's why it's so important that you understand how to use Information Systems Technology instead of just computer technology. There's a big difference between the two, and we'll talk about it more.

6.3.4 Transformation of the Business Enterprise

You can't help but know about the entire job cuts occurring in our country. It seems like every week we hear about thousands and thousands of people losing their jobs. Back in the 80s most of the job losses were in the blue-collar sector. In the 90s it seems many of the cuts were being made in the white collar, management jobs. Why? Think about it. Technology, to a large extent, has driven organizations to change the way they operate and that includes the way they manage. We're going to take an in-depth look at how organizations work and how they've been transformed by technology.

But it isn't always bad! You just have to ask yourself this question: "With all the job losses in the last few years, many driven by technological changes, why has the Indian unemployment rate dropped to it's lowest in decades and remained so low?"

6.4 DIGITAL CONVERGENCE

The speed and computing capacity of technology continues to advance at dizzying speeds and in ways we can hardly imagine.

6.4.1 Interactive Multimedia

One trend highly touted by the experts is that of the "information appliance." Do we need to have a separate device for watching television, another one for listening to music, a different one called a telephone, and yet a whole separate device for computing? Some people say we can do all of that with one central appliance with a variety of input and output devices.

If you watch the mergers taking place in the corporate world between the telephone companies and cable TV companies, you can start to understand another major change that may be in store for us. The companies are working toward a convergence of the "entertainment outlets" we know as television and the Internet. Why can't we download a movie off the Internet whenever we're ready to watch it instead of having to follow a TV channel's set schedule? This idea may be a reality in a few years.

The music industry is struggling with the issue of music downloaded from Web sites. How do the musicians protect their copyrighted work while making the music more accessible to the public? How do the music publishing companies protect their business from disintermediation, the process of eliminating the middleman from transactions?

6.4.2 Role of Information Technologies on the Emergence of New Organizational Forms

During the last years, a consensus is emerging that to survive in the competitive turbulence that is engulfing a growing number of industries, firms will need to pinpoint innovative practices rapidly, to communicate them to their suppliers and to stimulate further innovation. In order to be competitive, companies are forced to adopt less hierarchical and more flexible structures, and to define strategies able to combine reduced costs, high quality, flexibility and a quick answer to customer requirements. Nowadays, there are very few companies with enough resources to form its value chain on their own.

Therefore, some changes are taking place within individual companies and in their relations with other organizations, creating new structures in which relationships between customers and suppliers are suffering considerable changes. One of these changes is concerned with the formation of networks in which there is a division of labour that allows each company to exploit their distinctive advantages, and be more competitive globally.

In a network model, a set of juridically independent companies establish cooperative long term links in order to achieve a higher level of competitiveness. The enterprises that belong to a network have not all the elements needed for manufacturing a product or providing a service under their absolute control. Therefore, the success of this kind of structures is conditioned by the coordination degree obtained along the realization of inter-organizational activities, which requires an efficient communication system among the partners. The Information Technology (IT) represents a supportive element that facilitates the transfer of information across organizational boundaries. In this paper we analyze the inclusion of the Interorganizational Information Systems (IOS) concept within the network model and discuss the role IT plays in enabling organizational transformation towards emergent forms of organization.

In order to attain relatively low costs in the last two decades the enterprises followed strategies of backward-forward integration, based on the improvement of the effects of the experience curve and the scale economies. We consider that this internal growth may be inadequate to face the new situations appearing in the nineties and, no doubt, those that will appear in the next century. The individual enterprise has less capability for foreseeing the consequences of the different business decisions; however, the need for competing in a more and more complex context requires the adoption of quick decisions, which facilitate the flexibility of the enterprise. New technologies, fast changing markets and global competitiveness are revolutionizing relationships both within and between organizations. Thus, the new environment requires from the enterprises a strategy able to agglutinate reduced costs, high quality, flexibility, and a quick response to the needs of the customer.

Nowadays, the enterprises have to compete in a more and more turbulent scene, which obliges them to adopt less hierarchical and more flexible structures. During the last years, a major transformation in the strategy of many enterprises has been observed with a tendency to disintegration. This is accompanied by a need for increasing the quality of the products or services offered, which requires more interdependency among the different corporate units. As a consequence of it, several transformations both inside the enterprises and in the relationships between them are taking place, which establishes new structures through which the relationships among competitors, customers and suppliers are changing substantially. One of these changes is the cooperation established among different enterprises, which allows them to develop their competitive capability. Companies are forming strategic alliances because there is an increasing acknowledgement that organizations operate in a relational context of environmental connectedness and that organizational survival and performance depend upon connections with other organizations.

The co-operation among enterprises allows their flexibility and their innovative capacity to be increased. Current products are based on so many critical technologies that most of the enterprises cannot keep constantly updated in all of them.

The Network Structure

The concept of the network's form of organization has been particularly popular with management writers for its potential to build the flexible organization with the ability to meet the challenges of a changing and global environment. Despite both the abundant available literature and the existence of a certain consensus on some aspects, there is still too much ambiguity in the concepts used in this area. Taking into account the formation of networks, which is an interesting field of recent development with strong repercussions on the inter-organizational relationships, it is necessary to clear the existing terminological confusions in order to formulate its theory and to improve its implementation.

Starting from the definition, a network is a specific kind of relationship joining a particular group of people, objects, or events. Two factors needed for constituting a network can be obtained from this definition; first, a network is formed by a group of elements; second, these elements establish specific relationships among them. We must show that the establishment of a co-operative network is not a purpose itself but "it must be a dynamic structure that allows consolidating the competitive position of its members".

By means of a network structure, the competitive position of the enterprises can be reinforced as these concentrate on what they do best, and on what maintains their success in the market. In this way, other enterprises make the activities left, in which they have distinctive competences too. The enterprises outsource those activities that are ballast and bureaucratize them.

The enterprises that belong to a network have not all the elements needed for manufacturing a product or providing a service under their absolute control. Within the networks, the involved elements belong to independent enterprises and are placed along the value system of a product or service.

All this drives to an organizational structure in which the enterprises generate more value in those areas where they have specific competencies. The success of these emergent organizational forms seems to be based, on a great extent, on an effective co-ordination by means of the use of advanced information systems, which are based on the Information Technologies (IT). There is an increasing interest in the relationship between the emerging organizational ways and the function of the IT/IS insofar as the progresses in each field have influenced the others.

Information Technology on the Emergence of Networks

At the moment, the most spectacular and potentially powerful uses of the information systems technology go beyond the individual borders of the enterprises. In fact, the most important function of IT in the nineties is the better management of the interdependencies among the enterprises. Information Technology has to be the most powerful instrument to reduce the co-ordination costs». While the traditional uses of IT tried to facilitate the internal processes of the enterprises, the Interorganizational Information Systems (IOS) are addressed towards the efficiency of a group of enterprises.

Most of the studies about IOS have focused on the incidence of IT on the flows of information among the organizations, its capability of reducing the transaction costs, and its potential to achieve competitive advantages. Many authors have verified that:

- IT influences the nature, punctuality and detail level of the information shared by enterprises

- IT reduces the transaction costs, while it provides a better management of the risks
- IT reduces the co-ordination costs.

In order to benefit from the advantages of IT, the enterprises have to keep in mind that IT cannot be isolated from its organizational context». We do not agree with the existence of causation between the implementation of IT and the organizational changes in the enterprise driving to an increase in the competitiveness of the enterprises. On the contrary the technological and organizational implementations are both sides of the same issue, since they depend on and determine each other». We think that, although IT might have the above mentioned positive effects on the organizations, the will and capabilities of the directors of the company are needed in order to make the most of those advantages.

In order to make the most of the whole potential of the IOS, it will be required that the managing directors get involved with the project, since they have a wider and more strategic view of the company. In this way, a system coherent with the objectives of the company would be implemented. This system would allow taking even more profit from IT, what would have positive repercussions on the enterprise and would facilitate the achievement of its objectives. The active participation of the Management Board in the planning of the IOS brings a problem related to the fact that IT is a relatively new resource that did not exist when most of the current managers were trained. Therefore, they usually do not feel comfortable with these new technologies.

As a proof of this, we will consider an example. McKesson was a dealer company of chemical products. This company knew that its success was linked to that of its customers, which were small stores, so it established a close relationship with them. By means of an appropriate use of Information Technologies, it helped its customers to maximize their profits, since it gave them useful information for competing with the big pharmaceutical chains, which were getting a greater market share. The McKesson Corporation directors' idea was so successful that many other enterprises of the sector tried to imitate it, but they made a terrible mistake. They thought that the network created by McKesson was just a computerized system with terminals connected in other enterprises.

The secret of the success of this company were not the computer links; information technology did not create the network. The network's success was due to the fact that the directors of McKesson were aware of both the relationships along the added value chain and the need to strengthen as much as possible every link within the chain, so cooperative behaviors could be established in order to provide the share of information and the quick response to the changes of the demand.

Another example, widely mentioned in the literature on Information Systems, is the one of the American Hospital Supply Company whose success has shown up the need to consider the network established not only as a mere system of electronic data exchange, but also as a better implementation of the technology found within a context of changes in the commercial relationships between the enterprise and its main customers.

They state that the implementation of this kind of technologies per se does not bring any competitive advantages; on the contrary, they must be accompanied by some particular elements, generally intangible, which facilitate the operation of the organization by means of a better distribution of the information and the experience. They also reflect a collaborative attitude among the enterprises.

A positive consequence of the revolution of communication and Information Technologies is that there are more available options for designing the labour now, because the technology can be used to increase the capacities of the workforce, and

the information can be transferred to those places where the labour is carried out. Workers do not need to be located according to parameters of time and space to co-ordinate any more. We consider that technology, although it is not the ground for the emergence of a new and innovative way of organizing the enterprises, plays an important role in its operation.

Technology allows doing things in a different way, which provides the directors some organizational possibilities that would be unthinkable without its implementation. Thus, using a mathematical expression, we can state that Information Technologies are necessary but they are not enough to achieve greater business competitiveness.

The Role of IOS within the Network Structure

The enterprises involved in an alliance must decide whether to use the manual management of all the exchanged data, or to complement that management with the interconnection of their respective computer applications. This interconnection may bring, however, compatibility problems in the integration of the data from the different enterprises, since those applications would have possibly been designed without taking into account any requirement of integration among enterprises. The establishment of co-operation networks implies the need for wider communication in the organizational field, as well as the requirement of capability to integrate the information systems from different enterprises.

The enterprises inside a network cannot operate properly if they have not the possibility to communicate quickly, accurately, and over long distances. Within a network, it does not make any sense to restrict the application of modern computer technologies to the individual borders of each enterprise. The Management Board of the enterprises in the network must, on the contrary, consider the possibilities of coordinating the processing of data outside the limits of their own organizations by means of an IOS.

The application of the IT which provides the electronic integration among the shareholders of an industry may make easier the outsourcing of activities, as well as be a basic part of the proper operation of the reticular structures. An IOS may play an important role in the coordination of interdependent activities, which would be carried out by distant organizational units. Thus, the enterprises can reduce their dependency on strategies of backward-forward integration in order to ensure the control over the production process.

The concept of network emphasizes the interdependency among enterprises, which is provoked by the presence and the sharing of the following key attributes: objectives, experience, labour, taking of decisions, responsibility, trust, and acknowledgement or reward. The enterprises within a network will adopt a common objective, namely to provide a quicker and better service to the final customer. With this aim in view, independent organizations will have to establish close interrelationships, in which Information Technologies have a vital role to play. In this way, the aim of optimizing the flow of profits along the supply chain could be achieved too. IOSs are, basically, new means to facilitate the relationships among organizations; they are, therefore, a strategic instrument. However, an IOS allows to obtain operative advantages too, such as:

- Reducing paper-work and manual operations;
- Reducing the stock levels;
- Accelerating the product and material flow;
- Standardizing of procedures;
- Accelerating the flow of information about changes on the demand;
- Reducing telecommunication costs.

The IT is a basic support that facilitates the co-ordination of different enterprises through EDI systems, shared databases, e-mail, videoconferences, which will allow them to work together. They will be able to share information on the markets, on the needs for materials, on stock levels, production schedules, and delivery programs. A key factor in an efficient exchange of information within a network is the computer connection of its members. The computer links accelerate the transference of information, since it provides the automatic transmission of data between physically distant computers. These links can be used as a strategic instrument to increase the competitiveness of the enterprise, binding it electronically with its customers and suppliers through inter-organizational systems. The electronic connection facilitates the approaching of the linked enterprises, which means that the companies may provide the customers direct access to the internal databases, as well as just-in-time stock control.

6.5 CHANGE IN BUSINESS ENVIRONMENT

The powerful worldwide changes have altered the environment of business. These changes in the business environment and climate are classified into political, social, economical and technological categories.

Environmental, organizational, and technological factors are creating a highly competitive business environment where customers are the focal point. Further, environmental, organizational, and technological factors can change quickly, sometimes in an unpredictable manner.

Therefore, companies need to react often and quickly to both the problems and the opportunities resulting from this new business environment. This dramatic change is due to a set of business pressures or drivers. They maintain that in order to succeed (or even to survive) in this dynamic world, companies must not rely only on traditional actions such as lowering cost, but also encourage innovative activities by empowering employees.

Organizations are composed of five major components: IT, organizational structure and corporate culture, management and business processes, organization's strategy, and individuals and roles. These components are in stable condition, called equilibrium, as long as no significant changes occur in the environment or in any of the components. However, as soon as a significant change occurs, the system becomes unstable and it is necessary to adjust some or all of the internal components since all are interrelated.

6.5.1 IT and Organizational Design

An important and fast growing technological innovation during this century is computer-based information systems. Computer-based information systems (CBIS or only IS) provide an opportunity for businesses to improve their efficiency and effectiveness, and even to gain a competitive advantage. IT is also a catalyst of fundamental changes in the structure, operations and management of organizations. Most businesses in the industrial world could not compete, and many could not even survive without computers and software. Now IT is an integral part of the products and services delivered to customers.

Competition leads to environmental uncertainty and increases both the need for and the rate of innovation adoption. By adopting IS, businesses will be able to compete in three ways:

- IS can change the industry structure and, in doing so, alter the rules of competition;
- IS can also create competitive advantage by offering business new ways to outperform their rivals; and
- IS spawns new businesses, often from within existing operations of the business.

6.5.2 IT-enabled Organizational Transformation

There is a growing body of conceptual papers and case studies on IT-enabled organizational transformation in the information systems literature. Most of the studies suggest that the use of IT without concomitant organizational changes is unlikely to yield significant gains in terms of organizational performance.

6.5.3 4R's of Business Transformation

Business Transformation can be defined as "The orchestrated redesign of the genetic architecture of the corporation, achieved simultaneously – although at different speed – along the four dimensions of reframing, restructuring, revitalization and renewal." By this definition a biological model has been developed that we call the Four R's of transformation are:

- Reframing
- Restructuring
- Revitalization
- Renewal

Reframing is the shifting of a company's conception of what it is and what it can achieve with new visions and a new resolve.

Restructuring is a girding of corporate loins, getting it to achieve a competitive level of performance by dealing with the body of corporation and competitiveness. The need to be lean and fit is the primary consideration.

Revitalization is about igniting growth by linking the corporate body to the environment.

Renewal deals with the people side of transformation, and with the spirit of the company. It is about investing individuals with new skills and new purposes, thus allowing the company to regenerate itself.

6.5.4 Five Levels of IT-induced Reconfiguration

The above figure is a schematic representation of these five levels along two basic dimensions – the degree of business transformation and the range of potential benefits from IT. Organizations thereby proceed to higher levels of transformation as the demands of competition and value creation for customer increases. The first two levels are evolutionary, requiring relatively incremental changes in the existing organizational processes. In contrast, the other three levels are conceptualized as revolutionary, requiring fundamental changes in the nature of business processes.

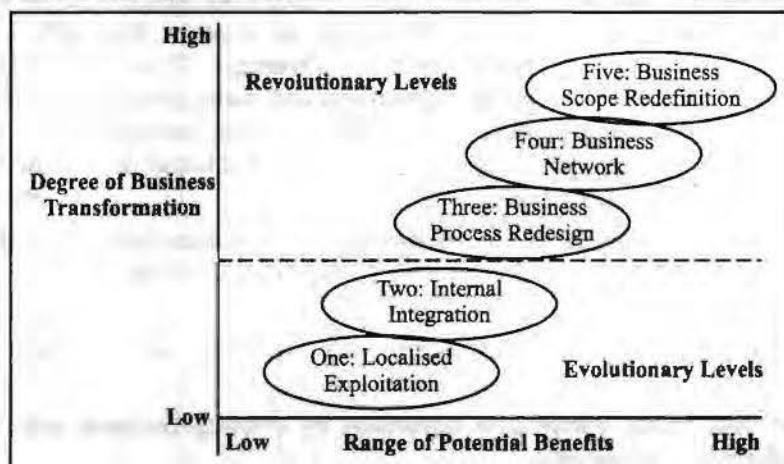


Figure: 6.1: Levels of IT-induced Reconfiguration

These five levels are explained as following:

- Level 1:** Localized Exploitation (Automation), which is concerned with the exploitation of IT within business functions.
- Level 2:** Internal Integration, a logical extension of the first in the sense that IT capabilities are exploited in all the possible activities within the business process. Two types of integration are critical here: technical integration and the organizational integration by using common IT platform to integrate the organization's business processes to enhance efficiency and effectiveness.
- Level 3:** Business Process Redesign, involving the reconfiguration of the business using IT as a central lever
- Level 4:** Business Network Redesign concerned with the reconfiguration of the scope and tasks of the business network involved in the creation and delivery of the products and services and
- Level 5:** Business Scope Redefinition concerned with the underlying principle of a corporation, pertaining to the possibilities of enlarging the business mission and scope (through related products and services) as well as shifting the business (through substitution of traditional capabilities with IT-enabled skills).

6.6 INFORMATION AND KNOWLEDGE ECONOMY

Information work is the art of creating and processing information. We use the term "art" because some companies do a very good job of creating, processing, and managing their information; others do such a poor job that these tasks become a detriment to the success of the organization. Which kind of company do you want to work for or own?

The two groups of employees primarily concerned with KWS are the data workers who process and distribute information and the knowledge workers who create knowledge and information. There are several ways to distinguish these two groups. You can also distinguish the two by the type of work they perform and how they create and use information. Here are some questions to help you:

- Do they create original ideas, or do they process, record, and store someone else's?
- Do they make their own original decisions regarding the information?
- Do they establish procedures to create and process the information, or do they follow someone else's procedures?

6.6.1 Distributing Knowledge: Office and Document Management Systems

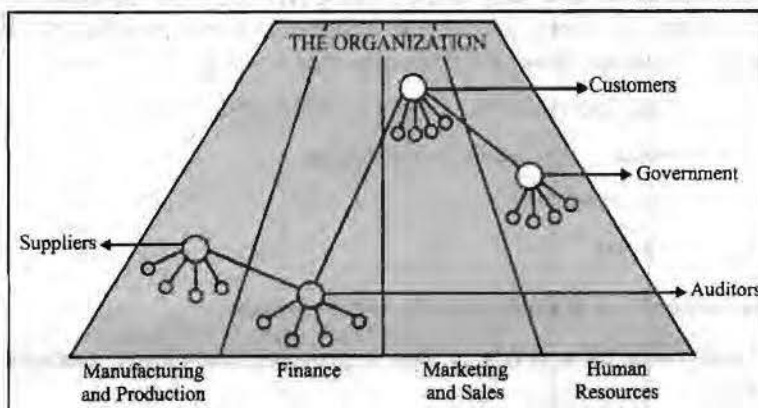


Figure 6.2

The office, as we know it in the traditional sense, is the setting for the generation and processing of information. As the above figure shows, it's where different roles mesh into a smooth "machine" of producing information, knowledge, and ideas instead of a product that you can touch, feel, or smell.

Table 6.1

Office Activity	Technology
Managing documents	Word processing, desktop publishing, document imaging, web publishing, work flow managers
Scheduling	Electronic calendars, groupware, intranets
Communicating	E-mail, voice mail, digital answering systems, groupware, intranets
Managing data	Desktop databases, spreadsheets, user-friendly interfaces to mainframe databases

The table describes typical Office Automation Systems and the activities they support, all of which are vital to the success of the organization. While some OAS still rely on stacks and stacks of paper, modern technology emphasizes digital sourcing, storage, and distribution. As computers and associated technology become more embedded into the normal workflow of offices, more is being done without paper. For instance, a clerical worker can create a document, send it to co-workers or supervisors for their input via email, have it returned electronically, correct it, and distribute it online.

But no matter how much we talk about a paperless society, we are actually generating more paper than ever. One of the emerging technologies that is enhancing the productivity and ease-of-use of Office Automation Systems and reducing paper problems is the document imaging system, which converts documents and images into digital form so they can be stored and accessed by computer.

Documents not in use are stored on-line on an optical disk system called a jukebox. The index server maintains the information the system will use to locate, access, and retrieve a document.

A wonderful example of document imaging systems is bank checks. Most banks don't return canceled checks any more. They make a digital image of the check, store it electronically, and then destroy the piece of paper. If you ever need a copy of one of your old checks, you have to request it. While the initial use of paper isn't reduced, the cost of processing and mailing the checks to the customer is gone altogether.

The advantages of using document imaging systems lie in the chance to redesign workflows. If companies aren't willing to do this, then they are laying out a lot of money to buy and install a system that they'll never fully use.

6.6.2 Creating Knowledge: Knowledge Work Systems

Now we'll review many different Knowledge Work Systems (KWS) so that you have a clear understanding of how they differ from OAS and other Information Systems. These systems help create new products or improve old ones, and they're also used to integrate new data into the flow of information that is so vital to an organization.

It's important that you understand the functions KWS perform. They:

- Keep the organization up-to-date in knowledge
- Serve as internal consultants
- Act as change agents

6.6.3 Requirements of Knowledge Work Systems

The first requirement of a KWS is that it provides knowledge workers with the necessary tools:

- Graphics tools

- Analytical tools
- Communication tools
- Document management tools

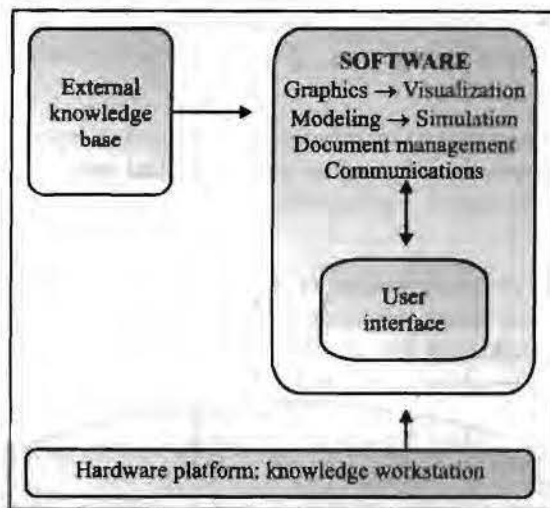


Figure 6.3

The above figure also shows how the elements of a KWS work together. Note that this kind of system requires links to external knowledge bases.

Most KWS require powerful workstations that can process the huge graphics files some professionals need or perform the massive calculations other types of professionals require. We're not talking clip art or simple adding or subtracting. We are talking huge amounts of data that must be processed quickly and the necessary storage for large files. The workstations must also have the necessary equipment and telecommunication connections that enable the knowledge workers to connect to external sources of information via Extranets, Intranets, or the Internet. These systems must have system and application software that is easy to use and manipulate, and intuitive to learn.

6.7 CONTEMPORARY APPROACH TO INFORMATION SYSTEM

There are several different approaches to Information Systems: technical, behavioral, socio-technical. Think of this analogy: A "techie" looks at most things associated with computing as a series of zeroes or ones. After all, everything in a computer is ultimately reduced to a zero or a one. So using the technical approach, you could say that $2 + 2 = 4$. The behavioral approach, on the other hand, takes into account the very nature of human beings. Nothing is totally black and white. Therefore the behavioral approach to the same equation would be " $2 + 2 =$ maybe 4 or perhaps 3.5 to 5.5, but we'll have to put it before the committee and see what the next quarter's figures say." Neither approach is better than the other, depending on the situation. Neither approach is more right than the other, depending on the situation.

An organization can't afford to view its information resources as belonging to either the techies (technical approach) or the non-techies (behavioral approach). Responsibility for information belongs to everyone in the organization. This is the socio-technical approach, that is, a combination of the two. Everyone has to work together to ensure that Information Systems serve the entire organization.

To help you understand the importance of viewing Information Systems through the socio-technical approach, look at what the current trade journals are saying. David Haskin, writing in the April 1999 issue of Windows Magazine, quotes Steve Roberts,

vice president of information technology for Mind Spring Enterprises, an Atlanta-based Internet service provider: "The gap in understanding between technical and non technical people is the biggest challenge I've seen." Haskin goes on to say, "Because technology is the bedrock on which successful businesses are built, the stakes in making this relationship work are high. Failing to use the correct technology can put you at a competitive disadvantage, and glitches in existing technologies can bring a business to a grinding halt."

Information Systems and the use of technology belong to everyone in an organization. This concept is best carried out through a socio-technical approach, which allows both the technical and behavioral approaches to be combined for the good of the organization.

Information systems are socio-technical systems. Through they are composed of machines, devices, and "hard" physical technology, they require substantial social, organizational, and intellectual investments to make them work properly.

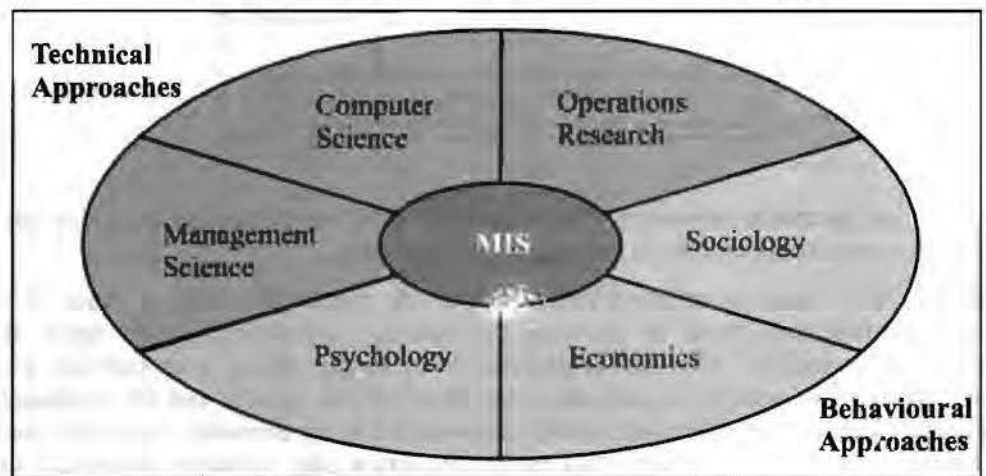


Figure 6.4: Contemporary Approaches to Information Systems

The study of information systems deals with issues and insights contributed from technological and behavioral disciplines.

Technical Approach

The technical approach to information systems emphasizes mathematically based models to study information systems, as well as the physical technology and formal capabilities of these systems.

Behavioral Approach

An important part of the information systems field is concerned with behavioral issues that arise in the development and long-term maintenance of information systems. Issues such as strategic business integration, design, implementation, utilization, and management cannot be explored usually with the model used in the technical approach.

Approach of this Text: Socio-technical Systems

MIS combined the theoretical work of computer science, management science, and operations research with a practical orientation toward building systems and applications. Technology must be changed and designed in such way as to fit organizational and individual needs. At times, the technology may have to be "de-optimized" to accomplish this fit.

6.8 INFORMATION SYSTEM MANAGEMENT CHALLENGES

Is this new technology worth the headaches and heartaches associated with all the problems that can and will arise? Yes. The opportunities for success are endless. The new technologies do offer solutions to age-old problems. Improvements are possible to the way you operate and do business.

6.8.1 The Strategic Business Challenge

Companies spend thousands of dollars on hardware and software, only to find that most of the technology actually goes unused. "How can that be?" you ask. Usually because they didn't pay attention to the full integration of the technology into the organization. Merely buying the technology without exploiting the new opportunities it offers for doing business smarter and better doesn't accomplish much. Think and rethink everything you do and figure out how you can do it better. Change is inevitable, and information must be managed just as you would any other resource.

Creating a digital firm and obtaining benefit is a long and difficult journey for most organisations. Despite heavy information technology investments, many organisations are not realising significant business value from their business systems, nor or they become digitally enabled. The power of computer hardware and software has grown much more rapidly than the ability of organisations to apply and to use this technology. To fully benefit from information technology, realize genuine productivity, and take advantage of digital firm capabilities, many organisations actually need to be redesigned. They will have to make fundamental changes in organisational behavior, develop new business models and eliminate the inefficiencies of outmoded organisational structures. If organisations merely automate what they are doing today, they are largely missing the potential of information technology.

6.8.2 The Globalization Challenge

The world becomes smaller every day. Competition increases among countries as well as companies. A good Management Information System meets both domestic and foreign opportunities and challenges. The rapid growth in international trade and the emergence of a global economy call for information systems that can support both producing and selling goods in many different countries. In the past, each regional office of a multinational corporation focused on solving its own unique information problems. Given language, cultural and political differences among countries, this focus frequently resulted in chaos and the failure of central management controls. To develop integrated, multinational, information systems, businesses must develop global hardware, software and communication standards; create cross-cultural accounting and reporting structures; and design transnational business processes.

6.8.3 The Information Architecture Challenge

You have to decide what business you are in, what your core competencies are, and what the organization's goals are. Those decisions drive the technology, instead of the technology driving the rest of the company. Purchasing new hardware involves more than taking the machine out of the box and setting it on someone's desk. Remember the triangle of hardware, software, and persware. Take care of the people and they will take care of the rest! Information architecture describes how to incorporate technology into the mainstream processes in which the business is involved. How will the new Information System support getting the product produced and shipped? How will Advertising and Marketing know when to launch ad campaigns? How will Accounting know when to expect payment?

Many companies are saddled with expensive and unwieldy information technology platforms that cannot adopt to innovation and change. Their information systems are

so complex and brittle that they act as constraints on business strategy and execution. Meeting new business and technology challenges may require redesigning the organisation and building a new information architecture and information technology infrastructure.

6.8.4 The Information Systems Investment Challenge

Too often managers look at their technological investments in terms of the cost of new hardware or software. They overlook the costs associated with the non-technical side of technology. Is productivity up or down? What is the cost of lost sales opportunities and lost customer confidence from a poorly managed E-Business Web site? How do you determine if your Management Information System is worth it?

A major problem raised by the development of powerful, inexpensive computers involves not technology but management and organisations. It's one thing to use information technology to design, produce, deliver and maintain new products. It's another thing to make money doing it. How can organisations obtain a sizeable payoff from their investments in information systems? How can management make sure that the management information systems contribute to corporate value?

6.8.5 The Responsibility and Control Challenge

Remember, humans should drive the technology, not the other way around. Too often we find it easier to blame the computer for messing up than to realize it's only doing what a human being told it to do. Your goal should be to integrate the technology into the world of people. Humans do control the technology, and as a manager, you shouldn't lose sight of that.

How can we define information systems that people can control and understand? Although information systems have provided enormous benefits and efficiencies, they have also created new problems and challenges of which managers should be aware.

The following table describes some of these problems and challenges.

Table 6.2: Positive and Negative Impacts of Information Systems

Benefits of Information Systems	Negative Impact
Information system can perform calculations or process paperwork much faster than people.	By automating activities that were previously performed by people, information systems may eliminate jobs
Information systems can help companies learn more about the purchase patterns and the preferences of the customers.	Information systems may allow organisations to collect personal details about people that violate their privacy
Information systems provide new efficiencies through services such as automated teller machines (ATMs), telephone systems, or computer controlled airplanes and air terminals	Information systems are used in so many aspects of everyday life that system outages can cause shutdowns of businesses or transportation services, paralyzing communities.
Information systems have made possible new medical advances in surgery, radiology, and patient monitoring	Heavy uses of information systems may suffer repetitive stress injury, technostress, and other health problems
The internet distributes information instantly to millions of people across the world.	The internet can be used to distribute illegal copies of software, books, articles, and other intellectual property.

Management's focus must continually change to take advantage of new opportunities. Changes should take place throughout the organization. They require lots of attention and planning for smooth execution.

6.9 ETHICAL AND SOCIETAL ISSUES OF INFORMATION SYSTEM

It probably goes without saying that the security and ethical issues raised by the Information Age and specifically the Internet are the most explosive to face our society in decades. It will be many years and many court battles before socially acceptable policies and practices are in place.

6.9.1 A Model for Thinking about Ethical, Social, and Political Issues

Many of these issues not only touch our society as a whole, but also raise lots of questions for organizations, companies, and the workplace in general. We hear arguments for free speech, personal responsibility, and corporate responsibility. There are discussions about the government's role in all this.

How you act, individually and as groups, in this gray area may well define the future of our society. Though that may sound a bit dramatic, you must understand that you are part of the development of "acceptable usage" of this new medium and will help define the direction in which it goes. That's no exaggeration: You use the Internet frequently (and be assured the frequency will increase), therefore you are....!

Five Moral Dimensions of the Information Age

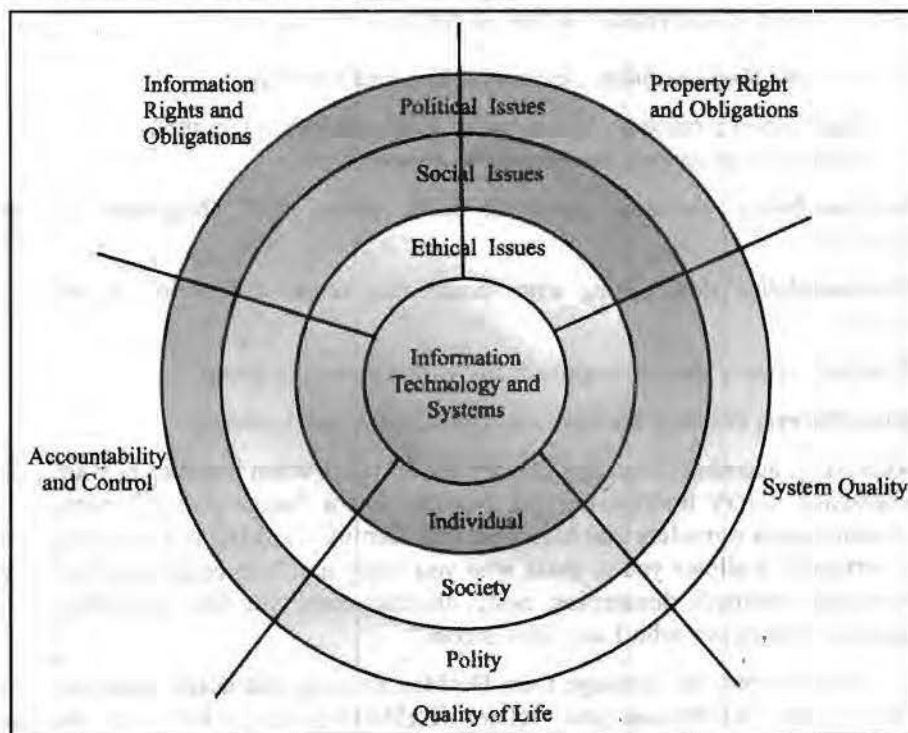


Figure 6.5: Ethical, Moral, Political Issues in an Information Society

This above figure 6.5 shows the relationship between ethical, social, and political issues in an information society. You could change this diagram somewhat to avoid the impression that the five dimensions are separate. You'd show significant overlap of each area, and most of the diagram would be in shades of gray. The five dimensions we'll discuss are: information rights and obligations, property rights, accountability and control, system quality, and the quality of life.

6.9.2 Key Technology Trends that Raise Ethical Issues

Information technologies pose problems and threats to established societal rules, and new advances pose new situations and possible threats to privacy and ethics. In

addition to the technologies in the book, you need to understand the most recent technological threats to your privacy in cyberspace:

You say to yourself, "Hey I don't really care. Nobody will ever care about what I do or where I go on the Internet." Well, you might want to think twice about that. There have been reported instances of companies accessing databases from various sources as part of the screening process to determine what chat rooms, Web sites, etc., prospective employees have visited. How can that be, you ask? The technological trends we discuss, such as advances in data storage, will give you one clue. The scenario at the beginning of this section about a personal profile is possible through the technique called datamining. It can and has been done, so you should be concerned and you should care.

6.9.3 Ethics in an Information Society

Did you ever hear the old warning, "Just because you can, doesn't mean you should?" Well, a lot of things are possible on the Internet nowadays, but that doesn't mean you should do them.

Ethics is easily managed in small groups because the group itself tends to control the individual's behavior. The larger the group, the harder it is to manage the actions of individuals. Now stretch that to a huge number of people with many frames of reference and experiences. Responsibility to the group becomes harder to police and accountability for an individual's actions is harder to enforce.

Basic Concepts: Responsibility, Accountability, and Liability

Every action causes a reaction. When you're using the Internet, computers on campus, or your employer's computer, you should be aware of:

- ***Responsibility:*** accepting potential costs, duties, and obligations for your decisions.
- ***Accountability:*** determining who should take responsibility for decisions and actions.
- ***Liability:*** legally placing responsibility with a person or group.
- ***Due Process:*** ensuring the laws are applied fairly and correctly.

Responsibility, accountability, and liability are all yours when it comes to your actions in cyberspace. Every Internet Service Provider has a "usage policy," even the so-called anonymous e-mailers that hide your real identity. HotMail is a popular Internet email service that allows you to mask who you really are. You could send out all the, shall we say, unethical, threatening, nasty, aberrant email you like. You think: "Hey, no one will really know who I am. This is cool."

And then here comes the message from HotMail to cease and desist. Your free email account is cancelled because you violated HotMail's usage policy. Then your local Internet Service Provider contacts you and tells you you're terminated, baby! You violated its usage policy by your actions. By now you're really mad, not to mention embarrassed (at least we hope so). It's true. It happens.

Just because you think you can, doesn't mean you should. Would you stand in the middle of campus and shout insults? As the text points out, "Using information technology in a socially responsible manner means that you can and will be held accountable for the consequences of your actions." Just as you are subject to rules, whether you like them or not, in public, you are subject to societal rules in cyberspace. Anonymity isn't a license for socially unacceptable behavior.

Some people seem to absolve themselves of responsibility by putting the blame on the computer - "Hey, the computer screwed up," or "Since it was an anonymous

username, I didn't think I'd get caught." It just doesn't work that way. No one can hide behind the technology. Humans control the computers, not the other way around.

And if you have received threatening, aberrant emails or flames in chatroom or discussion groups, and haven't reported them according to the usage policies, you may be as much a part of the problem as the perpetrator!

Ethical Analysis

It's safe to say you'll find yourself in situations where your ethics are challenged. What should you do? Try:

- Separating fact from fiction.
- Remembering, no matter how thin you slice it, there are always two sides.
- Determining who's really involved.
- Compromising; it doesn't always have to be an "either-or" outcome.
- Anticipating the outcome; it will help you devise better solutions.

Check Your Progress

1. The music industry is struggling with the issue of music downloaded from
2. The represents a supportive element that facilitates the transfer of information across organizational boundaries.
3. An may play an important role in the coordination of interdependent activities, which would be carried out by distant organizational units.

6.10 LET US SUM UP

Information Literacy is more than just clicking a mouse, pounding the computer keyboard, or surfing the Web. It's about integrating various elements of an organization, technical and non-technical, into a successful enterprise. As a successful manager you must concentrate on all the three parts of the Information Systems triangle (hardware, software, and liveware) and integrate them into a single, cohesive system that serves the needs of the organization, the wants of the customer, and the desires of the employees. The more complex, the harder to manage, but the greater the payoff. Managers will also be faced with ongoing problems of security and control. Information systems are so essential to business, government and daily life that organizations must take special steps to ensure that they are accurate, reliable and secure. A firm invites disaster if it uses systems that don't work as intended, that don't deliver information in a form that people can interpret correctly and use, or that have control rooms, where control don't work or where instruments give false signals. Information systems must be designed so that they function as intended and so that humans can control the process.

6.11 KEYWORDS

Information System: A collection of elements that capture data and convert it in information and disseminate to the decision-makers in an organization.

Information Technology: Hardware and software that perform data processing tasks, such as capturing, transmitting, storing, retrieving, manipulating or displaying data.

Input: Consists of data, instructions and involves capturing and assembling elements that enter the system to be processed.

Output Controls: Output controls are developed to ensure that information products are correct and complete and available to authorized users in a timely manner.

Information Superhighway: An advanced high-speed Internet-like network that connects individuals, households, businesses, government agencies, libraries, schools, universities, and other institutions with interactive voice, video, data, and multimedia communications.

Information Retrieval: The methods and procedures for recovering specific information from stored data.

Information Systems Planning: A formal planning process that develops plans for developing and managing information systems that will support the goals of the organization. This includes strategic, tactical, and operational planning activities.

IT Architecture: A conceptual design for the implementation of information technology in an organization, including its hardware, software, and network technology platforms, data resources, application portfolio, and IS organization.

6.12 QUESTIONS FOR DISCUSSION

1. Why are information systems essential in business today? Identify atleast two trends in the global business environment that have made information systems so important.
2. Evaluate the role of information systems in supporting various levels of business strategy. Why is there considerable resistance in organizations towards introduction of information systems?
3. How are information systems changing the management process? What specific managerial roles can information systems support?
4. How can information systems support an organisation's business operations, decision making by their managers and give them a competitive advantage? Identify examples within your organisation to illustrate your answer.
5. What are the key management challenges involved in building, operating and maintaining information systems today?
6. How we change our information system according to the competitive business environment?
7. How IT provides help in the design of organization?
8. What are the roles of information technology on the emergence of new organizational system?

Check Your Progress: Model Answer

1. Web sites
2. Information Technology (IT)
3. IOS

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