

Bachelor of Commerce

BCOM 104

COMPUTER APPLICATIONS IN BUSINESS



**Directorate of Distance Education
Guru Jambheshwar University of
Science & Technology
HISAR-125001**



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INTRODUCTION TO COMPUTER

Structure

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1.0 LEARNING OBJECTIVES

The main objective of this lesson is to introduce ‘computer’ to the students. After successful completion of the lesson the students will be able to:

- ✓ Understand the definition of computer
- ✓ Understand the characteristics computers
- ✓ Understand the capabilities as well as the limitations of computers.
- ✓ Understand about generations and classifications of computers

1.1 INTRODUCTION

Today, almost all of us in the world make use of computers in one way or the other. It finds applications in various fields of engineering, medicine, commercial, research and others. Not only in these sophisticated areas, but also in our daily lives, computers have become indispensable. They are present everywhere, in all the devices that we use daily like cars, games, washing machines, microwaves etc. and in day to day computations like banking, reservations, electronic mails, internet and many more.

The word computer is derived from the word compute. Compute means to calculate. The computer was originally defined as a super-fast calculator. It had the capacity to solve complex arithmetic and scientific problems at very high speed. But nowadays in addition to handling complex arithmetic computations, computers perform many other tasks like accepting, sorting, selecting, moving, comparing various types of information. They also perform arithmetic and logical operations on alphabetic, numeric and other types of information. This information provided by the user to the computer is data. The information in one form which is presented to the computer is the input information or input data.



Information in another form is presented by the computer after performing a process on it. This information is the output information or output data.

The terms hardware and software are almost always used in connection with the computer.

- **The Hardware:**

The hardware is the machinery itself. It is made up of the physical parts or devices of the computer system like the electronic Integrated Circuits (ICs), magnetic storage media and other mechanical devices like input devices, output devices etc. All this various hardware is linked together to form an effective functional unit. The various types of hardware used in the computers, has evolved from vacuum tubes of the first generation to Ultra Large Scale Integrated Circuits of the present generation.

- **The Software:**

The computer hardware itself is not capable of doing anything on its own. It has to be given explicit instructions to perform the specific task. The computer program is the one which controls the processing activities of the computer. The computer thus functions according to the instructions written in the program. Software mainly consists of these computer programs, procedures and other documentation used in the operation of a computer system. Software is a collection of programs which utilize and enhance the capability of the hardware.

1.2 WHAT IS A COMPUTER?

The word "computer" comes from the word 'compute', which means to calculate. So a computer is normally considered to be a calculating device. In fact, the original objective for inventing the computer was to create a fast calculating machine. But more than 90% of the work done by computers today is of non-mathematical or non-numerical nature. Hence, to define a computer merely as calculating device is to ignore over 90% of its work.

More accurately, a computer may be defined as a device that operates upon information or data. Data can be anything like bio-data of various applicants when the computer is used for recruiting personnel, or the marks obtained by various students in various subjects when the computer is used to prepare results, or the details (name, age, sex etc.) of various passengers when the computer is employed for making airline or railway reservations, or numbers of different types in case of application of computers



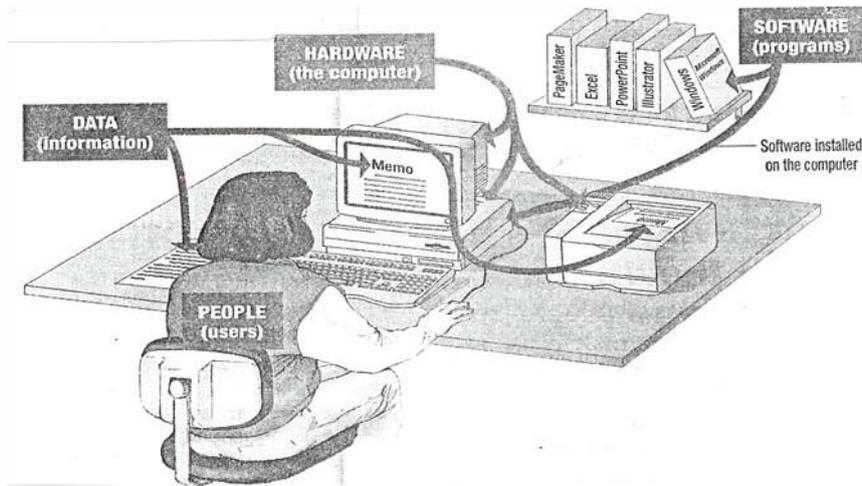
for scientific research problems, etc. Thus Computer can be defined as an electronic device for processing data that takes data input from its user, stores, processes data and generates the required output as per the processing instructions given to it by the user.

The fact that computers process data is so fundamental that many people have started calling it a data processor. The name data processor is more inclusive because modern computers not only compute in the usual sense but also perform other functions with the data that flow to and from them. For example, data processor may

- gather data from various sources;
- merge (process of mixing or putting together) them all;
- sort (process of arranging in some sequence-ascending or descending) them; and
- Print them in desired format.

Thus computers not only can add, subtract, multiply and divide numbers but can also do certain logical operations; can remember (i.e. store and recall information); can communicate with operators; can direct themselves in a predetermined manner; can process a large volume of data effortlessly; can interpret messages from remote locations. Computers undertake repetitive and boring tasks, relieving us for more critical, creative activities. Computers offer unmatched speed, performance, and accuracy in data processing. Computers work at constant efficiency and perform tasks repeatedly without errors, avoiding the fatigue, that affect human beings. Computers can be used in almost every field and for almost every purpose. Computers allow society to undertake new activities in various fields and to function more efficiently. Computers are impartial.

They offer a mean of data processing unaffected by social, religious or cultural bias and prejudice. Computers offer effective and efficient data storage and retrieval, highest degree of integrity and reliability.



Computers come in many varieties, including the personal computer, tiny computers built into appliances and automobiles, and mainframe machines used by many people simultaneously to run a business. Despite their differences in size and use, all these computers are part of a system. A complete computer system consists of four parts: hardware, software, people, and data as shown in above figure.

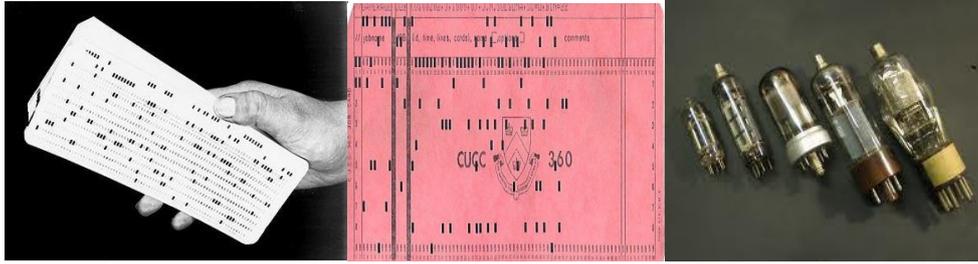
1.2.1 EVOLUTION OF COMPUTERS

The computers of today are vastly different in appearance and performance as compared to the computers of earlier days. But where did this technology come from and Where is it heading? To fully understand the impact of computers on today's world and the promises they hold for the future, it is important to understand the evolution of computers.

1.2.1.1 The First Generation

The first generation computers made use of:

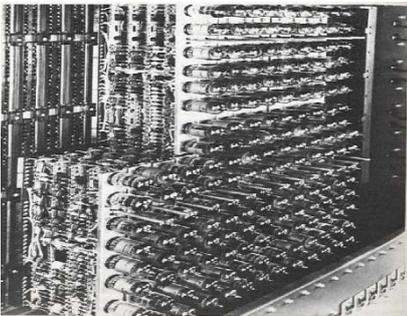
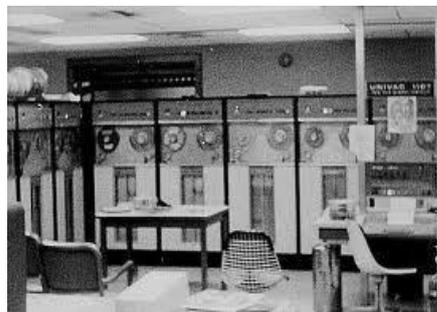
- Vacuum tube technology,
- Punched cards for data input,
- Punched cards and paper tape for output,
- Machine Language for writing programs,
- Magnetic tapes and drums for external storage.

*Punched cards**Paper tape**Vacuum tube*

The first Generation Computer technology

The computers of the first generation were very bulky and emitted large amount of heat which required air conditioning. They were large in size and cumbersome to handle. They had to be manually assembled and had limited commercial use. The concept of operating systems was not known at that time. Each computer had a different binary coded program called a machine language that told it how to operate.

The Abacus, which emerged about 5000 years ago in Asia Minor and is still in use today, allows users to make computations using a system of sliding beads arranged on a rack. Early merchants used Abacus to keep trading transactions.

*Abacus**Pascaline*

The first Generation Computers

Blaise Pascal, a French mathematician invented the first mechanical machine, a rectangular brass box, called Pascaline which could perform addition and subtraction on whole numbers. This was in the seventeenth century. Colmar, a Frenchman invented a machine that could perform the four basic arithmetic functions of addition, subtraction, multiplication and division. Colmar's mechanical



calculator, “Arithmometer”, presented a more practical approach to computing. With its enhanced versatility, the “Arithmometer” was widely used until the First World War, although later inventors refined Colmar’s calculator, together with fellow inventors, Pascal and Leibniz, he helped define the age of mechanical computation.

Charles Babbage a British mathematician at Cambridge University invented the first analytical engine or difference engine. This machine could be programmed by instructions coded on punch cards and had mechanical memory to store the results. For his contributions in this field Charles Babbage is known as ‘the father of modern digital computer.

Some of the early computers included:

Mark I –

This was the first fully automatic calculating machine. It was designed by Howard Aiken of Harvard University in collaboration with IBM. This machine was an electronic relay computer. Electromagnetic signals were used for the movement of mechanical parts. Mark I could perform the basic arithmetic and complex equations. Although this machine was extremely reliable, it was very slow (it took about 3-5 seconds per calculation) and was complex in design and large in size.





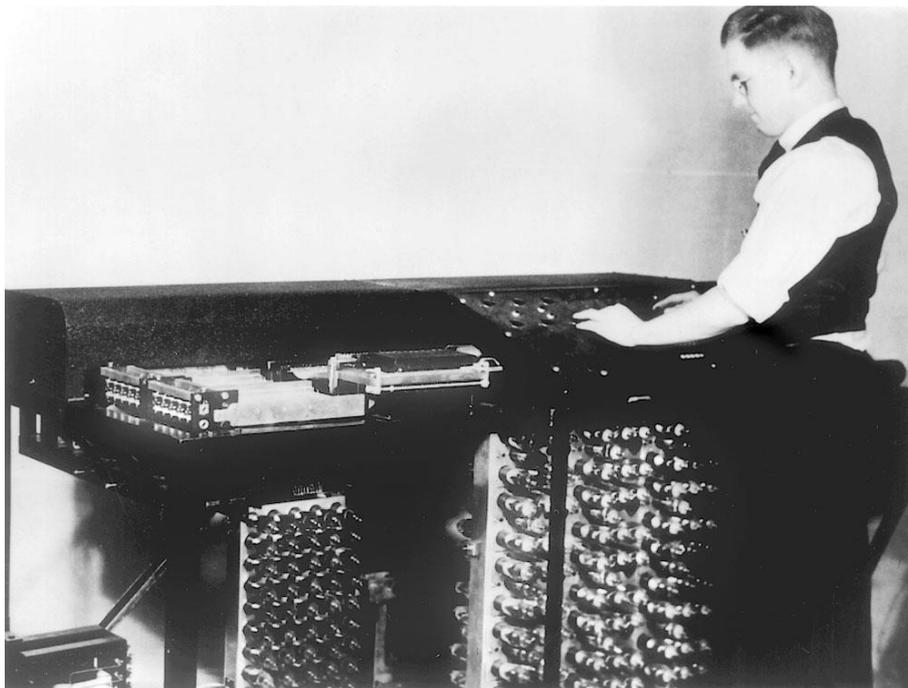
Fig.3 Mark-I Computer

Atanasoff-Berry Computer (ABC)

This computer developed by John Atanasoff and Clifford Berry was the world's first general purpose electronic digital computer. It made use of vacuum tubes for internal logic and capacitors for storage.

The machine was, however, the first to implement three critical ideas that are still part of every modern computer:

- Using binary digits to represent all numbers and data
- Performing all calculations using electronics rather than wheels, ratchets, or mechanical switches
- Organizing a system in which computation and memory are separated.



ABC Computer

The memory of the Atanasoff–Berry Computer was a system called regenerative capacitor memory, which consisted of a pair of drums, each containing 1600 capacitors that rotated on a common shaft once per second. The capacitors on each drum were organized into 32 "bands" of 50 (30 active bands and two spares in case a capacitor failed), giving the machine a speed of 30 additions/subtractions per

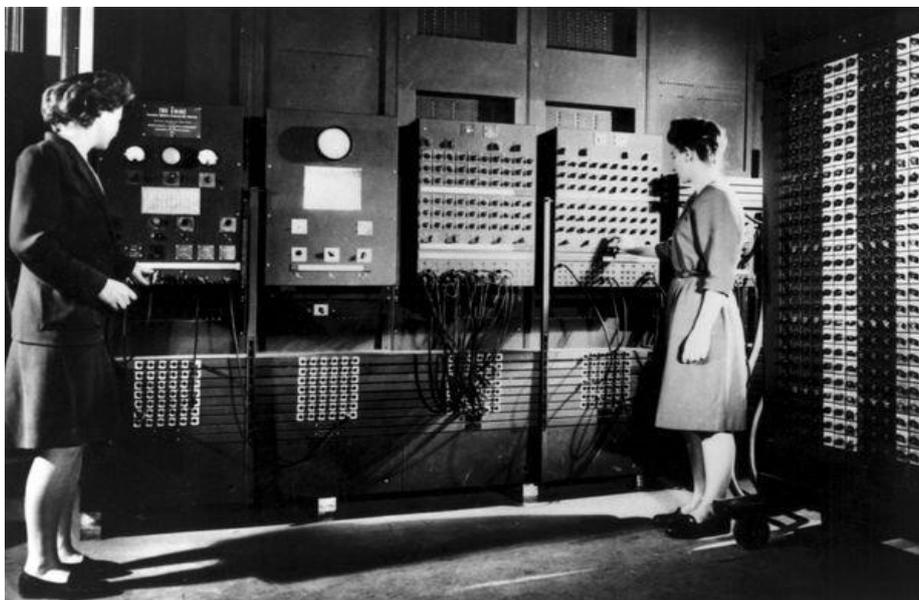


second. Data was represented as 50-bit binary fixed-point numbers. The electronics of the memory and arithmetic units could store and operate on 60 such numbers at a time (3000 bits).

ENIAC (Electronic Numeric Integrator and Calculator)

The first all-electronic computer was produced by a partnership between the US Government and the University of Pennsylvania. It was built using 18,000 vacuum tubes, 70,000 resistors and 1,500 relays and consumed 160 kilowatts of electrical power. The ENIAC computed at speed about thousand times faster than Mark I. However, it could store and manipulate only a limited amount of data. Program modifications and detecting errors were also difficult.

ENIAC was a modular computer, composed of individual panels to perform different functions. Twenty of these modules were accumulators that could not only add and subtract, but hold a ten-digit decimal number in memory. Numbers were passed between these units across several general-purpose buses (or trays, as they were called). In order to achieve its high speed, the panels had to send and receive numbers, compute, save the answer and trigger the next operation, all without any moving parts. Key to its versatility was the ability to branch; it could trigger different operations, depending on the sign of a computed result.



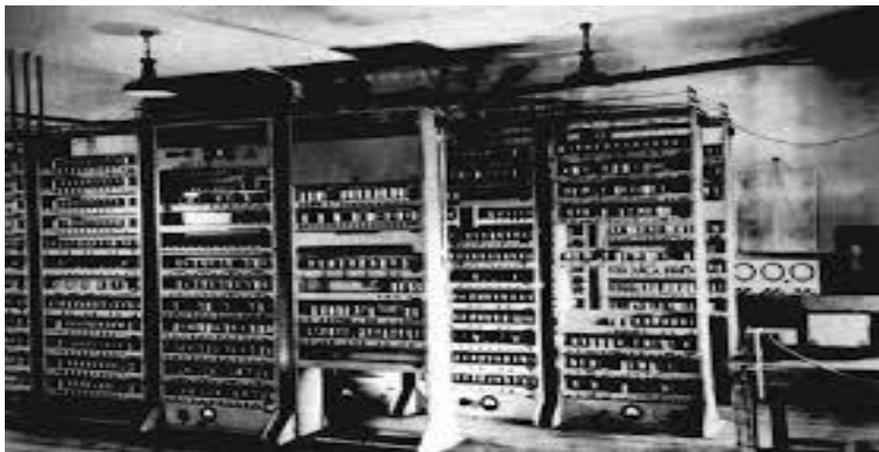
ENIAC Computer

EDVAC



In the mid 1940's Dr. John von Neumann designed the Electronic Discrete Variable Automatic Computer with a memory to store both program and data. This was the first machine which used the stored program concept. It had five distinct units - arithmetic, central control, memory, input and output. The key element was the central control. All the functions of the computer were co-ordinate through this single source, the central control. The programming of the computers was done in machine language.

Functionally, EDVAC was a binary serial computer with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory capacity of 1,000 34-bit words. EDVAC's average addition time was 864 microseconds and its average multiplication time was 2,900 microseconds.



EDVAC Computer

UNIVAC

Remington Rand designed this computer specifically for business data processing applications. On June 14, 1951, the U.S. Census Bureau dedicates UNIVAC, the world's first commercially produced electronic digital computer. UNIVAC, which stood for Universal Automatic Computer, was developed by J. Presper Eckert and John Mauchly, makers of ENIAC, the first general-purpose electronic digital computer. These giant computers, which used thousands of vacuum tubes for computation, were the forerunners of today's digital computers. UNIVAC and other first-generation computers were replaced



by transistor computers of the late 1950s, which were smaller, used less power, and could perform nearly a thousand times more operations per second.



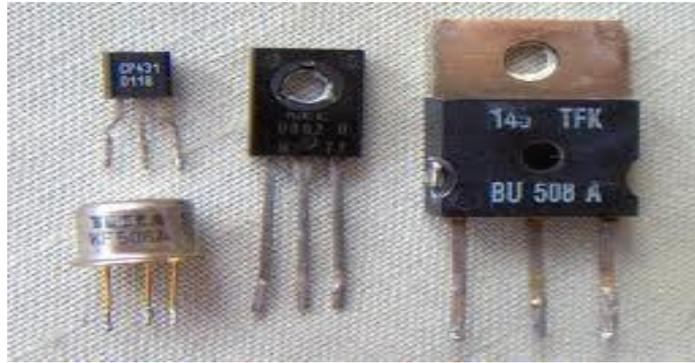
UNIVAC Computer

1.2.1.2 The Second Generation

In the second generation computers:

- Vacuum tube technology was replaced by transistorized technology,
- Size of the computers started reducing,
- Assembly language started being used in place of machine language,
- Concept of stored program emerged,
- High level languages were invented.

This was the generation of Transistorized Computers. Vacuum tubes were replaced by transistors. As a result, the size of the machines started shrinking. These computers were smaller, faster, more reliable and more energy efficient. The first transistorized computer was TX-0. The first large scale machines that took advantage of the transistor technology were the early supercomputers, Stretch by IBM and LARC by Sperry Rand. These machines were mainly developed for atomic energy laboratories. Typical computers of the second generation were the IBM 1400 and 7000 series, Honeywell 200 and General Electric.



Transistors

IBM 1401 was universally accepted throughout the industry and most large businesses routinely processed financial information using second generation computers. The machine language was replaced by assembly language. Thus the long and difficult binary code was replaced with abbreviated programming code which was relatively easy to understand.

The stored program concept and programming languages gave the computers flexibility to finally be cost effective and productive for business use. The stored program concept implied that the instructions to run a computer for a specific task were held inside the computer's memory and could quickly be modified or replaced by a different set of instructions for a different function. High level languages like COBOL, FORTRAN and ALGOL were developed. Computers started finding vast and varied applications. The entire software industry began with the second generation computers.

1.2.1.3. The Third Generation

The third generation computers were characterized by:

- Use of Integrated circuits,
- Phenomenal increase in computation speed,
- Substantial reduction in size and power consumption of the machines,
- Use of magnetic tapes and drums for external storage,
- Design-of Operating systems and new higher level languages,
- Commercial production of computers.

This generation was characterized by the invention of Integrated Circuits (ICs). The IC combined electronic components onto a small chip which was made from quartz.



Later, even more components were fitted onto a single chip, called a semiconductor. This reduced the size even further. The weight and power consumption of computers decreased and

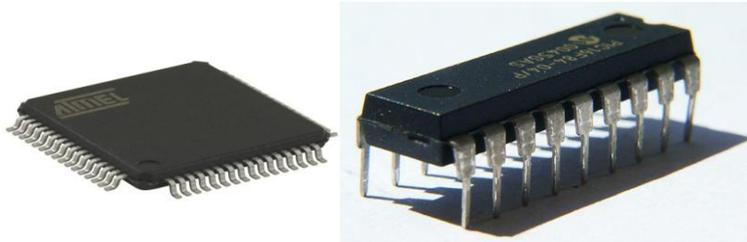


Fig. 1.9 Integrated Circuit

the speed increased tremendously. Heavy emphasis was given to the development of software. Operating systems were designed which allowed the machine to run many different programs at once. A central program monitored and co-ordinate the computer's memory. Multiprogramming was made possible, whereby the machine could perform several jobs at the same time. Computers achieved speeds of executing millions of instructions per second. Commercial production became easier and cheaper. Higher level languages like Pascal and Report Program Generator (RPG) were introduced and applications oriented languages like FORTRAN, COBOL, and PL/1 were developed.

1.2.1.4. The Fourth Generation

The general features of the fourth generation computers were:

- Use of Very Large Scale Integration,
- Invention of microcomputers,
- Introduction of Personal Computers,
- Networking,
- Fourth Generation Languages.

The third generation computers made use of 'Integrated Circuits that had 10- 20 components on each chip, this was Small Scale Integration (SSI).

The Fourth Generation realized Large Scale Integration (LSI) which could fit hundreds of components on one chip and Very Large Scale integration (VLSI) which squeezed thousands of components on one chip. The Intel 4004 chip, located all the components of a computer (central processing unit, memory,



input and output controls) on a single chip and microcomputers were introduced. Higher capacity storage media like magnetic disks were developed. Fourth generation languages emerged and applications software's started becoming popular.



Fig. 1.10 VLSI

Computer production became inexpensive and the era of Personal Computers (PCs) commenced. In 1981, IBM introduced its personal computer for use in office, home and schools. In direct competition, the Macintosh was introduced by Apple in 1984. Shared interactive systems and user friendly environments were the features of these computers.

As the computers started becoming more and more powerful, they could be linked together or networked to share not only data but also memory space and software. The networks could reach enormous proportions with local area networks. A global web of computer circuitry, the Internet, links the computers worldwide into a single network of information.

1.2.1.5 The Fifth Generation

Defining the fifth generation computers is somewhat difficult because the field is still in its infancy. The computers of tomorrow would be characterized by Artificial Intelligence (AI). An example of AI is



Expert Systems. Computers could be developed which could think and reason in much the same way as humans. Computers would be able to accept spoken words as input (voice recognition).

Many advances in the science of computer design and technology are coming together to enable the creation of fifth generation computers. Two such advances are parallel processing where many CPUs work as one and advance in superconductor technology which allows the flow of electricity with little or no resistance, greatly improving the speed of information flow.

1.2.2 CHARACTERISTICS OF A COMPUTER SYSTEM

Computers are not just adding machines; they are capable of doing complex activities and operations. They can be programmed to do complex, tedious and monotonous tasks. All computers have certain common characteristics irrespective of their type and size. The following are the important characteristics which taken together, enable a computer to surpass its performance in some tasks in which the human beings cannot perform efficiently:

1. Speed: A computer is a very fast device capable of data processing at unbelievable speed. It can perform in a few seconds the amount of work that a human being may not be able to do in an entire year even if he works day and night and does nothing else. Computers can process millions of instructions per second thus carrying out even the complex tasks in fractions of seconds without any mistake.

While talking about the speed of a computer, we do not talk in terms of seconds or even milliseconds (10⁻³). Our units of speed are the microseconds (10⁻⁶), the nanoseconds (10⁻⁹), and even the picoseconds (10⁻¹²). A powerful computer is capable of performing about 3 to 4 million simple arithmetic operations per second.

2. Accuracy: In addition to speed, the computer has high accuracy in computing. The accuracy of a computer is consistently high and the degree of accuracy of a particular computer depends upon its design. But for a particular computer, each and every calculation is performed with the same accuracy. Errors can occur in a computer, but these are mainly due to human rather than technological weakness. The errors in computer are due to errors in programming and operation by human and due to inaccurate data.



3. Versatility: A computer is a very versatile machine. Versatility is one of the most wonderful features of the computer in the sense that they are not only capable of handling complex arithmetical problems, but can do equally well other number of jobs. They can perform activities ranging from simple calculations to performing complex CAD modeling and simulations to navigating missiles and satellites. In other words, computers can be programmed to perform any task that can be reduced to a series of logical steps. Computers can communicate with other computers and can receive and send data in various forms like text, sound, video, graphics, etc. We, now, live in a connected world and all this is because of computers and other related technologies.

4. Diligency: Unlike human beings, a computer is free from monotony, tiredness, lack of concentration etc. and hence can work for hours together without creating any error and without grumbling. Due to this property computer obviously score over human beings in doing routine type of jobs, which require greater accuracy. They will perform the tasks that are given to them - irrespective of whether it is interesting, creative, monotonous or boring; irrespective of whether it is the first time or the millionth time - with exactly the same accuracy and speed.

5. Storage Capability: Computers have their main memory and auxiliary memory systems. A computer can store a large amount of data. With more and more auxiliary storage devices, which are capable of storing huge amounts of data, the storage capacity of a computer is virtually unlimited. The factor that makes computer storage unique is not that it can store vast amount of data, but the fact that it can retrieve the information that the user wants in a few seconds. Every piece of information can be retained as long as desired by the user and can be recalled as and when required. Even after several years, the information recalled is as accurate as on the day when it was fed to computer. A computer forgets or loses certain information only when it is asked to do so. So it is entirely up to the user to make a computer retain or forget particular information.

6. Reliability: Reliability of the computers is indeed very high. Modern electronic components have long failure free lives. A microprocessor chip is said to have a life of 40 years even under adverse conditions and much before it fails, it will become obsolete. Computers are also designed in modular form so as to make maintenance easy; when a component fails, it can be replaced or repaired at a minimal cost.



7. Automation: The level of automation achieved in a computer is phenomenal. It is not a simple calculator where you have to punch in the numbers and press the equal to sign to get the result. Once a task is initiated, computers can proceed on its own till its completion. Computers can be programmed to perform a series of complex tasks involving multiple programs. Computers will perform these things flawlessly. They will execute the programs in the correct sequence, they will switch on/off the machines at the appropriate time, they will monitor the operational parameters, and they will send warning signals or take corrective actions if the parameters exceed the control level, and so on. Computers are capable of these levels of automation, provided they are programmed correctly.

1.2.3 CAPABILITIES OF COMPUTERS

Stepping down from the domains of technical people such as scientists and engineers; computer, today, is a very familiar household word. In 1950's computers were special purpose machines, which only huge institutions such as governments and universities could afford. In the 1960's modern computer began to revolutionize the business world and today it has become popular with all kinds of people from business to employees, from doctors to lawyers and from players to school going children. Today, computers are directly or indirectly influencing every aspect of our lives. Wherever human intellect and technology meet, we will find computers. Computers of all sizes and shapes are used for every purpose imaginable - from selling railway tickets to running washing machines; from stock market analysis to playing games; from publishing a new letter to designing a building... They can perform activities ranging from simple calculations to performing complex CAD modeling and simulations to navigating missiles and satellites. Computers can communicate with other computers and can receive and send data in various forms like text, sound, video, graphics, etc. This ability of computer to communicate to one another has led to the development of computer networks, Internet, WWW and so on. Today, we can send e-mail to people all around the world. We, now, live in a connected world and all this is because of computers and other related technologies.



Uses of Computers

Application Area	Use of Computers
Scientific Research	Used to resolve complex scientific problems accurately in a short time
Business	Used in banks, airports, share markets, hotels, export houses, Government offices and others for rising business applications like MIS, Payroll, Inventory, Financial Accounting etc.
Defense	Used to computerize warplanes, ships, radars and many advanced weapons
Space	Used to design computerized space satellites, rockets and related technology
Data Communication	Used to computerize geo-graphically separated offices through networking
Telecommunication	Used in ISDN, E-mail, Internet, Intranet, VSAT, Videoconferencing, Paging, Cellular phones etc.
Medicine	Used in hospitals and nursing homes/clinics for maintaining medical records, prescription writing, diagnostic applications and computerized scanning(CAT Scanning)
Education	Used in development of CBT (Computer Based Teaching)/CAT (Computer Aided Teaching) programs for education
Law & Order	Used to records data of vehicles
Libraries	Used to develop Library Management Systems
Publishers	Used for Desk Top Publishing (DTP) for designing & printing of books
Engineering	Used CAD (Computer Aided Designing)/CAM (Computer Aided Manufacturing) by engineering companies
Emerging Technologies	Used in Artificial Intelligence (Expert Systems, Robotics etc.) and Virtual Reality

During the last four decades, computers have revolutionized almost all disciplines of our life. Computers have made possible many scientific, industrial and commercial advances that would have been impossible otherwise. Computers are being used in many areas of application viz. business, industry, scientific research, defense, space, communications, medicine, education and so on. The utilization of computers in different fields is summarized in above Table.



1.2.3.1 COMPUTERS IN BUSINESS

Computers have completely altered the structure of business. They are reshaping the basics of business. Customer service, operations, product and marketing strategies, and distribution are heavily, or sometimes even entirely, dependent on computer-enabled applications. The computers that support these functions can be found on the desk, on the shop floor, in the store, even in briefcases. Computers have become an everyday part of business life.

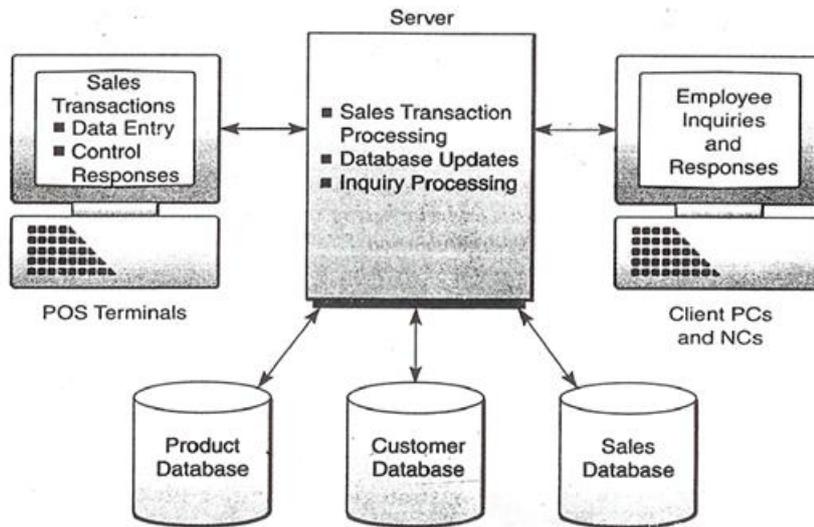
Figure below, illustrates the fundamental roles of computers in business. Computer systems perform three vital roles in any type of organization:

- Support of Business Operations
- Support of Managerial Decision-Making
- Support of Strategic Competitive Advantage



Three Major Roles of Computer-based Information Systems

Let's take a retail store as an example to illustrate these important roles. As a consumer, we have to deal regularly with the computer-based information systems that support business operations at many retail stores where we shop. For example, most retail stores now use computer-based information systems to help them record customer purchases, keep track of inventory, pay employees, buy new merchandise, and evaluate sales trends. Store operations would grind to a halt without the support of such information systems. See Figure below,



A Computer-based Sales Processing | System that supports Sales Transaction Processing, Employee Inquiries and Responses, and the Access and Updating of Business Databases

Computer-based information systems also help store managers make better decisions and attempt to gain a strategic competitive advantage. For example, decisions on what lines of merchandise need to be added or discontinued, or on what kind of investment they require, are typically made after an analysis provided by computer-based information systems. This not only supports the decision making of store managers but also helps them look for ways to gain an advantage over other retailers in the competition for customers. Gaining a strategic advantage over competitors requires innovative use of computers and information technology. For example, store managers might make a decision to install computerized touch-screen catalog ordering systems in all of their stores, tied in with computer-based telephone ordering systems and an Internet-based computer shopping network. This might attract new customers and lure customers away from competing stores because of the ease of ordering provided by such innovative information systems. Thus, computer-based strategic information systems can help provide strategic products and services that give a business organization competitive advantage over its competitors.



1.2.4 LIMITATIONS OF COMPUTERS

There is no doubt that computers surpass human being in many aspects and can perform certain tasks better, faster and cheaper. But it cannot substitute man. The words of John F Kennedy are also 100% true "*Man is still the most extraordinary Computers of all*". The Computer, being an electronic device, has certain limitations, which can be summarized as follow:

1. **No IQ:** A computer is not a magical device. It can only perform tasks that a human being can. The difference is that it performs these tasks with unthinkable speed and accuracy. It possesses no intelligence of its own. Its IQ is zero, at least till today. Hence, only the user can determine what tasks a computer will perform. A computer cannot take its own decision in this regard. Unlike the human brain, a computer cannot think on its own, but has to be given very explicit, step-by-step instructions to make it perform a task.
2. **No Feelings:** Computers are devoid of emotions. They have no feelings and no instincts because they are machine. Although men have succeeded in building a memory for the computer, but no computer possesses the equivalent of human heart and soul. Based on our feelings, taste, knowledge, and experience, we often make certain judgments in our day-to-day life. But computers cannot make such judgments on their own. Their judgments are based on the instructions given to them in the form of programs that are written by us. They are only as good as man makes and uses them. They do not learn from experiences.

It is said for computers, "Garbage In Garbage Out (GIGO)". Many of the problems with computers occur because the computer can't tell the difference between doing something sensible versus something ridiculous. Erasing all its stored data is no different to a computer from adding two numbers. Computers operate logically, but they are incapable of acting prudently and rationally.

Thus a computer is not intelligent: it is a fast, rule-following idiot. Fast because it works at electronic speeds; rule-following because it needs to be given very detailed and complete instructions before it can do even the simplest task; and an idiot because it will unhesitatingly follow instructions even when to us it would be obvious that they were nonsense.



1.2.5 CLASSIFICATION OF COMPUTERS

We can categorize computer by two ways:

- Data handling capabilities and
- Size

On the basis of data handling capabilities, the computer is of three types:

- Analogue Computer
- Digital Computer
- Hybrid Computer

1) Analogue Computer

Analogue computers are designed to process the analogue data. Analogue data is continuous data that changes continuously and cannot have discrete values such as speed, temperature, pressure and current. The analogue computers measure the continuous changes in physical quantity and generally render output as a reading on a dial or scale. Analogue computers directly accept the data from the measuring device without first converting it into numbers and codes.

Speedometer and mercury thermometer are examples of analogue computers.

2) Digital Computer

Digital computer is designed to perform calculations and logical operations at high speed. It accepts the raw data as digits or numbers and processes it with programs stored in its memory to produce output. All modern computers like laptops and desktops that we use at home or office are digital computers.

3) Hybrid Computer

Hybrid computer has features of both analogue and digital computers. It is fast like analogue computer and has memory and accuracy like digital computers. It can process both continuous and discrete data. So it is widely used in specialized applications where both analogue and digital data is processed. For example, a processor is used in petrol pumps that converts the measurements of fuel flow into quantity and price.

On the basis of size, the computer can be of five types:



- Supercomputer
- Mainframe Computer
- Miniframe Computer
- Workstation
- Microcomputer

1) Supercomputer

Supercomputers are the biggest and fastest computers. They are designed to process huge amount of data. A supercomputer can process trillions of instructions in a second. It has thousands of interconnected processors. Supercomputers are particularly used in scientific and engineering applications such as weather forecasting, scientific simulations and nuclear energy research. First supercomputer was developed by Roger Cray in 1976.

2) Mainframe computer

Mainframe computers are designed to support hundreds or thousands of users simultaneously. They can support multiple programs at the same time. It means they can execute different processes simultaneously. These features of mainframe computers make them ideal for big organizations like banking and telecom sectors, which need to manage and process high volume of data.

3) Miniframe computer

It is a midsize multiprocessing computer. It consists of two or more processors and can support 4 to 200 users at one time. Miniframe computers are used in institutes and departments for the tasks such as billing, accounting and inventory management.

4) Workstation

Workstation is a single user computer that is designed for technical or scientific applications. It has faster microprocessor, large amount of RAM and high speed graphic adapters. It generally performs a specific job with great expertise; accordingly, they are of different types such as graphics workstation, music workstation and engineering design workstation.



5) *Microcomputer*

Microcomputer is also known as personal computer. It is a general purpose computer that is designed for individual use. It has a microprocessor as a central processing unit, memory, storage area, input unit and output unit. Laptops and desktop computers are examples of microcomputers.

1.3 CARRIERS IN COMPUTER

Computers are growing in popularity very rapidly. Computers are running almost everything we can of think: from organizing records to directing traffic. The Information Technology (IT) industry is growing at an incredible rate. The impact of computers on our everyday lives is monumental, though taken for granted. Every time we make a bank deposit, purchase items on a credit card, pay an insurance premium or rent a video movie, innumerable computer operations are involved. Making all these operations happen, behind the scenes, is the work of a vast array of professionals: computer programmers, programmer analysts, systems analysts, hardware and software engineers, database managers, *etc.* As our society becomes more computerized and technologically sophisticated, the need for highly skilled computer professionals increases accordingly.

1.3.1 Career Options

The computer technology industry on the whole encompasses many fields of professional involvement and advancement. In broad terms, here are some of the career options that one can consider

1. Computer Science Jobs

Computer scientists are involved in designing computer systems and in researching ways to enhance the practical applications of such designs. Computer scientists address highly theoretical and complex problems associated with making new technology beneficial to all segments of society: academia, the military, civilian businesses, end-user consumers, *etc.* Included in this group of computer scientists are computer engineers, database administrators, computer support analysts, and other technically specialized professionals.

2. Systems Development Jobs

People working in this field analyze the informational needs within an organization and the ways by which various computer systems should properly relate to each other to enhance the overall operation of



the organization. Systems analysts ensure that the functional areas of the organization - accounting, marketing, sales *etc.*- communicate properly with each other. To accomplish this task, systems analysts study and modify the capabilities of the computer hardware and software to meet the changing demands of an evolving organization.

3. EDP Auditor Jobs

This is a challenging career option for professionals who have keen interests and skills in computers as well as in accounting and finance. The fundamental goal of EDP (Electronic Data Processing) auditing is to ensure the accuracy, efficiency, and integrity of a company's computer system, which is at the heart of all its business operations. EDP auditors are concerned, in part, with the accuracy of computer input and output as this accuracy relates to the possibility of financial impropriety, security leaks, or fraud. Along with knowledge of computer systems, programming languages, and various applications, EDP auditors need a good understanding of business and financial management. In fact, many EDP auditors hold MBA degrees and/or CA certification.

4. Consulting Jobs

One who aspires to become computer consultant can follow a number of career paths. Some computer consultants are motivated by strong entrepreneurial instincts. With several years of industry experience, they choose the route of freelance consulting, often as stepping-stones for starting their own companies to carve their niches in the computer market. Talented young professionals may also consider a career with combined-practice companies, such as the prestigious consulting firms, or with major hardware/software suppliers, or with international consulting firms that offer computer consulting as part of turnkey business services. Other rewarding computer careers include sales/marketing support, technical writing and instruction, quality assurance, network engineering, management information systems, and so forth.

5. Teaching Jobs

One can make career in computer teaching at both under graduate and post graduate levels.

1.3.2 Computers in Non-IT Professions

Even if we are not interested in becoming a computer professional, it is a must that we have basic



knowledge of computers and the commonly used applications. It is imperative that we become a computer savvy professional-a person who can use computers with ease to perform routine tasks like composing a letter or memo, send and receive e-mail, surf the Internet, make computer presentations, etc. Because in today's information age- where computers hold the center stage - computer proficiency is a must for our survival and success.

The workers and professionals of the world will soon be divided into two distinct groups: those who will control computers and those who will be controlled by computers. It would be best for you to be in the former group.

1.4 CHECK YOUR PROGRESS

A. Fill in the blanks:

1. A computer is made up of two components- one is _____ and other is _____.
2. _____ computers incorporate the technology of both analog and digital computers.
3. All physical components of computer are part of the_____.
4. The smallest unit of data in computer is _____.
5. The fastest and most expensive computers are_____

B. State whether the following statements are True or False:

1. A hybrid computer is the one having combined properties of analog and digital computer.
2. Charles Babbage is the father of computer.
3. Minicomputer works faster than micro-computers.
4. UNIVAC is universal array computer.
5. Fourth generation computers are based on VLSI.



1.5 SUMMARY

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 microcomputer.

1.6 KEYWORDS

Computer: an electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program.

Supercomputer: is a computer with a high level of performance as compared to a general-purpose computer. The performance of a supercomputer is commonly measured in floating-point operations per second (FLOPS) instead of million instructions per second (MIPS).

Minicomputer: Mini-Computer that is smaller, less expensive, and less powerful than a mainframe or supercomputer.

Mainframe computers or mainframes: are computers used primarily by large organizations for critical applications; bulk data processing, such as census, industry and consumer statistics, enterprise resource planning; and transaction processing.

PDA: Personal digital assistant, also known as a handheld PC, is a variety mobile device which functions as a personal information manager.

1.7 SELF-ASSESSMENT TEST

- 1 What are the motivating factors behind the development of computers?
- 2 Explain some of the important characteristics of computers.



- 3 Write a short note on “Capabilities of Computers”. How the field of business is affected by the capabilities of computers?
- 4 Explain the limitations of computers.
- 5 What is a computer? Why is it known as data processor?
- 6 Explain the generations of computer.
- 7 Discuss the classification of computers.

1.8 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress A

1. Software, Hardware
2. Hybrid
3. Hardware
4. Bit
5. Supercomputers

Check your Progress B

1. True
2. True
3. True
4. False
5. True

1.9 REFERENCES/SUGGESTED READINGS

- ❖ Peter C. Jurs, *Computer Software Applications in Chemistry*; Wiley-IEEE.
- ❖ Manoj Kumar, M. Shamir Bhudookan, *Information Technology for ‘O’ Level*, Editions De L’Ocean Indien.
- ❖ *Fundamentals of Computers* by V Raja Raman. Prentice Hall of India Pvt. Ltd., New Delhi.
- ❖ *Computer Fundamentals* by P K Sinha. BPB Publications., New Delhi.
- ❖ *Computer Fundamentals* by B Ram. New Age International.



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Computer Components and Peripheral Devices

Structure

- 2.0 Learning Objectives
- 2.1 Introduction
 - 2.1.1 Components of a computer system
 - 2.1.2 Input/output devices
 - 2.1.3 What is port?
 - 2.1.3.1 Parallel port
 - 2.1.3.2 Serial port
 - 2.1.3.3 Universal serial bus (USB)
 - 2.1.3.4 Small computer system interface (SCSI)
- 2.2 Input Devices
- 2.3 Output devices
- 2.4 Check Your Progress
- 2.5 Summary
- 2.6 Keywords
- 2.7 Self-Assessment Questions
- 2.8 Answers to Check Your Progress
- 2.9 References/Suggested Readings



2.0 LEARNING OBJECTIVES

After studying this lesson, you should be able to understand:

- ✓ Components of a Computer System
- ✓ The basic concepts of input/output devices
- ✓ Functions of input/output devices
- ✓ Types of input/output devices
- ✓ Types of Ports

2.1 INTRODUCTION

In this lesson we shall discuss about components of a computer system and discuss something about input/output devices and their functions. Input/output devices constitute a major part of a computer system. These are also called peripheral devices. Without I/O devices, a user cannot communicate with the computer. They are required to enter data and instructions in a computer so that the computer can process that data and provide the result to the user through output devices. In computer, inputs are the signals and data received by the system and outputs are the signals and data which are generated from the system.

First we will discuss about components of a computer system in detail. Then input/output devices and then move on to the function and structure of input and output devices. And finally, we will discuss about recent trends in input devices such as digital camera, barcode reader, magnetic ink character recognition and magnetic stripe reader such as ATM machines and Electronic Point of Sale (EPOS).

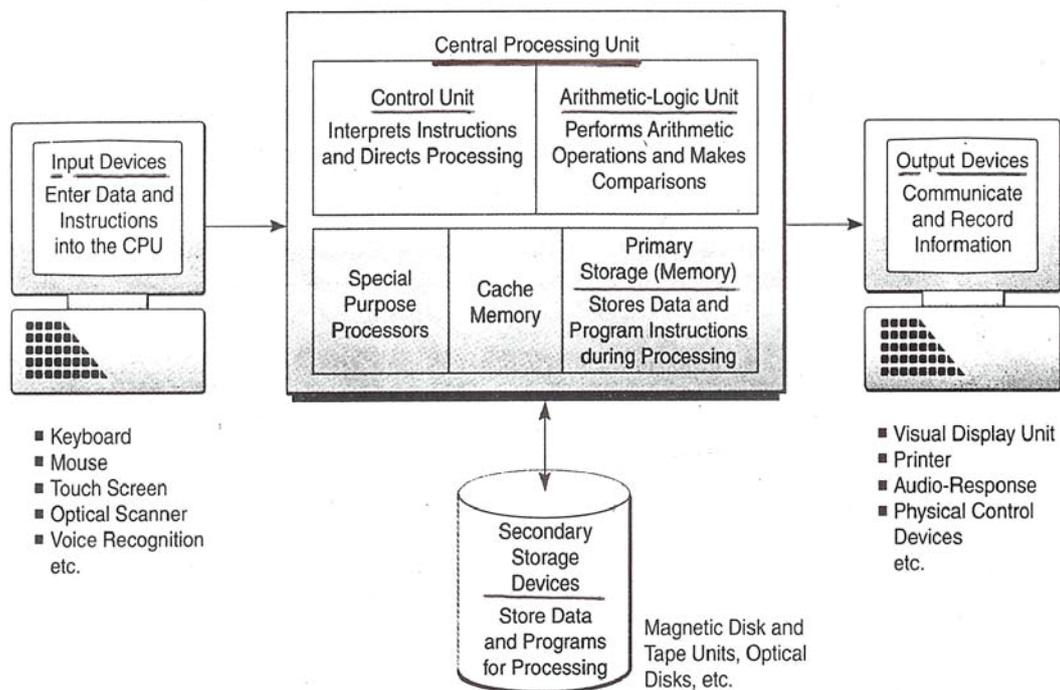
2.1.1 COMPONENTS OF A COMPUTER SYSTEM

The capacity, size, cost and internal architectural design of computers differ from one model to another. However, the basic organization remains the same for all computer systems. A block diagram is shown in fig. below, which displays the basic building blocks or functional units, of a digital computer system. These units correspond to the basic operations performed by all computer systems. The function of each of these units is described below.



2.1.1.1 Input Unit

Data and instructions must enter the computer system before any computation can be performed on the supplied data. The input unit that links the external environment with the computer system performs this task. Data and instructions enter input units in forms that depend upon the particular device used. For example, data is entered from a keyboard in a manner similar to typing, and this differs from the way in which data is entered through a card reader which is another type of input device. However, regardless of the form in which they receive their inputs, all input devices must provide a computer with data that are transformed into the binary codes that the primary memory of a computer is designed to accept. This transformation is accomplished by units called input interfaces. Input interfaces are designed to match the unique physical or electrical characteristics of input devices to the requirements of the computer system.



Components of a Computer System

In short, an input unit performs the following functions:

- It accepts (or reads) the list of instructions and data from the outside world.
- It converts these instructions and data in the computer acceptable form.



- It supplies the converted instructions and data to the complete system for further processing.

2.1.1.2 Output Unit

The job of an output unit is just the reverse of that of an input unit. It supplies information and results of computation to the outside world. Thus, it links the computer with the external environment. As computers work with binary code, the results produced are also in the binary form. Hence, before supplying the results to the outside world, it must be converted to human acceptable (readable) form. This task is accomplished by units call output interfaces. Output interfaces are designed to match the unique physical or electrical characteristics of output devices (terminals, printers, etc.) to the requirements of the external environmental.

In short, an output unit performs the following functions:

- It accepts the results produced by the computer, which are in coded form and hence cannot be easily understood by us.
- It converts these coded results to human acceptable (readable) form.
- It supplies the converted results to the outside world.

2.1.1.3 Storage Unit

The data and instructions that are entered into the computer system through input units have to be stored inside the computer before the actual processing starts. Similarly, the results produced by the computer after processing must also be kept somewhere inside the computer system before being passed on to the output units. Moreover, the intermediate results produced by the computer must also be preserved for ongoing processing.

The storage unit at the primary/main storage of a computer system is designed to cater to all these needs. It provides space for storing data and instructions; space for intermediate results; and also space for the final results.

In short the specific functions of the storage unit are to hold (store):

- All the data to be processed and the instructions required for processing (received from input devices).
- Intermediate results of processing.



- Final results of processing before these results are released to an output device.

Two Kinds of Memory

The main memory, housed inside the computer unit, is built from two different kinds of memory chip: the first kind, called ROM (read only memory), has permanently built into information and instructions the computer needs to know in order to operate properly; the second kind of memory, called RAM (random access memory), holds the program and other information typed in at the keyboard.

The RAM is a 'read and write' memory. This means we can store, or 'write', information into this memory and later recall it, or 'read' it out again. The ROM, on the other hand, can only be read; we cannot write information into it. This ensures that we do not destroy

the vital information held in ROM by over-writing it.

An important difference between the two types of memory is that RAM is 'volatile', i.e. it loses all the information stored when the power is switched off. ROM, on the other hand, is 'non-volatile'; its information is not lost when the power is switched off.

The secondary storage medium stores data, instructions and output for archival purpose so that whenever any data or instructions is required in the future it can be retrieved for reference or for further processing.

2.1.1.4 Central Processing Unit

The Arithmetic Logic Unit and the Control Unit of a computer system are jointly known as the Central Processing Unit (CPU). The CPU is the brain of any computer system. In a human body, the brain takes all major decisions and the other parts of the body function as directed by the brain. Similarly, in a computer system, all major calculations and comparisons are made inside the CPU and the CPU is also responsible for activating and controlling the operations of other units of a computer system.

2.1.1.5 Arithmetic Logic Unit

The Arithmetic Logic Unit (ALU) of a computer system is the place where the actual execution of the instructions takes place during the processing operation. To be more precise all calculations are performed and all comparisons (decisions) are made in the ALU. The data and instructions stored in the primary storage prior to processing, are transferred as and when needed to the ALU where processing



takes place. No processing is done in the primary storage unit. Intermediate results generated in the ALU are temporarily transferred back to the primary storage until needed at a later time. Data may, thus, move from primary storage to ALU and back again to storage many times before the processing is over. After the completion of processing the final results, which are stored in the storage unit, are released to an output device.

The type and number of arithmetic and logic operations that a computer can perform is determined by the engineering design of the ALU. However almost all ALU's are designed to perform the four basic arithmetic operations (add, subtract, multiply, divide) and logic operations or comparisons such as less than, equal to, or greater than.

2.1.1.6 Control Unit

How does the input device know that it is time for it to feed data into the storage unit? How does the ALU know what should be done with the data once they are received? And how is it that only the final results are sent to the output device and not the intermediate result? All this is possible because of the Control Unit of the computer system. By selecting, interpreting, and seeing to the execution of the program instructions, the Control Unit is able to maintain order and direct the operation of the entire system. Although, it does not perform any actual processing on the data, the Control Unit acts as a central nervous system for the other components of the computer. It manages and coordinates the entire computer system. It obtains instructions from the program stored in main memory, interprets the instructions, and issues signals that cause other units of the system to execute them.

2.1.2 INPUT/OUTPUT DEVICES

The computer will be of no use if it is not communicating with the external world. Thus, a computer must have a system to receive information from the outside world and must be able to communicate results to the external world. Thus, a computer consists of input/output devices. Input and output devices can also be written as I/O devices.

Input and output devices of a computer system are the devices that connect you to computer. Input devices let you to transfer data and user command into the computer system. I/O devices are used to interact with the computer system. For example, you can type in data by using a keyboard, or you can input data in picture form by using a scanner in computer system.



On the other hand, output devices display the result of input data or signals after processing it. Examples of these could be your computer's monitor, which displays all the programs which are running on the computer, as well as the printer, which will print out a hard copy of the information which is saved in your computer.

Input and output devices allow the computer system to interact with the outside world by moving data into and out of the computer system.

Examples of some input devices are:

- Keyboard
- Mouse
- Joystick
- Bar code reader
- Graphics tablet
- Pen drive
- CD/DVD
- Digital Camera

An output device is used to send data out of the system. The user sees the result after processing of data by the computer through output devices. Examples of some output devices are:

- Monitor
- Printer
- Plotter
- Speaker

Input and output devices are also called I/O devices. They are directly connected to an electronic module called I/O module or device controller. For example, the speakers of a multimedia computer system are directly connected to a device controller called an audio card, which in turn is connected to the rest of the system. Input and output devices are similar in operation but perform opposite functions. It is through the use of these devices that the computer is able to communicate with the outside world.

Input data for the computer system could be in any of the following forms:



- Manual inputs from a keyboard or console.
- Analog inputs from instruments or sensors.
- Inputs from a storage device, such as pen-drive, CD's and Floppy Drives.

The speed of a processor is far more than the input devices, such as the keyboard of computer system. Computer systems can process hundreds or thousands of computer words or characters per second. Thus, a study of the first method, i.e. manual input reflects the inability of human-operated keyboards or keypunches to supply data at a speed that matches the speed of digital computers.

2.1.3 WHAT IS PORT?

Port is a connecting socket, outside the system into which different types of cables are plugged. It is a specific place from which other devices can be physically connected. I/O ports are the interfaces through which computers communicate with external devices such as printers, modems, joysticks and terminals. There are many types of ports used in computer system. Some of them are given as follows.

2.1.3.1 Parallel Port

Various peripherals can be connected through parallel port, which is a parallel communication physical interface. A parallel port transmits 8 bits of a byte of data in parallel. It is used for transmitting fast data over short distances. It is used to connect a printer to a computer. Since a parallel port transmits an entire byte at a time, it operates I/O devices at a relatively high speed. A Parallel port is primarily used to connect printers to a computer and hence it is often called a printer port.



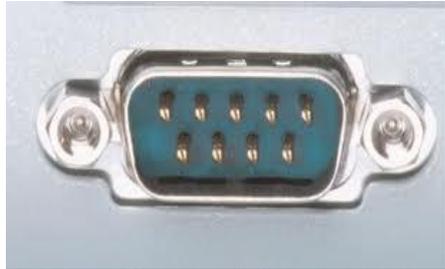
Parallel Port

2.1.3.2 Serial Port

Serial port transmits one bit of a byte, one at a time as a single stream of bits. It is meant for transmitting slow data over long distances. Communication over a phone is an example of serial communication. It is a serial communication physical interface which transmits one bit at a time. Dial-



up modems and serial mice use serial ports.



Serial Port

2.1.3.3 Universal Serial Bus (USB)

A USB Port can connect up to 127 peripheral devices such as a digital camera, digital speakers, scanners, speakers etc. It permits Plug and Play – configuring of expansion cards and peripheral devices as and when they are installed.



USB

2.1.3.4 Small Computer System Interface (SCSI) Port

SCSI-Small Computer System Interface Port allows data to be transmitted in a daisy chain to up to 7 devices at a speed higher (32 bits at a time) than those possible with serial and parallel ports. It is a fast data transmitting device and is used to connect HDD,

CD ROM drives and scanners with the computer system.

2.2 INPUT DEVICES

In this section we will discuss various types of input devices used for entering data into the computer system. These are:

2.2.1 Keyboard



It is the most common input device used for entering data and information into the computer system. This is the standard input device attached to all computers. The keyboard is a primary device for inputting text by pressing a set of keys. All the keys are neatly mounted in a keyboard connected to the computer system. Keyboard devices can be classified into two types general purpose keyboards and special purpose keyboards. General purpose keyboard are standard keyboards used with most computer system. They are called general purpose because that have enough keys to make them useful for any type of application. The layout of keyboard is just like the traditional typewriter of the type QWERTY. It also contains some extra command keys and function keys. It contains a total of 101 to 104 keys. You have to press a correct combination of keys to input data. The computer can recognize the electrical signals corresponding to the correct key combination and processing is done accordingly.

The User can enter data into the computer by pressing a set of keys on the keyboard. In a keyboard letters are printed on the keys. The first keyboard was developed in the 18th century and was named as a QWERTY keyboard. A Computer keyboard includes control circuitry which converts the key pressed by the user into key codes so that the computer can understand it. Now-a-days wireless keyboards are also being used which increase user freedom. The wireless feature is achieved by infrared signals or by radio frequency.

In general, a computer keyboard has following keys:

1. Alphanumeric Keys: It includes letters and numbers.
2. Punctuation Keys: These include comma, period, semicolon etc. and
3. Special Keys: These can be function keys, control keys, arrow keys and Caps lock keys etc.



All the modern keyboards of computer are classified as:



- (a) Original PC keyboard having 84 keys;
- (b) Advance Technology (AT) Keyboard having 101-104 keys; and
- (c) Multimedia Keyboard having 120 – 140 keys.

2.2.2 Mouse

A Mouse is a handy device which can be moved on a smooth surface to cause the movement of a cursor on the screen. It is a pointing device which is used to input data and information into the computer system by pointing on it. Physically, a mouse contains a small case, held under one of the user's hands with one or more buttons. For GUI-based systems a mouse is an essential pointing-device. The cursor of the mouse moves in the same direction in which the mouse ball rolls.



Its name is derived from its shape, which looks a bit like a mouse, with its connecting wire that one can imagine to be the mouse's tail. A Mouse rolls on a small ball and has two or three buttons on the top. When you roll the mouse across a flat surface on the screen, sensors sense the mouse in the direction of mouse movement. The cursor moves very fast with a mouse giving you more freedom to work in any direction. It is easier and faster to move through a mouse compared to movement using keys.

Types of Mouse

Mouse could be mechanical, optical or cordless types. Further information regarding these types are as follows:

Mechanical Mouse: Mechanical Mouse uses ball for the movement of cursor on the computer screen. When the ball is rolled in any direction, a sensor of the mouse detects it and also moves the mouse pointer in the same direction.



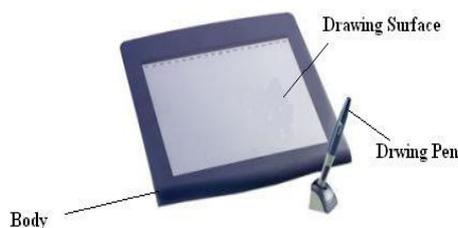
Optical Mouse: Optical Mouse uses Laser rays for the movement of cursor on the computer screen. It is an advanced pointing device. Movement is detected by sensing changes in the reflected light rather than the motion of a rolling sphere.

Cord-Less Mouse: Cord-Less Mouse is battery driven and does not need any wire for the physical connection with the motherboard. It transmits data through infrared or radio signal.

Computer mice are very useful in designing pictures and graphs and computer and video games by multimedia designers. A Mouse pad is required to move the mouse because it provides a smooth surface. However, an optical or laser mouse doesn't require a mouse pad.

2.2.3 Digitizing (Graphic) Tablet

Digitizing or Graphics' tablet is a computer input device that allows one to hand-draw images and graphics, similar to the way one draws images with a pencil and paper. These tablets may also be used to capture data of handwritten signatures. Some tablets are intended as a general replacement for a mouse as the primary pointing and navigation device for desktop computers. These are used by architects, engineers and designers in Computer Aided Design (CAD) for designing purposes, such as buildings, cars, mechanical parts, robots etc. These are also used in Geographical Information System (GPS) for digitizing of maps.



Graphics Tablet

Graphics tablet is most suited for artists and those who want the natural feel of a pen-like object to manipulate the cursor on their screen. Wacom is the most well-known manufacturer of graphics tablets, and is incredibly well respected.



2.2.4 Trackball

Trackball is a moveable ball mounted on a stationary device, which can be rotated manually by using fingers. It is also a pointing device. In a trackball, the ball is placed on the top along with buttons which can be rolled with the fingers. These are used in playing video games. Mouse and mobile phones are equipped with trackballs to navigate addresses as well as play games.



2.2.5 Joystick

Joystick is a remote control device for a computer which is used for playing video games to indicate the position. It has a stick that pivots on a base and is used for controlling the action in video games. The User moves a spherical ball with the help of a stick in the joystick as opposed to the trackball where fingers are used for moving the ball. Joysticks are also used for controlling machines such as cranes, trucks, underwater unmanned vehicles, flight simulators, industrial robots etc. The Joystick shown in figure has a base and a handle for controlling the movement of the cursor on the screen.





2.2.6 Pick Devices

Pick devices are used to select an object on the screen. The selected object can be text or graphics. Examples of pick devices are light pens and touch screens.

2.2.6.1 Light Pens

A Light pen is a pen like light-sensitive device. It is connected by a wire to the computer terminal to detect the CRT beam when pointed towards the screen and generate a narrow electrical pulse that can be fed to the computer as an input signal.

It is used to draw on the screen or to point to the displayed objects. It operates by detecting the light emitted by the screen phosphors. A light pen can work with any CRT monitor but not with LCD monitors. It is used by architects and engineers for CAD applications and editing.



Light Pen

2.2.6.2 Touch Screens

Touch screens are monitors / electronic visual display screens which detect where they are being touched. The user makes selections by directly touching the screen, rather than moving a cursor to the point on the screen with a mouse or joystick

Now days touch screens are being used in ATM machines for making it user friendly and

Kiosk machines are used for guiding the travelers about their travel plans. Touch screens are also used in many of the modern cell phones.



Touch Screen

2.2.7 Source Data Entry Devices

Entry of data into a computer system directly from the source, without transcription is called source data entry. Source data entry devices have a lower probability of error in input data than standard keyboard entry.

Some of the common source data entry devices are discussed below:

2.2.7.1 Digital Camera

A Digital camera is an electronic device which takes video or still photographs or both, digitally by recording images via an electronic image sensor. Digital cameras can do things which film cameras can't, for example displaying images on screen immediately after they are recorded. Images recorded on a digital camera can be cropped for editing, deleted and various types of special effects can be created by using Photoshop software.

Digital cameras look like ordinary cameras but have sufficient memory in the form of chips to store thousands of images, rather than using photographic films.



Digital camera



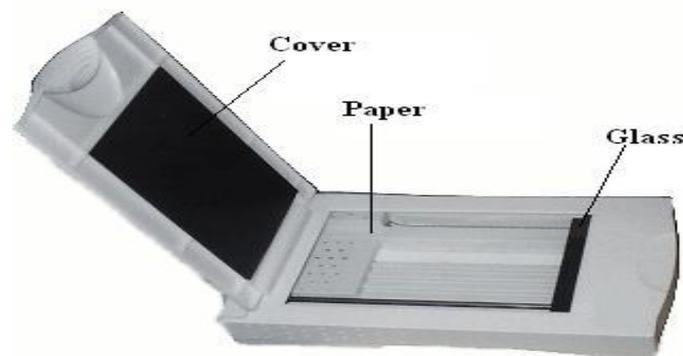
Most digital cameras allow users to choose the resolution needed for a picture. Most of those can connect directly to a computer to transfer data. A USB port is generally used for this purpose. A Wireless connection can also be used for connecting to a computer via Bluetooth.

These cameras use memory cards with flash memory to store images. The joint photographing expert's group standard (JPEG) is the most common file format used for storing data in a camera. Other formats include raw image format, DNG format etc.

2.2.7.2 Scanners

A Scanner is an input device and is used to input data into the computer system in the form of pictures. It optically scans images, printed text, handwriting, or an object, and converts it to a digital image. Examples of scanners are a desktop or flatbed scanner.

In scanners the document is placed on a glass window for scanning. Mechanically driven scanners that move the document are typically used for large-formatted volume of documents. Another type of scanner is a planetary scanner. This scanner takes photographs of books and documents. Three dimensional scanners are used for producing three-dimensional models of objects.



Optical Scanner

2.2.7.3 Optical Mark Recognition (OMR)

OMR is the scanning of paper to detect the presence or absence of a mark in a predetermined position. Now days, it is used as an input device for source data entry purposes. Universities and colleges often use OMR for the evaluation of OMR sheets for competitive exams. OMR sheets consist of multiple



choice question papers and students are required to make a mark to indicate their answers. OMR is used in the evaluation of questionnaires, surveys and university exam OMR sheets.



Optical Mark Recognition

2.2.7.4 Magnetic Ink Character Recognition (MICR)

Magnetic Ink Character Recognition is a character recognition system that uses special ink and characters. When a document that contains this ink needs to be read, it passes through a machine, which magnetizes the ink and then translates the magnetic information into characters.

MICR technology is used by banks for faster processing of large volumes of cheques. Numbers and characters found on the bottom of checks (usually containing the check number, sort number, and account number) are printed using Magnetic Ink. To print Magnetic Ink codes, we need a laser printer that accepts MICR toner.

MICR provides a secure, high-speed method of scanning and processing information. This technology is used for processing large volume of data. It speeds up data input for the bank because cheques can be directly fed into the input device as it also ensures accuracy of data entry. The most commonly used character set by MICR devices are known as E13B font which consists of the numerals 0 to 9, and four special characters.

2.2.7.5 Bar Code Reader

A barcode reader is an electronic device which is used to read printed barcodes. Barcodes represent alphanumeric data which is a combination of vertical lines (bars) that vary in width and length. It is a fast and effective way to input data. A Barcode reader uses a laser beam to read the series of thick and thin lines which represent the bar code number.

**Bar Codes****Bar Code Reader**

The bar code is 13 digits long and it has four main divisions. The First two digits of a bar code represent the country, the second part represents the manufacturer's code (five digits) the third part represents the product code (five digits) and the last digit is a check digit.

2.2.7.6 Magnetic Stripe Reader

A magnetic reader is a hardware device which is used to read the information encoded in the magnetic stripe located at the back of a credit/debit card. A bank card holds data about the owner of the card, bank account number and code of the bank branch, where the account is held.

**Magnetic Stripe Reader****ATM Machine with Card**

Magnetic stripe readers are often used at supermarkets and in many different types of shops. In these machines data is read electronically and the point of sale is called Electronic Point of Sale (EPOS).

There are several other pick devices such as microphones and speakers. These have been discussed in length under the section Out Put Devices section of this unit.

2.3 OUTPUT DEVICES

One of the most important output devices in computer system is its screen commonly called monitor. It is an output device and displays all the programs and applications which are running on the computer



system. A Monitor is the visual display unit of the computer system. It displays images generated from the video output. It displays images without keeping a permanent record.

A Graphic display is made up of a series of dots called 'pixels' (picture elements) whose pattern produces images in computer system. Each dot on the screen is defined as a separate unit which can be addressed separately. Since each dot on the screen can be controlled separately it gives greater flexibility in drawing pictures. The Number of dots per inch (dpi) is called the resolution of the screen and represents the quality of the computer system.

2.3.1 Cathode Ray Tube Monitors (CRT)

Monitors display what is going on in your computer. They can run at various resolutions. It is the part of computer which looks like a TV set. After typing the characters from the keyboard, we can see them on the monitor. The main components of a CRT monitors are the electron gun, the electron beam controlled by an electromagnetic field and phosphor coated display screen. These older monitors are bulky and require a lot of space for installation.



In CRT monitors, the image is projected on the screen by directing the electron beam onto the computer screen. To precisely direct the electron beams, copper steering coils are used to create a magnetic field inside the tube. By applying varying voltages to the copper coils a beam can be positioned at any point on the screen.

2.3.2 Liquid Crystal Displays (LCD)

First introduced in watches and clocks in the 1970's, LCDs are now used to display images in monitors. A newer technology in computer screens is TFT LCD monitors. These are light weight monitors and are used in laptop computers. Active matrix structure is used by most of the modern LCD monitors and



television sets. In this technology, a matrix of thin-film transistors (TFT) is added to the polarizing and color filters. It enhances the display to make it look brighter and sharper. It can also produce much better images and have quicker response times.



These monitors are portable, reliable and consume less electricity. Images produced by these monitors are of better quality than that of old CRT monitors. The LCD monitors have very high resolution and emit less radiation than CRT monitors. The screen is also flicker free.

2.3.3 Thin Film Transistor Liquid Crystal Display (TFT LCD)

It is type of monitor which used thin film transistor technology to enhance the image quality of LCD Monitors. These are used as monitor in television set, desktop computer, laptop computer and mobile phones etc.

2.3.4 Light Emitting Diodes Monitors (LED)

Light Emitting Diodes (LED) is the latest technology which is being used now a day for making high definition TV screens and monitors. It is a semi-conductor light source. In this technology diodes are used to light up the screen instead of liquid crystal Diodes.

LED is known as light emitting diode. It is an electronic device that lights up when electricity is passed through it. LEDs are usually red. They are good for displaying images because they can be relatively small, and they do not burn out. However, they require more power than LCD monitors. LED is light weight monitors and is used in laptop computers and in TV.

The Life of LED monitors is three times than that of LCD monitors and they have less warm up time than that of CRT or LCD monitors. These monitors require less space on the desk, less power consumption and have flicker free screen.

2.3.5 Projection Displays



These are normally used for large group presentations. These systems can be connected to a computer and whatever appears on the computer terminal gets enlarged and projected on a large screen. Video projector receives video signals and projects the corresponding image on a projection screen. It uses a lens system for this projection.



LCD Overhead Projector

These are popularly used for seminars, class room lectures, marketing presentations and conference room presentations etc.

2.3.6 Printers

Printers are used for producing output on paper. There are a large variety of printers and printing devices which can be classified according to the print quality and printing speed.

These varieties of printers are:

Printing Technology – impact printers vs. non-impact printers

Impact printers use variations of the standard typewriter printing mechanism where a hammer strikes paper through an inked ribbon.

A non-Impact printer uses chemical, heat or electrical signals to produce symbols on paper. Some of these require special coated or treated paper to print characters on them.

2.3.7 Plotters

A Plotter is a device that draws pictures on a page as output, after receiving a print command from the computer. It is also called a graph plotter. In plotters pens are used to draw lines on the paper, which is placed in the plotter.



Plotter

Plotters produce high quality diagrams on the paper and their output quality is good. Engineers, architects and planners use plotters to generate high quality, high-precision graphic output of different sizes. For several design applications such as design of layout of an aircraft, car, and architectural design of a building and in other computer-aided design applications plotter are very useful.

Plotter is of two types:

- Drum Plotter
- Flat-Bed Plotter

The drum plotters are generally smaller than flatbed plotters and they have lower resolutions than flatbed plotters. HP, Canon and Epson are the popular companies which manufacture good quality of platters.

2.3.8 Speaker

Computer speakers, or multimedia speakers, are external speakers, commonly equipped with a low-power internal amplifier which produces sound as output. External speakers are connected with a computer by using a plug and socket.





Computer speakers range widely in quality and in price. Laptop computers have inbuilt speakers.

2.4 CHECK YOUR PROGRESS

A. Fill in the blanks:

1. The _____ pen is a small input device used to select and display objects on a screen.
2. _____ keys are present on the top row of the keyboard.
3. The OCR recognises the _____ of the characters with the help of light source.
4. The most common method of entering text and numerical data into a computer system is through the use of a _____.
5. Information that comes from an external source and is fed into computer software is called _____.

B. State whether the following statements are True or False:

1. Scanner is used to print documents.
2. Printer is used to display pictures.
3. Pick devices are used to pick objects on the monitor.
4. Graphic tablets are used for designing purposes.
5. Speaker is an output device.

2.5 SUMMARY

Input/output devices are the devices that connect you to your computer. Input devices let you input data and other information into your computer and they also let you give your computer special instructions so that it will know what to do. For example, you can type in data by using a keyboard, or you can input data in picture form by using a scanner.

On the other hand, output devices display the results of your computer's computations. Examples of these would be your computer's monitor, which displays all of the programs you're running, as well as the printer, which will print out a hard copy of the information. Source data entry devices are those devices which automatically capture data and images at its source, record it in small chips and produces images immediately.



2.6 KEYWORDS

Input Unit: This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer.

CPU: Central Processing Unit is considered as the brain of the computer. CPU performs all types of data processing operations.

Output Unit: The output unit consists of devices with the help of which we get the information from the computer. This unit is a link between the computer and the users.

Input Devices: In computing, an input device is a piece of computer hardware equipment used to provide data and control signals to an information processing system such as a computer.

Output Devices: An output device is any piece of computer hardware equipment which converts information into human-readable form. It can be text, graphics, tactile, audio, and video.

2.7 SELF-ASSESSMENT TEST

1. Explain the various components of a computer system.
2. What do you mean by a port? Discuss various types of port associated with computer.
3. What do you mean by peak devices? Discuss various types of pick devices.
4. Write a short note on:
 - a. CPU
 - b. ALU
5. Define input devices. Describe various types of input devices.
6. Define output devices. Describe various types of output devices.

2.8 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress A

1. Light
2. Function
3. Shape
4. Keyboard



5. Input

Check Your Progress B

1. False
2. False
3. True
4. True
5. True

2.9 REFERENCES/SUGGESTED READINGS

- ❖ V. Rajaraman, Fundamentals of Computers, PHI Publication.
- ❖ Alexix Leon, Mathews Leon, Introduction to Computers, Leon Press.
- ❖ E Balagurusamy, Fundamentals of Computers, Tata Mcgraw Hill Publication.
- ❖ Rohit Khuran, Introduction to Computer Science, ITL Education Solution and Pearson Education Press.
- ❖ Deborah Morley, Charles S. Parker, Fundamentals of Computers, Taj Press.
- ❖ Dr. Aditi Markale, Dr, Onkar Nath, Introduction to Computers, Macmillan Press.
- ❖ V. C. Jain, Computer Fundamentals and Personal Computer Software BPB Publication.
- ❖ Pradeep K Sinha, Priti Sinha, Computer Fundamentals, BPB Publication.



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Computer Memory

Structure

- 3.0 Learning Objectives
- 3.1 Introduction
- 3.2 Computer Memory
 - 3.2.1 Register Memory
 - 3.2.2 Cache memory
 - 3.2.3 Primary memory
 - 3.2.4 Secondary memory
 - 3.2.4.1 Hard disk
 - 3.2.4.2 Solid state drive
 - 3.2.4.3 Pen drive
 - 3.2.4.4 SD card
 - 3.2.4.5 Compact disk (CD)
 - 3.2.4.6 DVD
- 3.3 Memory units
- 3.4 Introduction to modern processor
- 3.5 Check Your Progress
- 3.6 Summary
- 3.7 Keywords



- 3.8 Self-Assessment Test
- 3.9 Answers to Check Your Progress
- 3.10 References/Suggested Readings

3.0 LEARNING OBJECTIVES

After studying this lesson, you should be able to understand:

- ✓ The basics of computer memory and its types
- ✓ What is RAM and its types
- ✓ ROM and its types
- ✓ Mass storage devices and its types
- ✓ Brief idea of modern processor

3.1 INTRODUCTION

Charles Babbage, the famous 19th century English mathematician and polymath, once said that for a machine to perform the functions of a human computer it must possess three things: a unit capable of performing the operations of arithmetic, a built-in power of judgement and a store.

The latter - a store - would retain the numbers and instructions required to define the successive stages in computation. Of course, in the 21st century we'd recognize this as 'computer memory', but in the 19th century this really was a groundbreaking idea.

Let's first define, in modern terms, what we mean by a store, or the memory of a computational machine:

"The memory of a computer is where the program and data are stored before the calculations begin. During a computer run, the control section may store partial answers in the memory, similar to the way we use paper to record our work. The memory is therefore one of the most active parts of a computer, storing not only the program and data but processed data as well. The memory is equivalent to thousands of registers, each storing a binary word."



In this lesson we discuss register memory, cache memory, primary memory and secondary memory.

3.2 COMPUTER MEMORY

The computer memory holds the data and instructions needed to process raw data and produce output. The computer memory is divided into large number of small parts known as cells. Each cell has a unique address which varies from 0 to memory size minus one.

Computer memory is of two types: Volatile (RAM) and Non-volatile (ROM). The secondary memory (hard disk) is referred as storage not memory.

But, if we categorize memory on behalf of space or location, it is of four types:

1. Register memory
2. Cache memory
3. Primary memory
4. Secondary memory

3.2.1 REGISTER MEMORY

Register memory is the smallest and fastest memory in a computer. It is not a part of the main memory and is located in the CPU in the form of registers, which are the smallest data holding elements. A register temporarily holds frequently used data, instructions, and memory address that are to be used by CPU. They hold instructions that are currently processed by the CPU. All data is required to pass through registers before it can be processed. So, they are used by CPU to process the data entered by the users.

Registers hold a small amount of data around 32 bits to 64 bits. The speed of a CPU depends on the number and size (no. of bits) of registers that are built into the CPU. Registers can be of different types based on their uses. Some of the widely used Registers include Accumulator or AC, Data Register or DR, the Address Register or AR, Program Counter (PC), I/O Address Register, and more.

3.2.1.1 Types and Functions of Computer Registers

Data Register: It is a 16-bit register, which is used to store operands (variables) to be operated by the processor. It temporarily stores data, which is being transmitted to or received from a peripheral device.



Program Counter (PC): It holds the address of the memory location of the next instruction, which is to be fetched after the current instruction is completed. So, it is used to maintain the path of execution of the different programs and thus executes the programs one by one, when the previous instruction gets completed.

Instructor Register: It is a 16-bit register. It stores the instruction which is fetched from the main memory. So, it is used to hold instruction codes, which are to be executed. The Control Unit takes instruction from Instructor Register, then decodes and executes it.

Accumulator Register: It is a 16-bit register, which is used to store the results produced by the system. For example, the results generated by CPU after the processing are stored in the AC register.

Address Register: It is a 12-bit register that stores the address of a memory location where instructions or data is stored in the memory.

I/O Address Register: Its job is to specify the address of a particular I/O device.

I/O Buffer Register: Its job is to exchange the data between an I/O module and the CPU.

3.2.2 CACHE MEMORY

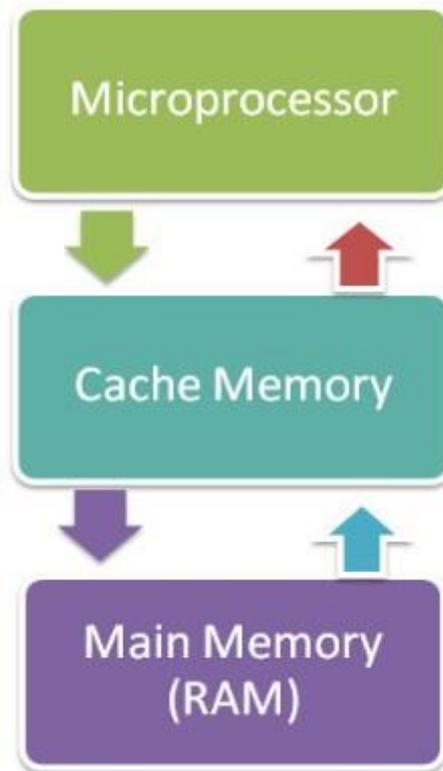
Cache memory is a high-speed memory, which is small in size but faster than the main memory (RAM). The CPU can access it more quickly than the primary memory. So, it is used to synchronize with high-speed CPU and to improve its performance. Cache memory can only be accessed by CPU. It can be a reserved part of the main memory or a storage device outside the CPU. It holds the data and programs which are frequently used by the CPU. So, it makes sure that the data is instantly available for CPU whenever the CPU needs this data. In other words, if the CPU finds the required data or instructions in the cache memory, it doesn't need to access the primary memory (RAM). Thus, by acting as a buffer between RAM and CPU, it speeds up the system performance.

3.2.2.1 Types of Cache Memory

L1: It is the first level of cache memory, which is called Level 1 cache or L1 cache. In this type of cache memory, a small amount of memory is present inside the CPU itself. If a CPU has four cores (quad core CPU), then each core will have its own level 1 cache. As this memory is present in the CPU, it can work at the same speed as of the CPU. The size of this memory ranges from 2KB to 64 KB. The



L1 cache further has two types of caches: Instruction cache, which stores instructions required by the CPU, and the data cache that stores the data required by the CPU.



L2: This cache is known as Level 2 cache or L2 cache. This level 2 cache may be inside the CPU or outside the CPU. All the cores of a CPU can have their own separate level 2 cache, or they can share one L2 cache among themselves. In case it is outside the CPU, it is connected with the CPU with a very high-speed bus. The memory size of this cache is in the range of 256 KB to the 512 KB. In terms of speed, they are slower than the L1 cache.

L3: It is known as Level 3 cache or L3 cache. This cache is not present in all the processors; some high-end processors may have this type of cache. This cache is used to enhance the performance of Level 1 and Level 2 cache. It is located outside the CPU and is shared by all the cores of a CPU. Its memory size ranges from 1 MB to 8 MB. Although it is slower than L1 and L2 cache, it is faster than Random Access Memory (RAM).

3.2.2.2 How does cache memory work with CPU?



When CPU needs the data, first of all, it looks inside the L1 cache. If it does not find anything in L1, it looks inside the L2 cache. If again, it does not find the data in L2 cache, it looks into the L3 cache. If data is found in the cache memory, then it is known as a cache hit. On the contrary, if data is not found inside the cache, it is called a cache miss.

If data is not available in any of the cache memories, it looks inside the Random Access Memory (RAM). If RAM also does not have the data, then it will get that data from the Hard Disk Drive.

So, when a computer is started for the first time, or an application is opened for the first time, data is not available in cache memory or in RAM. In this case, the CPU gets the data directly from the hard disk drive. Thereafter, when you start your computer or open an application, CPU can get that data from cache memory or RAM.

3.2.3 PRIMARY MEMORY

Primary Memory is of two types: RAM and ROM.

RAM (Volatile Memory)

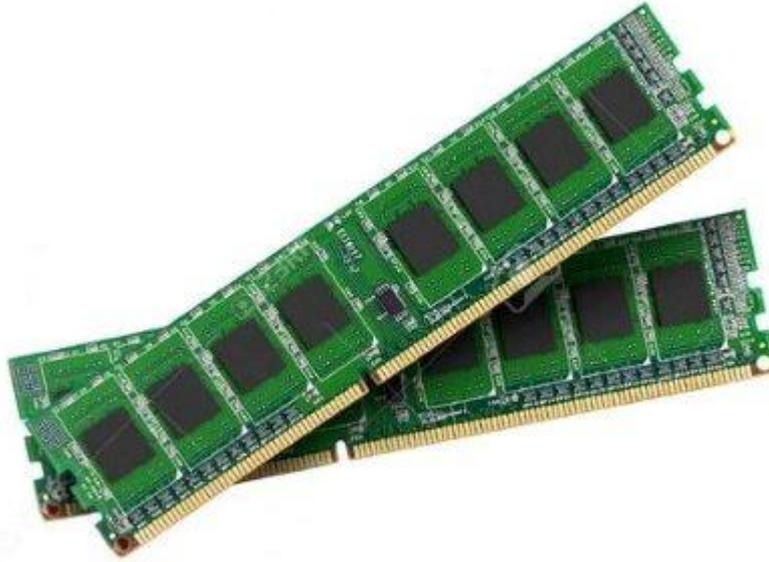
It is a volatile memory. It means it does not store data or instructions permanently. When you switch on the computer the data and instructions from the hard disk are stored in RAM. CPU utilizes this data to perform the required tasks. As soon as you shut down the computer the RAM loses all the data.

ROM (Non-volatile Memory)

It is a non-volatile memory. It means it does not lose its data or programs that are written on it at the time of manufacture. So it is a permanent memory that contains all important data and instructions needed to perform important tasks like the boot process.

3.2.3.1 What is RAM?

RAM, which stands for Random Access Memory, is a hardware device generally located on the motherboard of a computer and acts as an internal memory of the CPU. It allows CPU store data, program, and program results when you switch on the computer. It is the read and write memory of a computer, which means the information can be written to it as well as read from it.



RAM is a volatile memory, which means it does not store data or instructions permanently. When you switch on the computer the data and instructions from the hard disk are stored in the RAM, e.g., when the computer is rebooted, and when you open a program, the operating system (OS), and the program are loaded into RAM, generally from an HDD or SSD. CPU utilizes this data to perform the required tasks. As soon as you shut down the computer, the RAM loses the data. So, the data remains in the RAM as long as the computer is on and lost when the computer is turned off. The benefit of loading data into RAM is that reading data from the RAM is much faster than reading from the hard drive.

In simple words, we can say that RAM is like a person's short term memory, and hard drive storage is like a person's long term memory. Short term memory remembers the things for a short duration, whereas long term memory remembers for a long duration. Short term memory can be refreshed with information stored in the brains long term memory. A computer also works like this; when the RAM fills up, the processor goes to the hard disk to overlay the old data in Ram with new data. It is like a reusable scratch paper on which you can write notes, numbers, etc., with a pencil. If you run out of space on the paper, you may erase what you no longer need; RAM also behaves like this, the unnecessary data on the RAM is deleted when it fills up, and it is replaced with new data from the hard disk which is required for the current operations.

RAM comes in the form of a chip that is individually mounted on the motherboard or in the form of several chips on a small board connected to the motherboard. It is the main memory of a computer. It is



faster to write to and read from as compared to other memories such as a hard disk drive (HDD), solid-state drive (SSD), optical drive, etc.

A computer's performance mainly depends on the size or storage capacity of the RAM. If it does not have sufficient RAM (random access memory) to run the OS and software programs, it will result in slower performance. So, the more RAM a computer has, the faster it will work. Information stored in RAM is accessed randomly, not in a sequence as on a CD or hard drive. So, its access time is much faster.

3.2.3.1.1 History of RAM:

- The first type of RAM was introduced in 1947 with the Williams tube. It was used in CRT (cathode ray tube), and the data was stored as electrically charged spots on the face.
- The second type of RAM was a magnetic-core memory, invented in 1947. It was made of tiny metal rings and wires connecting to each ring. A ring stored one bit of data, and it can be accessed at any time.
- The RAM which we know today, as solid-state memory, was invented by Robert Dennard in 1968 at IBM Thomas J Watson Research Centre. It is specifically known as dynamic random access memory (DRAM) and has transistors to store bits of data. A constant supply of power was required to maintain the state of each transistor.
- In October 1969, Intel introduced its first DRAM, the Intel 1103. It was its first commercially available DRAM.
- In 1993, Samsung introduced the KM48SL2000 synchronous DRAM (SDRAM).
- In 1996, DDR SDRAM was commercially available.
- In 1999, RDRAM was available for computers.
- In 2003, DDR2 SDRAM began being sold.
- In June 2007, DDR3 SDRAM started being sold.
- In September 2014, DDR4 became available in the market.

3.2.3.1.2 Types of RAM:

Integrated RAM chips can be of two types:

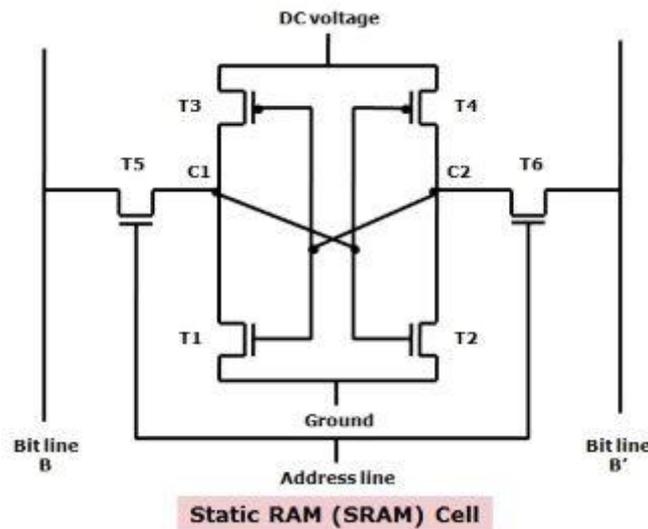
- Static RAM (SRAM):



- Dynamic RAM (DRAM):

Both types of RAM are volatile, as both lose their content when the power is turned off.

1) Static RAM:



Static RAM (SRAM) is a type of random access memory that retains its state for data bits or holds data as long as it receives the power. It is made up of memory cells and is called a static RAM as it does not need to be refreshed on a regular basis because it does not need the power to prevent leakage, unlike dynamic RAM. So, it is faster than DRAM.

It has a special arrangement of transistors that makes a flip-flop, a type of memory cell. One memory cell stores one bit of data. Most of the modern SRAM memory cells are made of six CMOS transistors, but lack capacitors. The access time in SRAM chips can be as low as 10 nanoseconds. Whereas, the access time in DRAM usually remains above 50 nanoseconds.

Furthermore, its cycle time is much shorter than that of DRAM as it does not pause between accesses. Due to these advantages associated with the use of SRAM, It is primarily used for system cache memory, and high-speed registers, and small memory banks such as a frame buffer on graphics cards.

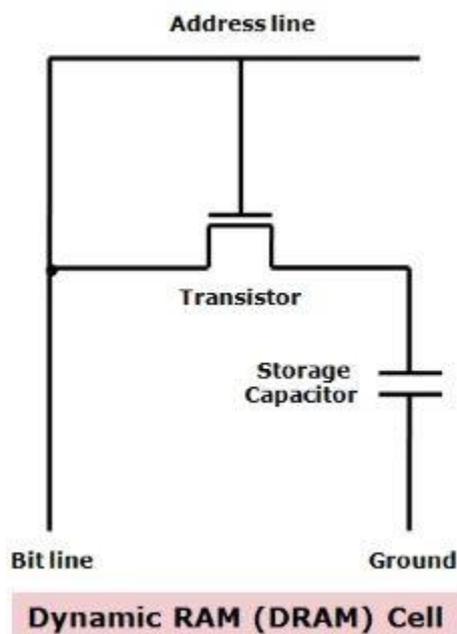
The Static RAM is fast because the six-transistor configuration of its circuit maintains the flow of current in one direction or the other (0 or 1). The 0 or 1 state can be written and read instantly without waiting for the capacitor to fill up or drain. The early asynchronous static RAM chips performed read



and write operations sequentially, but the modern synchronous static RAM chips overlap read and write operations.

The drawback with Static RAM is that its memory cells occupy more space on a chip than the DRAM memory cells for the same amount of storage space (memory) as it has more parts than a DRAM. So, it offers less memory per chip.

2) Dynamic RAM:



Dynamic Ram (DRAM) is also made up of memory cells. It is an integrated circuit (IC) made of millions of transistors and capacitors which are extremely small in size and each transistor is lined up with a capacitor to create a very compact memory cell so that millions of them can fit on a single memory chip. So, a memory cell of a DRAM has one transistor and one capacitor and each cell represents or stores a single bit of data in its capacitor within an integrated circuit.

The capacitor holds this bit of information or data, either as 0 or as 1. The transistor, which is also present in the cell, acts as a switch that allows the electric circuit on the memory chip to read the capacitor and change its state.

The capacitor needs to be refreshed after regular intervals to maintain the charge in the capacitor. This is the reason it is called dynamic RAM as it needs to be refreshed continuously to maintain its data or it

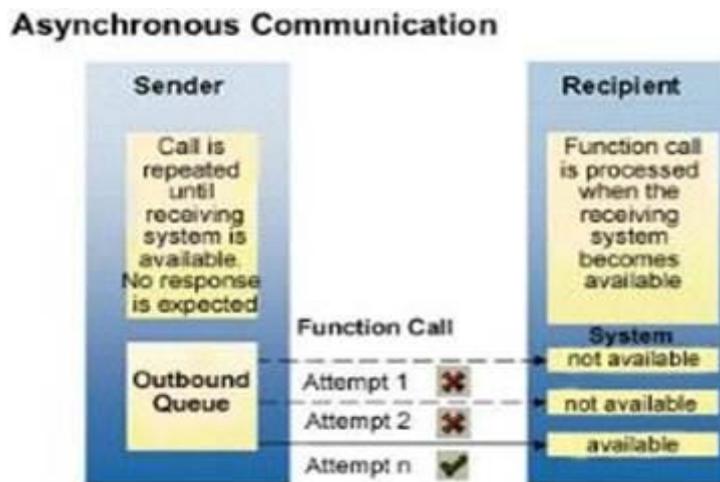


would forget what it is holding. This is achieved by placing the memory on a refresh circuit that rewrites the data several hundred times per second. The access time in DRAM is around 60 nanoseconds.

We can say that a capacitor is like a box that stores electrons. To store a '1' in the memory cell, the box is filled with electrons. Whereas, to store a '0', it is emptied. The drawback is that the box has a leak. In just a few milliseconds the full box becomes empty. So, to make dynamic memory work, the CPU or Memory controller has to recharge all the capacitors before they discharge. To achieve this, the memory controller reads the memory and then writes it right back. This is called refreshing the memory and this process continues automatically thousands of times per second. So, this type of RAM needs to be dynamically refreshed all the time.

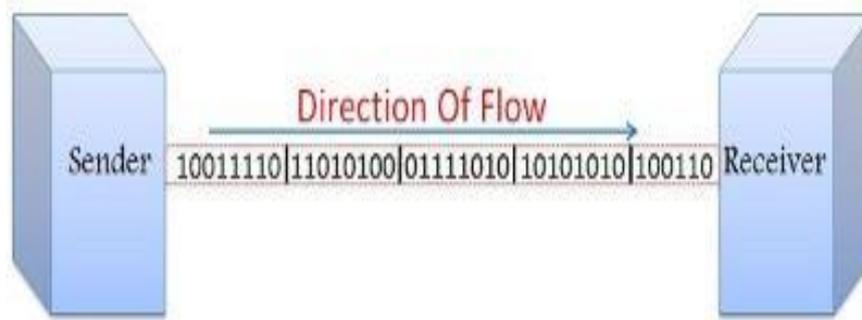
Types of DRAM:

i) Asynchronous DRAM:



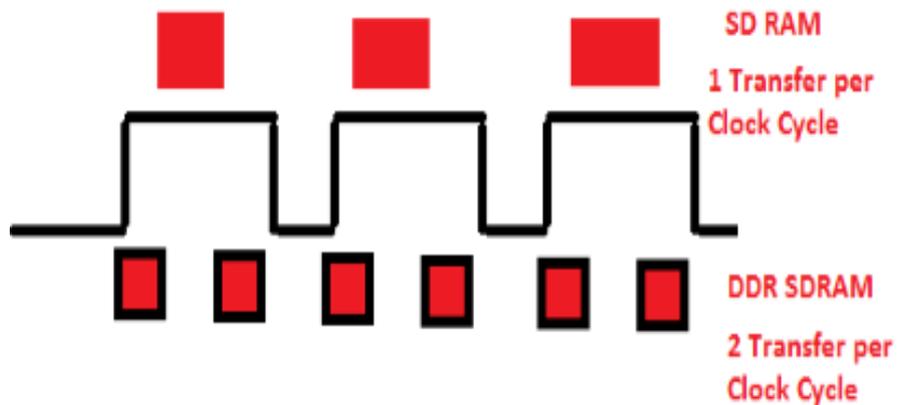
This type of DRAM is not synchronized with the CPU clock. So, the drawback with this RAM is that CPU could not know the exact timing at which the data would be available from the RAM on the input-output bus. This limitation was overcome by the next generation of RAM, which is known as the synchronous DRAM.

ii) Synchronous DRAM:



SDRAM (Synchronous DRAM) began to appear in late 1996. In SDRAM, the RAM was synchronized with the CPU clock. It allowed the CPU or to be precise the memory controller to know the exact clock cycle or timing or the number of cycles after which the data will be available on the bus. So, the CPU does not need for the memory accesses and thus the memory read and write speed can be increased. The SDRAM is also known as the single data rate SDRAM (SDR SDRAM) as data is transferred only at each rising edge of the clock cycle. See the image in the following description.

iii) DDR SDRAM:

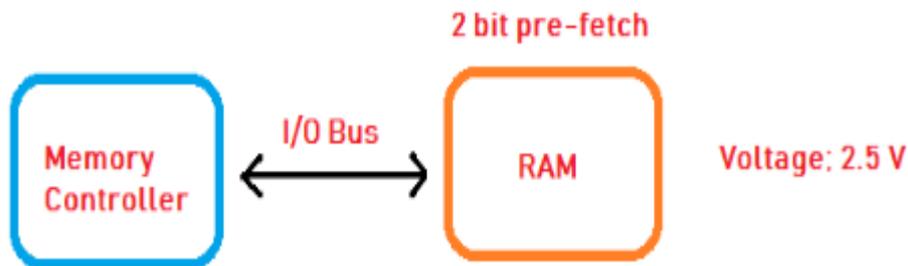


The next generation of the synchronous DRAM is known as the DDR RAM. It was developed to overcome the limitations of SDRAM and was used in PC memory at the beginning of the year 2000. In DDR SDRAM (DDR RAM), the data is transferred twice during each clock cycle; during the positive edge (rising edge) and the negative edge (falling edge) of the cycle. So, it is known as the double data rate SDRAM.



There are different generations of DDR SDRAM which include DDR1, DDR2, DDR3, and DDR4. Today, the memory that we use inside the desktop, laptop, mobile, etc., is mostly either DDR3 or DDR4 RAM. Types of DDR SDRAM:

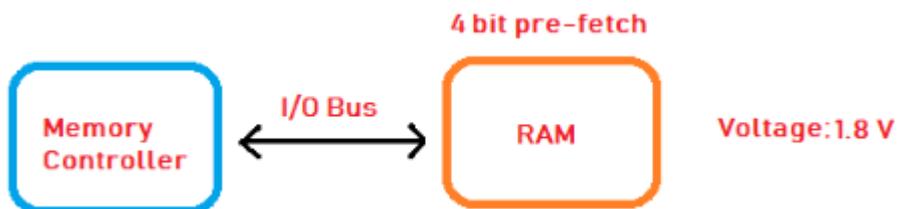
a) DDR1 SDRAM:



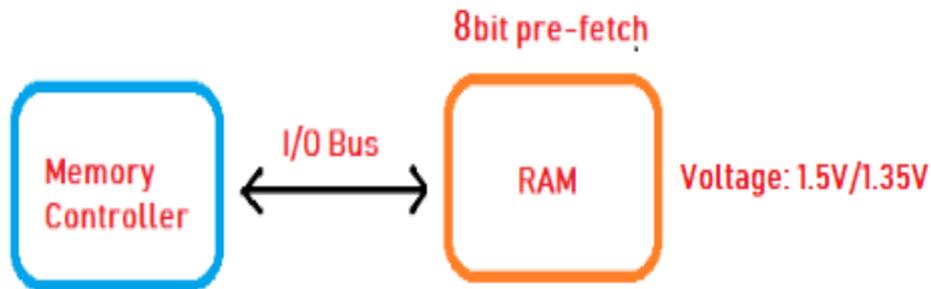
DDR1 SDRAM is the first advanced version of SDRAM. In this RAM, the voltage was reduced from 3.3 V to 2.5 V. The data is transferred during both the rising as well as the falling edge of the clock cycle. So, in each clock cycle, instead of 1 bit, 2 bits are being pre-fetched which is commonly known as the 2-bit pre-fetch. It is mostly operated in the range of 133 MHz to the 200 MHz.

Furthermore, the data rate at the input-output bus is double the clock frequency because the data is transferred during both the rising as well as falling edge. So, if a DDR1 RAM is operating at 133 MHz, the data rate would be double, 266 Mega transfer per second.

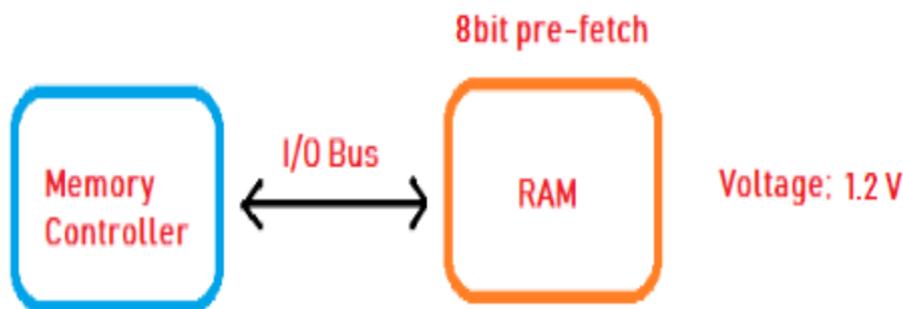
b) DDR2 SDRAM:



It is an advanced version of DDR1. It operates at 1.8 V instead of 2.5V. Its data rate is double the data rate of the previous generation due to the increase in the number of bits that are pre-fetched during each cycle; 4 bits are pre-fetched instead of 2 bits. The internal bus width of this RAM has been doubled. For example, if the input-output bus is 64 bits wide, the internal bus width of it will be equal to 128 bits. So, a single cycle can handle double the amount of data.

c) **DDR3 SDRAM:**

In this version, the voltage is further reduced from 1.8 V to the 1.5 V. The data rate has been doubled than the previous generation RAM as the number of bits that are pre-fetched has been increased from 4 bits to the 8 bits. We can say that the internal data bus width of RAM has been increased 2 times than that of the last generation.

d) **DDR4 SDRAM:**

In this version, the operating voltage is further reduced from 1.5 V to 1.2 V, but the number of bits that can be pre-fetched is same as the previous generation; 8 bits per cycle. The Internal clock frequency of the RAM is double of the previous version. If you are operating at 400 MHz the clock frequency of the input-output bus would be four times, 1600 MHz and the transfer rate would be equal to 3200 Mega transfer per second.

Difference between Static RAM and Dynamic RAM:



SRAM

It is a static memory as it does not need to be refreshed repeatedly.

Its memory cell is made of 6 transistors. So its cells occupy more space on a chip and offer less storage capacity (memory) than a DRAM of the same physical size.

It is more expensive than DRAM and is located on processors or between a processor and main memory.

It has a lower access time, e.g. 10 nanoseconds. So, it is faster than DRAM.

It stores information in a bistable latching circuitry. It requires regular power supply so it consumes more power.

It is faster than DRAM as its memory cells don't need to be refreshed and are always available. So, it is mostly used in registers in the CPU and cache memory of various devices.

Its cycle time is shorter as it does not need to be paused between accesses and refreshes.

Examples: L2 and LE cache in a CPU.

Size ranges from 1 MB to 16MB.

DRAM

It is a dynamic memory as it needs to be refreshed continuously or it will lose the data.

Its memory cell is made of one transistor and one capacitor. So, its cells occupy less space on a chip and provide more memory than a SRM of the same physical size.

It is less expensive than SRAM and is mostly located on the motherboard.

It has a higher access time, e.g. more than 50 nanoseconds. So, it is slower than SRAM.

The information or each bit of data is stored in a separate capacitor within an integrated circuit so it consumes less power.

It is not as fast as SRAM, as its memory cells are refreshed continuously. But still, it is used in the motherboard because it is cheaper to manufacture and requires less space.

Its cycle time is more than the SRAM's cycle time.

Example: DDR3, DDR4 in mobile phones, computers, etc.

Size ranges from 1 GB to 3 GB in smartphones and 4GB to 16GB in laptops.

3.2.3.2 What is ROM?



ROM, which stands for read only memory, is a memory device or storage medium that stores information permanently. It is also the primary memory unit of a computer along with the random access memory (RAM). It is called read only memory as we can only read the programs and data stored on it but cannot write on it. It is restricted to reading words that are permanently stored within the unit.



The manufacturer of ROM fills the programs into the ROM at the time of manufacturing the ROM. After this, the content of the ROM can't be altered, which means you can't reprogram, rewrite, or erase its content later. However, there are some types of ROM where you can modify the data.

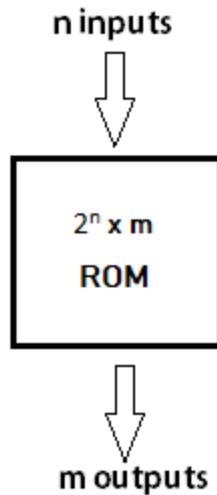
ROM contains special internal electronic fuses that can be programmed for a specific interconnection pattern (information). The binary information stored in the chip is specified by the designer and then embedded in the unit at the time of manufacturing to form the required interconnection pattern (information). Once the pattern (information) is established, it stays within the unit even when the power is turned off. So, it is a non-volatile memory as it holds the information even when the power is turned off, or you shut down your computer.

The information is added to a RAM in the form of bits by a process known as programming the ROM as bits are stored in the hardware configuration of the device. So, ROM is a Programmable Logic Device (PLD).

A simple example of ROM is the cartridge used in video game consoles that allows the system to run many games. The data which is stored permanently on personal computers and other electronic devices like smartphones, tablets, TV, AC, etc. is also an example of ROM.

For example, when you start your computer, the screen does not appear instantly. It takes time to appear as there are startup instructions stored in ROM which are required to start the computer during the booting process. The work of the booting process is to start the computer. It loads the operating system into the main memory (RAM) installed on your computer. The BIOS program, which is also present in the computer memory (ROM) is used by the microprocessor of the computer to start the computer during the booting process. It allows you to open the computer and connects the computer with the operating system.

ROM is also used to store Firmware, which is a software program which remains attached to the hardware or programmed on a hardware device like a keyboard, hard drive, video cards, etc. It is stored in the flash ROM of a hardware device. It provides instructions to the device to communicate and interact with other devices.

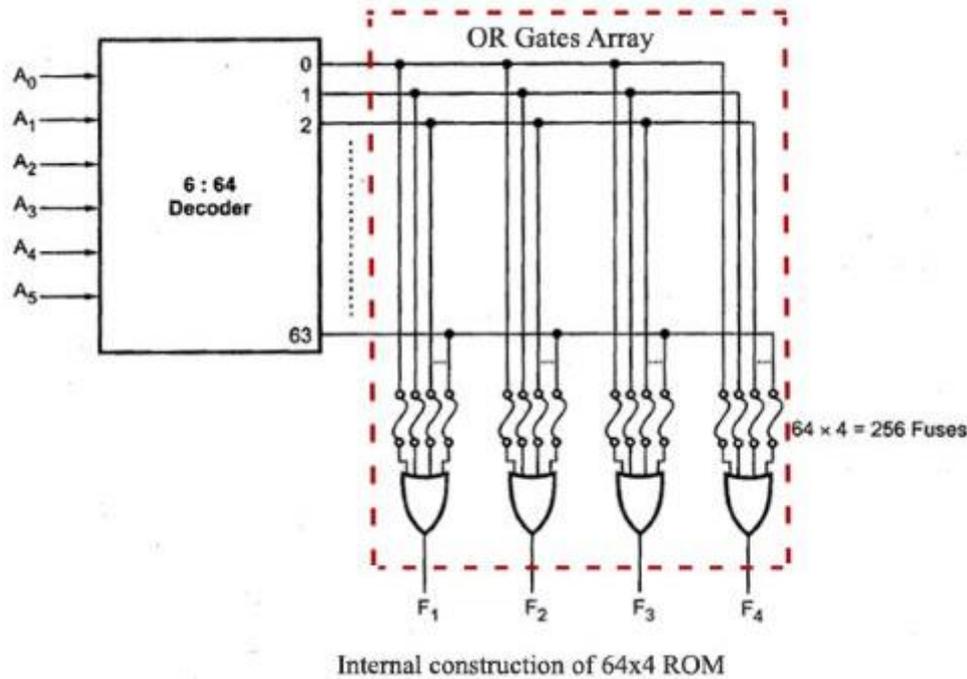
**Block Diagram of ROM:**

The block of ROM has 'n' input lines and 'm' output lines. Each bit combination of the input variables is known as an address. Each bit combination that comes out through output lines is called a word. The number of bits per word is equal to the number of output lines, m.

The address of a binary number refers to one of the addresses of n variables. So, the number of possible addresses with 'n' input variables is 2^n . An output word has a unique address, and as there are 2^n distinct addresses in a ROM, there are 2^n separate words in the ROM. The words on the output lines at a given time depends on the address value applied to the input lines.

3.2.3.2.1 Internal Structure of ROM:

The internal structure comprises two basic components: decoder and OR gates. A decoder is a circuit that decodes an encoded form (such as binary coded decimal, BCD) to a decimal form. So, the input is in binary form, and the output is its decimal equivalent. All the OR gates present in the ROM will have outputs of the decoder as their output. Let us take an example of 64 x 4 ROM. The structure is shown in the following image.



This Read Only Memory consists of 64 words of 4 bits each. So, there would be four output lines, and one of the 64 words available on the output lines is determined from the six input lines as we have only six inputs because in this ROM we have $2^6 = 64$, so we can specify 64 addresses or minterms. For each address input, there is a unique selected word. For example, if the input address is 000000, word number 0 will be selected and applied to the output lines. If the input address is 111111, word number 63 is selected and applied to the output lines.

3.2.3.2.2 Types of ROM:

1) Masked Read Only Memory (MROM):

It is the oldest type of read only memory (ROM). It has become obsolete so it is not used anywhere in today's world. It is a hardware memory device in which programs and instructions are stored at the time of manufacturing by the manufacturer. So it is programmed during the manufacturing process and can't be modified, reprogrammed, or erased later.

The MROM chips are made of integrated circuits. Chips send a current through a particular input-output pathway determined by the location of fuses among the rows and columns on the chip. The current has



to pass along a fuse-enabled path, so it can return only via the output the manufacturer chooses. This is the reason the rewriting and any other modification is not impossible in this memory.

2) Programmable Read Only Memory (PROM):

PROM is a blank version of ROM. It is manufactured as blank memory and programmed after manufacturing. We can say that it is kept blank at the time of manufacturing. You can purchase and then program it once using a special tool called a programmer.

In the chip, the current travels through all possible pathways. The programmer can choose one particular path for the current by burning unwanted fuses by sending a high voltage through them. The user has the opportunity to program it or to add data and instructions as per his requirement. Due to this reason, it is also known as the user-programmed ROM as a user can program it.

To write data onto a PROM chip; a device called PROM programmer or PROM burner is used. The process or programming a PROM is known as burning the PROM. Once it is programmed, the data cannot be modified later, so it is also called as one-time programmable device.

Uses: It is used in cell phones, video game consoles, medical devices, RFID tags, and more.

3) Erasable and Programmable Read Only Memory (EPROM):

EPROM is a type of ROM that can be reprogrammed and erased many times. The method to erase the data is very different; it comes with a quartz window through which a specific frequency of ultraviolet light is passed for around 40 minutes to erase the data. So, it retains its content until it is exposed to the ultraviolet light. You need a special device called a PROM programmer or PROM burner to reprogram the EPROM.

Uses: It is used in some micro-controllers to store program, e.g., some versions of Intel 8048 and the Freescale 68HC11.

4) Electrically Erasable and Programmable Read Only Memory (EEPROM):

ROM is a type of read only memory that can be erased and reprogrammed repeatedly, up to 10000 times. It is also known as Flash EEPROM as it is similar to flash memory. It is erased and reprogrammed electrically without using ultraviolet light. Access time is between 45 and 200 nanoseconds.



The data in this memory is written or erased one byte at a time; byte per byte, whereas, in flash memory data is written and erased in blocks. So, it is faster than EEPROM. It is used for storing a small amount of data in computer and electronic systems and devices such as circuit boards.

Uses: The BIOS of a computer is stored in this memory.

5) FLASH ROM:

It is an advanced version of EEPROM. It stores information in an arrangement or array of memory cells made from floating-gate transistors. The advantage of using this memory is that you can delete or write blocks of data around 512 bytes at a particular time. Whereas, in EEPROM, you can delete or write only 1 byte of data at a time. So, this memory is faster than EEPROM.

It can be reprogrammed without removing it from the computer. Its access time is very high, around 45 to 90 nanoseconds. It is also highly durable as it can bear high temperature and intense pressure.

Uses: It is used for storage and transferring data between a personal computer and digital devices. It is used in USB flash drives, MP3 players, digital cameras, modems and solid-state drives (SSDs). The BIOS of many modern computers are stored on a flash memory chip, called flash BIOS.

3.2.4 SECONDARY MEMORY

The secondary storage devices which are built into the computer or connected to the computer are known as a secondary memory of the computer. It is also known as external memory or auxiliary storage.

The secondary memory is accessed indirectly via input/output operations. It is non-volatile, so permanently stores the data even when the computer is turned off or until this data is overwritten or deleted. The CPU can't directly access the secondary memory. First, the secondary memory data is transferred to primary memory then the CPU can access it.

Some of the secondary memory or storage devices are described below:

3.2.4.1 Hard Disk:

It is a rigid magnetic disc that is used to store data. It permanently stores data and is located within a drive unit.



The hard disk is also known as a hard drive. It is a rigid magnetic disc that stores data permanently, as it is a non-volatile storage device. The hard disk is located within a drive unit on the computer's motherboard and comprises one or more platters packed in an air-sealed casing. The data is written on the platters by moving a magnetic head over the platters as they spin. The data stored on a computer's hard drive generally includes the operating system, installed software, and the user's files and programs, including pictures, music, videos, text documents, etc.

Components of Hard Drive:

The main components of a hard drive include a head actuator, read/write actuator arm, read/write head, platter, and spindle. A circuit board, which is called the disk controller or interface board, is present on the back of a hard drive. It allows the hard drive to communicate with the computer.

3.2.4.2 Solid-state Drive:





SSD (Solid State Drive) is also a non-volatile storage medium that is used to hold and access data. Unlike a hard drive, it does not have moving components, so it offers many advantages over SSD, such as faster access time, noiseless operation, less power consumption, and more.

As the cost of SSD has come down, it has become an ideal replacement for a standard hard drive in desktop and laptop computers. It is also suitable for notebooks, and tablets that don't require lots of storage.

3.2.4.3 Pen drive:



Pen drive is a compact secondary storage device. It is also known as a USB flash drive, thumb drive or a jump drive. It connects to a computer via a USB port. It is commonly used to store and transfer data between computers. For example, you can write a report using a computer and then copy or transfer it in the pen drive. Later, you can connect this pen drive to a computer to see or edit your report. You can also store your important documents and pictures, music, videos in the pen drive and keep it at a safe place.

Pen drive does not have movable parts; it comprises an integrated circuit memory chip that stores the data. This chip is housed inside a plastic or aluminum casing. The data storage capacity of the pen drive generally ranges from 2 GB to 128 GB. Furthermore, it is a plug and play device as you don't need additional drives, software, or hardware to use it.

3.2.4.4 SD Card:





SD Card stands for Secure Digital Card. It is most often used in portable and mobile devices such as smartphones and digital cameras. You can remove it from your device and see the things stored in it using a computer with a card reader.

There are many memory chips inside the SD card that store the data; it does not have moving parts. SD cards are not created equal, so they may differ from each other in terms of speed, physical sizes, and capacity. For example, standard SD cards, mini SD cards, and micro SD cards.

3.2.4.5 Compact Disk (CD):



Compact Disk is a portable secondary storage device in the shape of a round medium disk. It is made of polycarbonate plastic. The concept of CD was co-developed by Philips and Sony in 1982. The first CD was created on 17 August 1982 at the workshop of Philips in Germany.

In the beginning, it was used for storing and playing sound recordings, later it was used for various purposes such as for storing documents, audio files, videos, and other data like software programs in a CD.

Physical characteristics of a CD/ Structure of CD:

A standard CD is around 5 inches in diameter and 0.05 inches in thickness. It is made of a clear polycarbonate plastic substrate, a reflective metallic layer, and a clear coating of acrylic plastic. These thin circular layers are attached one on top of another as described below:

- A polycarbonate disc layer at the bottom has the data encoded by creating lands and pits.
- The polycarbonate disc layer is coated with a thin aluminum layer that reflects the laser.
- The reflective aluminum layer is coated with a lacquer layer to prevent oxidation in order to protect the below layers. It is generally spin coated directly on the top of the reflective layer.



- The label print is applied on the lacquer layer, or artwork is screen printed on the top of the disc on the lacquer layer by offset printing or screen printing.

How Does a CD Work?

The data or information is stored or recorded or encoded in CD digitally using a laser beam that etches tiny indentations or bumps on its surface. The bump is called a pit, which represents the number 0. Space, where the bump is not created, is called land, and it represents the number 1. Thus, the data is encoded into a compact disc by creating pits (0) and lands (1). The CD players use laser technology to read the optically recorded data.

3.2.4.6 DVD:

DVD is short for digital versatile disc or digital video disc. It is a type of optical media used for storing optical data. Although it has the same size as a CD, its storage capacity is much more than a CD. So, it is widely used for storing and viewing movies and to distribute software programs as they are too large to fit on a CD. DVD was co-developed by Sony, Panasonic, Philips, and Toshiba in 1995.



Types of DVDs:

DVDs can be divided into three main categories which are as follows:

DVD-ROM (Read-Only): These types of DVDs come with media already recorded on them, such as movie dvds. As the name suggests, data on these discs cannot be erased or added, so these discs are known as a read-only or non-writable DVD.



DVD-R (Writable): It allows you to record or write information to the DVD. However, you can write information only once as it becomes a read-only DVD once it is full.

DVD-RW (Rewritable or Erasable): This type of discs can be erased, written, or recorded multiple times.

3.3 MEMORY UNITS

Memory units are used to measure and represent data. Some of the commonly used memory units are:

- 1) **Bit:** The computer memory units start from bit. A bit is the smallest memory unit to measure data stored in main memory and storage devices. A bit can have only one binary value out of 0 and 1.
- 2) **Byte:** It is the fundamental unit to measure data. It contains 8 bits or is equal to 8 bits. Thus a byte can represent 2^8 or 256 values.
- 3) **Kilobyte:** A kilobyte contains 1024 bytes.
- 4) **Megabyte:** A megabyte contains 1024 kilobytes.
- 5) **Gigabyte:** A gigabyte contains 1024 megabyte.
- 6) **Terabyte:** A terabyte contains 1024 gigabytes.

3.4 INTRODUCTION TO MODERN PROCESSOR

A processor, or "microprocessor," is a small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output. While this may seem like a simple task, modern processors can handle trillions of calculations per second.

The central processor of a computer is also known as the CPU, or "central processing unit." This processor handles all the basic system instructions, such as processing mouse and keyboard input and running applications. Most desktop computers contain a CPU developed by either Intel or AMD, both of which use the x86 processor architecture. Mobile devices, such as laptops and tablets may use Intel and AMD CPUs, but can also use specific mobile processors developed by companies like ARM or Apple.



Modern CPUs often include multiple processing cores, which work together to process instructions. While these "cores" are contained in one physical unit, they are actually individual processors. In fact, if you view your computer's performance with a system monitoring utility like Windows Task Manager (Windows) or Activity Monitor (Mac OS X), you will see separate graphs for each processor. Processors that include two cores are called dual-core processors, while those with four cores are called quad-core processors. Some high-end workstations contain multiple CPUs with multiple cores, allowing a single machine to have eight, twelve, or even more processing cores.

Besides the central processing unit, most desktop and laptop computers also include a GPU. This processor is specifically designed for rendering graphics that are output on a monitor. Desktop computers often have a video card that contains the GPU, while mobile devices usually contain a graphics chip that is integrated into the motherboard. By using separate processors for system and graphics processing, computers are able to handle graphic-intensive applications more efficiently.

3.5 CHECK YOUR PROGRESS

A. Fill in the blanks:

1. Storage which stores or retains data after power off is called _____.
2. _____ memories must be refreshed many times per second.
3. Magnetic tape is not practical for applications where data must be quickly recalled because tape is _____.
4. Main memory works in conjunction with _____.
5. SRAM stands for _____.

B. State whether the following statements are True or False:

1. Magnetic Tape used random access method.
2. Cache memory is placed in between the CPU and ROM.
3. Primary memory is usually referred to as RAM.
4. A group of 8 bits is called a byte.
5. ROM is a volatile memory



3.6 SUMMARY

The basic computer model works on stored program concept. The computer architecture has been developed to be able to store data, instructions and storage space for temporary variables. This storage space is supplemented by internal (primary storage devices) and external (secondary storage devices). Variety of storage devices have been developed depending upon the need and suitability of the application. This lesson discussed the different types of primary and secondary storage devices.

3.7 KEYWORDS

Computer memory: is any physical device capable of storing information.

Register memory is the smallest and fastest memory in a computer. It is not a part of the main memory and is located in the CPU in the form of registers.

Cache memory is an extremely fast memory type that acts as a buffer between RAM and the CPU.

Primary memory is computer memory that is accessed directly by the CPU.

Secondary memory is where programs and data are kept on a long-term basis. Common secondary storage devices are the hard disk and optical disks.

3.8 SELF-ASSESSMENT TEST

1. Define computer memory? Why we need memory?
2. Describe the register memory. Discuss various types of registers.
3. What do you mean by cache memory? How cache memory works with CPU?
4. Discuss different types of Cache memory.
5. What do you mean by primary memory? Explain different types of primary memory.
6. What do you mean by secondary memory? Explain different types of secondary memory.
7. Differentiate between SRAM and DRAM.
8. Discuss the various types of ROM in detail.
9. Discuss the different types of RAM in detail.



3.9 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress A

1. Non-volatile memory
2. Dynamic RAM
3. A sequential-access medium
4. CPU
5. Static Random-Access Memory

Check Your Progress B

1. False
2. False
3. True
4. True
5. False

3.10 REFERENCES/SUGGESTED READINGS

- ❖ V. Rajaraman, Fundamentals of Computers, PHI Publication.
- ❖ Alexix Leon, Mathews Leon, Introduction to Computers, Leon Press.
- ❖ E Balagurusamy, Fundamentals of Computers, Tata Mcgraw Hill Publication.
- ❖ Rohit Khuran, Introduction to Computer Science, ITL Education Solution and Pearson Education Press.
- ❖ Deborah Morley, Charles S. Parker, Fundamentals of Computers, Taj Press.
- ❖ Dr. Aditi Markale, Dr, Onkar Nath, Introduction to Computers, Macmillan Press.
- ❖ V. C. Jain, Computer Fundamentals and Personal Computer Software BPB Publication.
- ❖ Pradeep K Sinha, Priti Sinha, Computer Fundamentals, BPB Publication.



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INTRODUCTION TO COMPUTER SOFTWARE AND PROGRAMMING LANGUAGE

Structure

- 4.0 Learning Objectives
- 4.1 Introduction
 - 4.1.1 Types of software
 - 4.1.1.1 System Software
 - 4.1.1.2 Application Software
 - 4.1.2 Software Acquisition
 - 4.1.3 Introduction of Programming Language
 - 4.1.3.1 Types of Programming Language
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- 4.2 Converting to Machine Language
- 4.3 Different generations of Programming Languages
- 4.4 Choosing a Programming Language
- 4.5 Check your progress
- 4.6 Summary
- 4.7 Keywords



- 4.8 Self-Assessment Test
- 4.9 Answers to Check Your Progress
- 4.10 References/suggested readings

4.0 LEARNING OBJECTIVES

The computer, as a machine, can do nothing for you without the software. Software is required for the functioning of computer. Software programs instruct computer about the actions to be performed, so as to get the desired output. The purpose of this chapter is to introduce you to the different categories of software.

In this lesson you will learn about

- ✓ Computer software and its types
- ✓ System software
 - For management and functionality of computer—Operating system, device drivers, and system utilities
 - For development of application software—Programming languages, translator
- ✓ software, loader, and linker
- ✓ Operating system
- ✓ Device drivers
- ✓ System utility software—Anti-virus, data compression, cryptographic, disk compression, disk partitioning, disk cleaner, backup, system profiling, and network manager
- ✓ Programming language—Machine language, assembly language, high-level language, and different generations of programming languages
- ✓ Translator software—Assembler, compiler, and interpreter
- ✓ Linker, and loader software
- ✓ Application software—Word processing software, image processing software, accounting software, spreadsheet software, presentation software, CAD/CAM software, and web browser software



4.1 INTRODUCTION

Computer software, or simply software, is a collection of data or computer instructions that tell the computer how to work. This is in contrast to physical hardware, from which the system is built and actually performs the work. Computer software includes computer programs, libraries and related non-executable data, such as online documentation or digital media. Computer hardware and software require each other and neither can be realistically used on its own.

At the lowest programming level, executable code consists of machine language instructions supported by an individual processor—typically a central processing unit (CPU) or a graphics processing unit (GPU). A machine language consists of groups of binary values signifying processor instructions that change the state of the computer from its preceding state. For example, an instruction may change the value stored in a particular storage location in the computer—an effect that is not directly observable to the user. An instruction may also invoke one of many input or output operations, for example displaying some text on a computer screen; causing state changes which should be visible to the user. The processor executes the instructions in the order they are provided, unless it is instructed to "jump" to a different instruction, or is interrupted by the operating system. As of 2015, most personal computers, smartphone devices and servers have processors with multiple execution units or multiple processors performing computation together, and computing has become a much more concurrent activity than in the past.

The majority of software is written in high-level programming languages. They are easier and more efficient for programmers because they are closer to natural languages than machine languages. High-level languages are translated into machine language using a compiler or an interpreter or a combination of the two. Software may also be written in a low-level assembly language, which has strong correspondence to the computer's machine language instructions and is translated into machine language using an assembler. In this lesson, we will discuss the different categories of computer software.

4.1.1 TYPES OF SOFTWARE

On virtually all computer platforms, software can be grouped into a few broad categories.

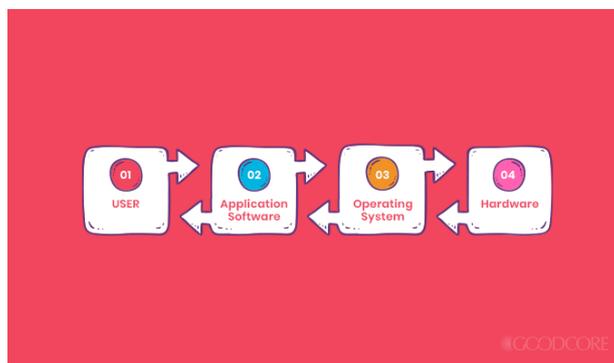


Based on the goal, computer software can be divided into:

4.1.1.1 System Software

Which is software for managing computer hardware behaviour, as to provide basic functionalities that are required by users, or for other software to run properly, if at all. System software provides basic functionality to the computer. System software is required for the working of computer itself. The user of computer does not need to be aware about the functioning of system software, while using the computer. For example, when you buy a computer, the system software would also include different device drivers. When you request for using any of the devices, the corresponding device driver software interacts with the hardware device to perform the specified request. If the appropriate device driver for any device, say a particular model of a printer, is installed on the computer, the user does not need to know about the device driver, while printing on this printer.

It only runs in the background of your device, at the most basic level while you use other application software. This is why system software is also called “**low-level software**”.



Example of System Software

The purposes of the system software are:

- To provide basic functionality to computer,
- To control computer hardware, and
- To act as an interface between user, application software and computer hardware.

On the basis of their functionality, system software may be broadly divided into two categories:



➤ System software for the management and functionality of computer relates to the functioning of different components of the computer, like, processor, input and output devices etc. System software is required for managing the operations performed by the components of computer and the devices attached to the computer. It provides support for various services, as requested by the application software. Operating system, device drivers, and system utilities constitute the system software for management of computer and its resources.

➤ System software for the development of application software provides services required for the development and execution of application software. System software provides the software tools required for the development of application software. The programming language software, translator software, loader, and linker are also categorized as system software, and are required for the application software development.

Features of a system software

- Close to the system
- Fast in speed
- Difficult to design
- Difficult to understand
- Less interactive
- Smaller in size
- Difficult to manipulate
- Generally written in low-level language



System software is also designed for providing a platform for running application software, and it includes the following:



Operating system

Which are essential collections of software that manage resources and provide common services for other software that runs "on top" of them. Supervisory programs, boot loaders, shells and window systems are core parts of operating systems.

All of your computer-like devices run on an operating system, including your desktop, laptop, smartphone, and tablet, etc. Here is a list of examples of an operating system. Let's take a look and you might spot some familiar names of system software:

For desktop computers, laptops and tablets:

- Microsoft Windows
- Mac (for Apple devices)
- Linux

For smartphones:

- Apple's iOS
- Google's Android
- Windows Phone OS

In practice, an operating system comes bundled with additional software (including application software) so that a user can potentially do some work with a computer that only has one operating system.

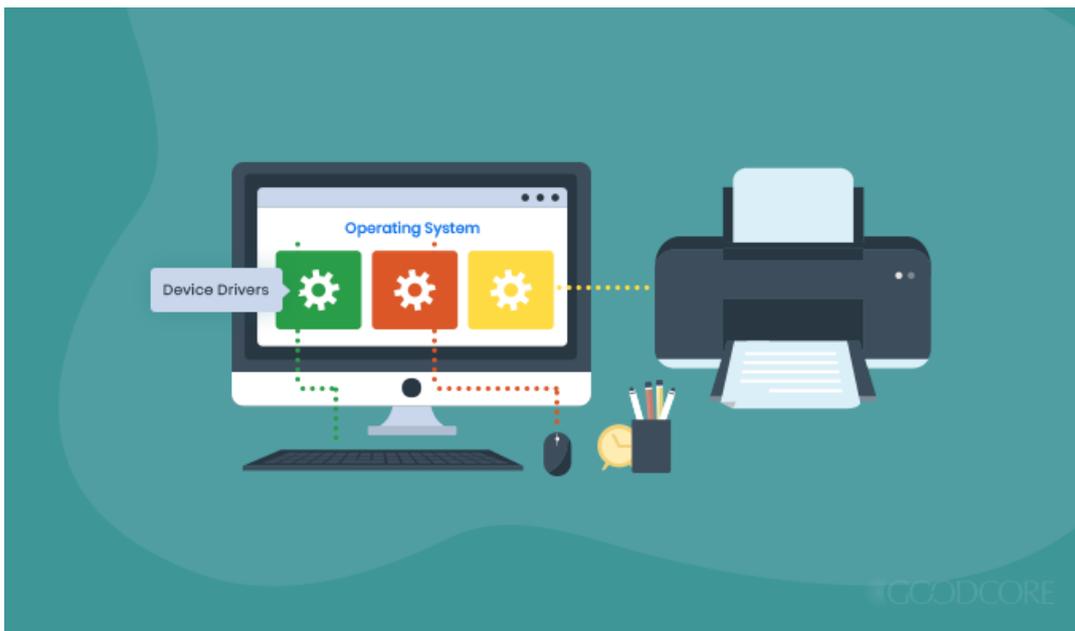
- It controls the execution of different programs to prevent occurrence of error.
- It provides a convenient interface to the user in the form of commands and graphical interface, which facilitates the use of computer.
- Some available operating systems are Microsoft Disk Operating System (MS-DOS), Windows 7, Windows XP, Linux, UNIX, and Mac OS X Snow Leopard



Device drivers

Which operate or control a particular type of device that is attached to a computer. Each device needs at least one corresponding device driver; because a computer typically has at minimum at least one input device and at least one output device, a computer typically needs more than one device driver.

- Driver software is often classified as one of the types of system software.
- They operate and control devices and peripherals plugged into a computer.
- Drivers are important because they enable the devices to perform their designated tasks. They do this by translating commands of an Operating System for the Hardware or devices, assigning duties.
- Therefore, each device connected with your computer requires at least one device driver to function.



Driver Software

- Since there are thousands of types of devices, drivers make the job of your system software easier by allowing it to communicate through a standardized language.
- Some examples of driver software that you may be familiar with are:
 - Printer Driver



- Mouse Driver
- Network Card

Usually, the operating system comes built-in with drivers for mouse, keyboard, and printers by default. They often do not require third-party installations. But for some advanced devices, you may need to install the driver externally. Moreover, if you use multiple operating systems like Linux, Windows, and Mac, then each of these supports different variants of drivers. For them, separate drivers need to be maintained for each.

Utilities

Which are computer programs designed to assist users in the maintenance and care of their computers.

Some features of utility software include:

- Antivirus and security software
 - File compressor
 - Disk cleaner
 - Disk defragmentation software
 - Data backup software
- Backup Utility to make a copy of all information stored on the disk. It also restores the backed up contents in case of disk failure.
- System Profiling Utility provides detailed information about the software installed on the computer and the hardware attached to it.
- Network Managers to check the computer network and to log events.

The system utilities on a computer working on Windows XP OS can be viewed by clicking

<Start><All Programs><Accessories><System Tools>

Malicious Software

which is software that is developed to harm and disrupt computers. As such, malware is undesirable. Malware is closely associated with computer-related crimes.

Programming tools



Programming tools are also software in the form of programs or applications that software developers (also known as *programmers*, *coders*, *hackers* or *software engineers*) use to create, debug, maintain (i.e. improve or fix), or otherwise support software.

4.1.1.2 APPLICATION SOFTWARE

Which is software that uses the computer system to perform special functions or provide entertainment functions beyond the basic operation of the computer itself. There are many different types of application software, because the range of tasks that can be performed with a modern computer is so large.

As a user of technology, Application Software or ‘Apps’ are what you engage with the most. These types of computer software are productive end-user programs that help you perform tasks. Following are some examples of application software that allow you to do specific work:

- **Word Processing Software:** For writing letter, reports, documents etc. (e.g. MS-WORD).
- **Image Processing Software:** For assisting in drawing and manipulating graphics (e.g. Adobe Photoshop).
- **Accounting Software:** For assisting in accounting information, salary, tax returns (Tally software).
- **MS Excel:** It is spreadsheet software that you can use for presenting and analyzing data.
- **Photoshop:** It is a photo editing application software by Adobe. You can use it to visually enhance, catalog and share your pictures.
- **Skype:** It is an online communication app that you can use for video chat, voice calling and instant messaging.
- **Spreadsheet Software:** Used for creating budget, tables etc. (e.g. MS-Excel).
- **Presentation Software:** To make presentations, slide shows (e.g. MS-PowerPoint)
- **Suite of Software having Word Processor, Spreadsheet and Presentation Software:** Some examples are MS-Office, Google Docs, Sun Openoffice, Apple iWork.
- **CAD/CAM Software:** To assist in architectural design. (e.g. AutoCAD, Autodesk)



- **Geographic Information Systems:** It captures, stores, analyzes, manages, and presents data, images and maps that are linked to different locations. (e.g. ArcGIS)
- **Web Browser Software:** To access the World Wide Web to search documents, sounds, images etc. (e.g. Internet Explorer, Netscape Communicator, Chrome)



Application Software

Examples of Application software are the following –

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word
- Microsoft Excel
- Microsoft PowerPoint



Features of application software are as follows –

- Close to the user
- Easy to design
- More interactive
- Slow in speed
- Generally written in high-level language
- Easy to understand

Software applications are also referred to as non-essential software. They are installed and operated on a computer-based on the user’s requirement. There are plenty of application software that you can use to perform different tasks. The number of such apps keeps increasing with technological advances and the evolving needs of the users. You can categorize these software types into different groups, as shown in the following table:

Application Software Type	Examples
<p>Word processing software: Tools that are used to create word sheets and type documents etc.</p>	<p>Microsoft Word, WordPad, AppleWorks and Notepad</p>



Application Software Type	Examples
Spreadsheet software: Software used to compute quantitative data.	Apple Numbers, Microsoft Excel and Quattro Pro
Database software: Used to store data and sort information.	Oracle, MS Access and FileMaker Pro
Application Suites: A collection of related programs sold as a package.	OpenOffice, Microsoft Office
Multimedia software: Tools used for a mixture of audio, video, image and text content.	Real Player, Media Player
Communication Software: Tools that connect systems and allow text, audio, and video-based communication.	MS NetMeeting, IRC, ICQ
Internet Browsers: Used to access and view websites.	Netscape Navigator, MS Internet Explorer, and Google Chrome
Email Programs: Software used for emailing.	Microsoft Outlook, Gmail, Apple Mail

4.1.2 SOFTWARE ACQUISITION

Different kinds of software are made available for use to users in different ways. The user may have to purchase the software, can download for free from the Internet, or can get it bundled along with the hardware. Nowadays with the advent of Cloud computing, many application software are also available



on the cloud for use through the Internet, e.g. Google Docs. The different ways in which the software are made available to users are:

Retail Software is off-the-shelf software sold in retail stores. It comes with printed manuals and installation instructions. For example, Microsoft Windows operating system.

OEM Software stands for “Original Equipment Manufacturer” software. It refers to software which is sold, and bundled with hardware. Microsoft sells its operating system as OEM software to hardware dealers. OEM software is sold at reduced price, without the manuals, packaging and installation instructions. For example, Dell computers are sold with the “Windows 7” OS pre-loaded on them.

Demo Software is designed to demonstrate what a purchased version of the software is capable of doing and provides a restricted set of features. To use the software, the user must buy a fully- functional version.

Shareware on the other hand, are software applications that are paid programs, but are made available for free for a limited period of time known as ‘trial period’. You can use the software without any charges for the trial period but you will be asked to purchase it for use after the trial ends. Shareware allows you to test drive the software before you actually invest in purchasing it. Some examples of Shareware that you must be familiar with are:

- Adobe PhotoShop
- Adobe Illustrator
- Netflix App
- Matlab
- McAfee Antivirus

Freeware is software that is free for personal use. It is downloadable from the Internet. The commercial use of this software may require a paid license. The author of the freeware software is the owner of the software, though others may use it for free. The users abide by the license terms, where the user cannot make changes to it, or sell it to someone else.

Some well-known examples of freeware are:



- Google Chrome
- Skype
- Instagram
- Snapchat
- Adobe reader

Although they all fall under the category of Application or end-user software, they can further be categorized as freeware because they are free for you to use.

Public Domain Software is free software. Unlike freeware, public domain software does not have a copyright owner or license restrictions. The source code is publicly available for anyone to use. Public domain software can be modified by the user.

Open-Source Software

is software whose source code is available and can be customized and altered within the specified guidelines laid down by the creator. Unlike public domain software, open-source software has restrictions on their use and modification, redistribution limitations, and copyrights are some examples of open-source software.

Common examples of open source software used by programmers are:

- LibreOffice
- PHP
- GNU Image Manipulation Program (GIMP)
- Linux
- Apache
- Firefox
- OpenOffice

Closed Source Software



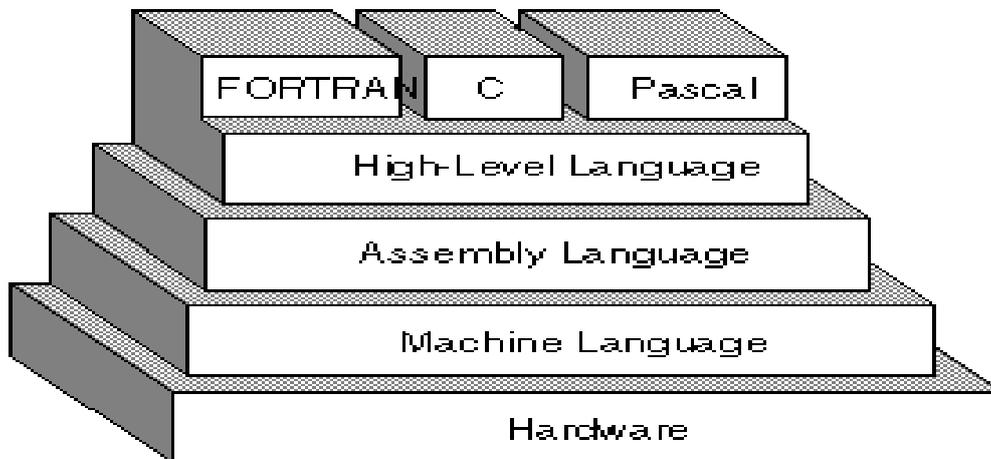
These are the types of software that are non-free for the programmers. For this software, the source code is the intellectual property of software publishers. It is also called '**proprietary software**' since only the original authors can copy, modify and share the software. Following are some of the most common examples of closed-source software:

- .Net
- Java
- Android
- Microsoft Office
- Adobe Photoshop

4.1.3 INTRODUCTION OF PROGRAMMING LANGUAGES

Software is written in one or more programming languages; there are many programming languages in existence, and each has at least one implementation, each of which consists of its own set of programming tools. These tools may be relatively self-contained programs such as compilers, debuggers, interpreters, linkers, and text editors, that can be combined together to accomplish a task; or they may form an integrated development environment (IDE), which combines much or all of the functionality of such self-contained tools.

A programming language is a vocabulary and set of grammatical rules for instructing a computer or computing device to perform specific tasks. The term *programming language* usually refers to high-level languages, such as BASIC, C, C++, COBOL, JAVA, FORTRAN, Ada, and Pascal. Each programming language has a unique set of keywords (words that it understands) and a special syntax for organizing program instructions.



Computer Program

- **A program is a set of instructions following the rules of the chosen language.**
- **Without programs, computers are useless.**
- **A program is like a recipe. It contains a list of ingredients (called variables) and a list of directions (called statements) that tell the computer what to do with the variables.**

4.1.3.1 TYPES OF PROGRAMMING LANGUAGE

There are three types of programming language: –

- Machine language (Low-level language)
- Assembly language (Low-level language)
- High-level language

Low-level languages are closer to the language used by a computer, while high-level languages are closer to human languages.

4.1.3.1.1 Machine Language

- Machine language is a collection of binary digits or bits that the computer reads and interprets. Machine languages are the only languages understood by computers.
- While easily understood by computers, machine languages are almost impossible for humans to use because they consist entirely of numbers.



Machine Language

169 1 160 0 153 0 128 153 0 129 153 130 153 0 131 200 208 241 96

High level language

```
FOR I=1 TO 1000: PRINT "A"; NEXT I
```

- Machine Language Example:
- Let us say that an electric toothbrush has a processor and main memory.
- The processor can rotate the bristles left and right, and can check the on/off switch.

4.1.3.1.2 Assembly Language

A program written in assembly language consists of a series of instructions mnemonics that correspond to a stream of executable instructions, when translated by an assembler, that can be loaded into memory and executed.

- Assembly languages use keywords and symbols, much like English, to form a programming language but at the same time introduce a new problem.
- The problem is that the computer doesn't understand the assembly code, so we need a way to convert it to machine code, which the computer does understand.
- Assembly language programs are translated into machine language by a program called an assembler.
- Example: – Machine language: 10110000 01100001
Assembly language: mov a1, #061h
Meaning: Move the hexadecimal value 61 (97 decimal) into the processor register named "a1".

4.1.3.1.3 High Level Language

High-level languages allow us to write computer code using instructions resembling everyday spoken language (for example: print, if, while) which are then translated into machine language to be executed.

- Programs written in a high-level language need to be translated into machine language before they can be executed.



➤ Some programming languages use a compiler to perform this translation and others use an interpreter

➤ Examples of High-level Language:

1. ADA
2. C
3. C++
4. JAVA
5. BASIC
6. COBOL
7. PASCAL
8. PHYTON

4.2 CONVERTING TO MACHINE LANGUAGE

Regardless of what language you use, you eventually need to convert your program into machine language so that the computer can understand it. There are two ways to do this:

- 1) Compile the program.
- 2) *Interpret* the program.

Compile is to transform a program written in a high-level programming language from source code into object code.

- This can be done by using a tool called compiler.
- A compiler reads the whole source code and translates it into a complete machine code program to perform the required tasks which is output as a new file.

Interpreter is a program that executes instructions written in a high-level language.

- An interpreter reads the source code one instruction or line at a time, converts this line into machine code and executes it.

Computer programming is the process of writing, testing, debugging/troubleshooting, and maintaining the source code of computer programs.



The question of which language is best is one that consumes a lot of time and energy among computer professionals. Every language has its strengths and weaknesses. For example, FORTRAN is a particularly good language for processing numerical data, but it does not lend itself very well to organizing large programs. Pascal is very good for writing well-structured and readable programs, but it is not as flexible as the C programming language. C++ embodies powerful object-oriented features, but it is complex and difficult to learn.

Programs are easier to write, read or understand in high-level languages than in machine language or assembly language. For example, a program written in C++ is easier to understand than a machine language program.

- Programs written in high-level languages is the source code which is converted into the object code (machine code) using translator software like interpreter or compiler.
- A line of code in high-level program may correspond to more than one line of machine code.
- Programs written in high-level languages are easily portable from one computer to another.

4.3 DIFFERENT GENERATIONS OF PROGRAMMING LANGUAGES

In addition to the categorization of programming languages into machine language, assembly language, and high-level language, programming languages are also classified in terms of generations in which they have evolved.

- ❖ **First Generation Languages**, or 1GL, are low-level languages that are machine language.
- ❖ **Second Generation Languages**, or 2GL, are also low-level languages that generally consist of assembly languages.
- ❖ **Third Generation Languages**, or 3GL, are high-level languages such as C.
- ❖ **Fourth Generation Languages**, or 4GL, are languages that consist of statements similar to statements in a human language. Fourth generation languages are commonly used in database programming and scripts.
- ❖ **Fifth Generation Languages**, or 5GL, are programming languages that contain visual tools to help develop a program. A good example of a fifth generation language is Visual Basic.



4.4 CHOOSING A PROGRAMMING LANGUAGE

Before you decide on what language to use, you should consider the following:

- your server platform
- the server software you run
- your budget
- previous experience in programming
- the database you have chosen for your backend

4.5 CHECK YOUR PROGRESS

A. Fill in the blanks:

1. -----is a program that translate mnemonic statements into executable instructions.
2. A set of instructions is called -----.
3. The instructions that tell a computer how to carry out the processing tasks are referred to as computer.....
4. The only language which the computer understands is _____.
5. The software designed to perform a specific task is _____.

B. State whether the following statements are True or False:

1. Word processing software is a type of application software.
2. Binary code comprises of digits from 0 to 9.
3. Word processor is an example of system software?
4. Software Package is a group of programs that solve a multiple problem.
5. Interpreter is a program that reads each of the instructions in mnemonic form and translates it into the machine-language equivalent.

4.6 SUMMARY

In conclusion, there can be multiple ways to classify different types of computer software. The software can be categorized based on the function they perform such as Application software, System software, Programming Software, and Driver software. They can also be classified based on different features such as the nature of source code, accessibility, and cost of usage.



After reading this chapter, I am hopeful you will now be able to clearly identify the types of software around you. A clear understanding of them will help you choose and use the software efficiently.

4.7 KEYWORDS

Freeware: Freeware is software, most often proprietary, that is distributed at no monetary cost to the end user.

Program: A computer program is a collection of instructions that can be executed by a computer to perform a specific task.

Anti-virus utility: Antivirus software is a type of utility used for scanning and removing viruses from your computer.

Application software: Application software is a program or group of programs designed for end users.

Programming languages: A programming language is a formal language comprising a set of instructions that produce various kinds of output.

Assembler: program for converting instructions written in low-level symbolic code into machine code.

High-level language: high-level language is any programming language that enables development of a program in a much more user-friendly programming

Assembly language: programming language that consists of instructions that are mnemonic codes for corresponding machine language

Shareware: software that is available free of charge and often distributed informally for evaluation, after which a fee may be requested for continued use.

Software: Computer software, or simply software, is a collection of data or computer instructions that tell the computer how to work

Interpreter: an interpreter is a computer program that directly executes instructions written in a programming or scripting language, without requiring them previously to have been compiled into a machine language program.

CAD/CAM software: CAD/CAM software is used to design and manufacture prototypes, finished products and production runs.

Linker: a program used with a compiler or assembler to provide links to the libraries needed for an executable program.



Source code: *source code* is any collection of *code*, possibly with comments, written using a human-readable programming language, usually as plain text.

Compiler: A compiler is a computer program that translates computer code written in one programming language into another language

Low-level language: A *low-level language* is a type of *programming language* that contains basic instructions recognized by a computer.

System software: System software is software designed to provide a platform for other software

System utility: *Utility* software is software designed to help to analyze, configure, optimize or maintain a computer

Object code: object code is a sequence of statements or instructions in a computer language, usually a machine code language or an intermediate language

4.8 SELF-ASSESSMENT TEST

1. What is the purpose of a device driver? What are the uses of system utilities?
2. Why are programming languages used?
3. What is the need for programming languages?
4. Name the three categories of programming languages.
5. What are low-level languages?
6. Define source code?
7. Define object code?
8. Machine language is hardware dependent—True or False.
9. List the key features of machine language.
10. List the key features of assembly language.
11. List the key features of high-level languages
12. Why is it difficult to write a program in machine language?
13. State three features of the program written in machine language?

4.9 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress A

1. Assembler



2. Program
3. Program
4. Binary
5. Application software

Check Your Progress B

1. True
2. False
3. False
4. False
5. False

4.10 REFERENCES/SUGGESTED READINGS

- ❖ V. Rajaraman, Fundamentals of Computers, PHI Publication.
- ❖ Alexix Leon, Mathews Leon, Introduction to Computers, Leon Press.
- ❖ E Balagurusamy, Fundamentals of Computers, Tata Mcgraw Hill Publication.
- ❖ Rohit Khuran, Introduction to Computer Science, IITL Education Solution and Pearson Education Press.
- ❖ Deborah Morley, Charles S. Parker, Fundamentals of Computers, Taj Press.
- ❖ Dr. Aditi Markale, Dr, Onkar Nath, Introduction to Computers, Macmillan Press.
- ❖ V. C. Jain, Computer Fundamentals and Personal Computer Software BPB Publication.
- ❖ Pradeep K Sinha, Priti Sinha, Computer Fundamentals, BPB Publication.



Course: BCOM 104	Author: Mr. Sawtantar Singh
Lesson: 5	Updated By: Mr. Balwant

APPLICATION SOFTWARES

Structure

- 5.0 Learning Objectives
- 5.1 Introduction
- 5.2 Microsoft Excel 2003
- 5.3 Microsoft Word 2003
- 5.4 Microsoft Access 2003
- 5.5 Check Your Progress
- 5.6 Summary
- 5.7 Keywords
- 5.8 Self-Assessment Tests
- 5.9 Answers to Check Your Progress
- 5.10 References/Suggested Readings

5.0 LEARNING OBJECTIVES

After going through this lesson you will be familiar with

- ✓ What is an application software?
- ✓ How to use spreadsheet
- ✓ How to use word processor for creating, editing text?
- ✓ What is DBMS?



5.1 INTRODUCTION

Application software is a software that performs specific tasks for the end user. Effectively, if the user is interacting directly with a piece of software it is application software. For example, Microsoft Word or Excel are application software, as are common web browsers such as Firefox or Google Chrome.

It also includes the category of mobile apps, including communication apps such as WhatsApp or games such as Candy Crush Saga. There are also app versions of common services such as those providing weather or transport information or apps for customers to interact with companies.

Application software is distinct from system software, which refers to the software that actually keeps the systems running such as the operating system, computational science software, game engines, industrial automation, and software as a service application. Instead of interacting with the user, the system software interacts with other software or hardware. In this lesson we will discuss the following application software

- ✓ Microsoft Excel 2003
- ✓ Microsoft word 2003
- ✓ Microsoft Access 2003

5.2 MICROSOFT EXCEL 2003

A spreadsheet is essentially a matrix of rows and columns. Consider a sheet of paper on which horizontal and vertical lines are drawn to yield a rectangular grid. The grid namely a cell, is the result of the intersection of a row with a column. Such a structure is called a **Spreadsheet**.

A spreadsheet package contains electronic equivalent of a pen, an eraser and large sheet of paper with vertical and horizontal lines to give rows and columns. The cursor position uniquely shown in dark mode indicates where the pen is currently pointing. We can enter text or numbers at any position on the worksheet. We can enter a formula in a cell where we want to perform a calculation and results are to be displayed. A powerful recalculation facility jumps into action each time we update the cell contents with new data.

MS-Excel is the most powerful spreadsheet package brought by Microsoft. The three main components of this package are



- ❖ Electronic spreadsheet
- ❖ Database management
- ❖ Generation of Charts.

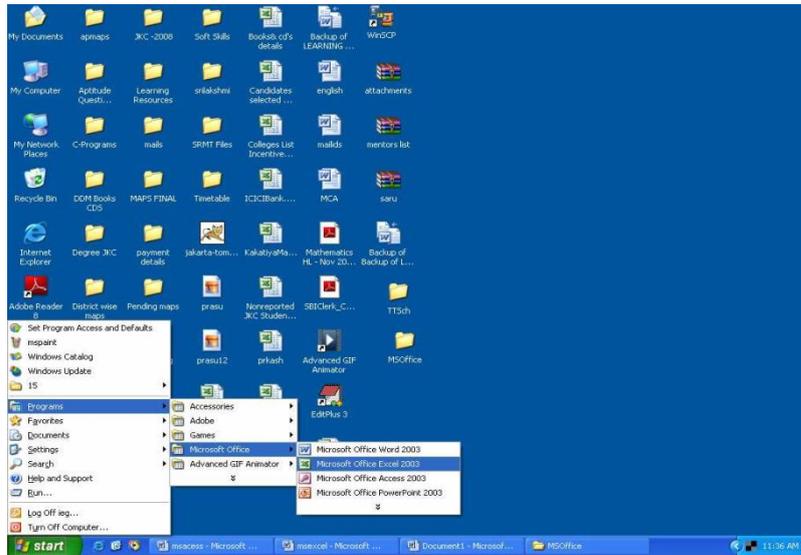
Each workbook provides 3 worksheets with facility to increase the number of sheets. Each sheet provides 256 columns and 65536 rows to work with. Though the spreadsheet packages were originally designed for accountants, they have become popular with almost everyone working with figures. Sales executives, book-keepers, officers, students, research scholars, investors bankers etc, almost any one find some form of application for it.

You will learn the following features at the end of this section.

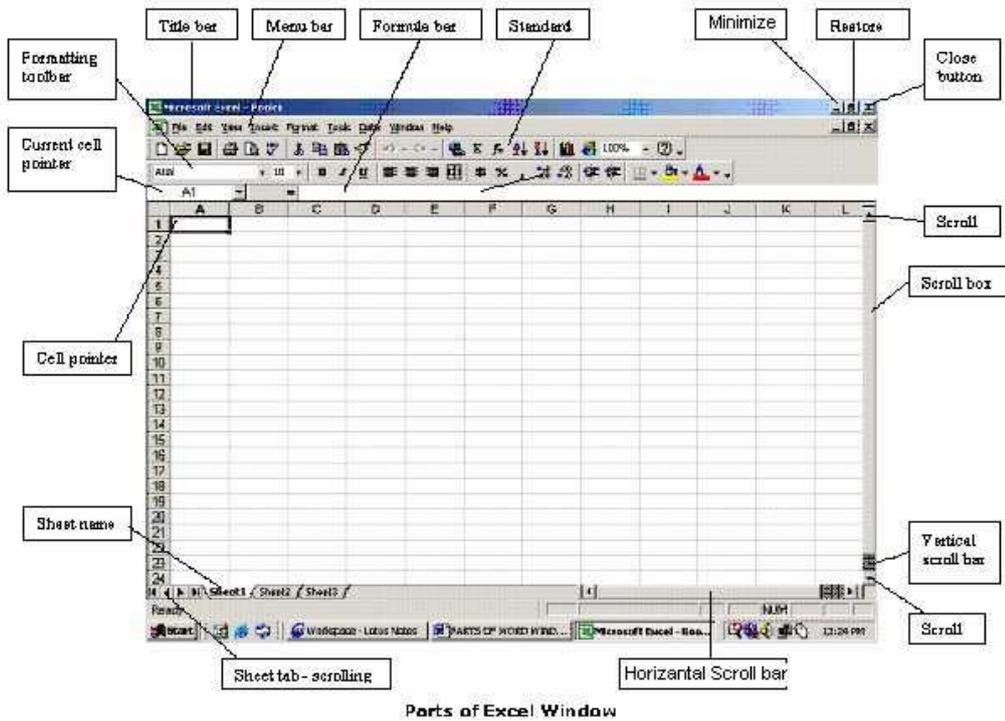
- ❖ Starting Excel 2003
- ❖ Using Help
- ❖ Workbook Management
- ❖ Cursor Management
- ❖ Manipulating Data
- ❖ Using Formulae and Functions
- ❖ Formatting Spreadsheet
- ❖ Printing and Layout
- ❖ Creating Charts and Graphs

Starting Excel 2003

- ❖ Switch on your computer and click on the **Start** button at the bottom left of the screen.
- ❖ Move the mouse pointer to Programs, then across to Microsoft Excel, then click on **Excel** as shown in this screen.



When you open Excel a screen similar to this will appear



The options shown

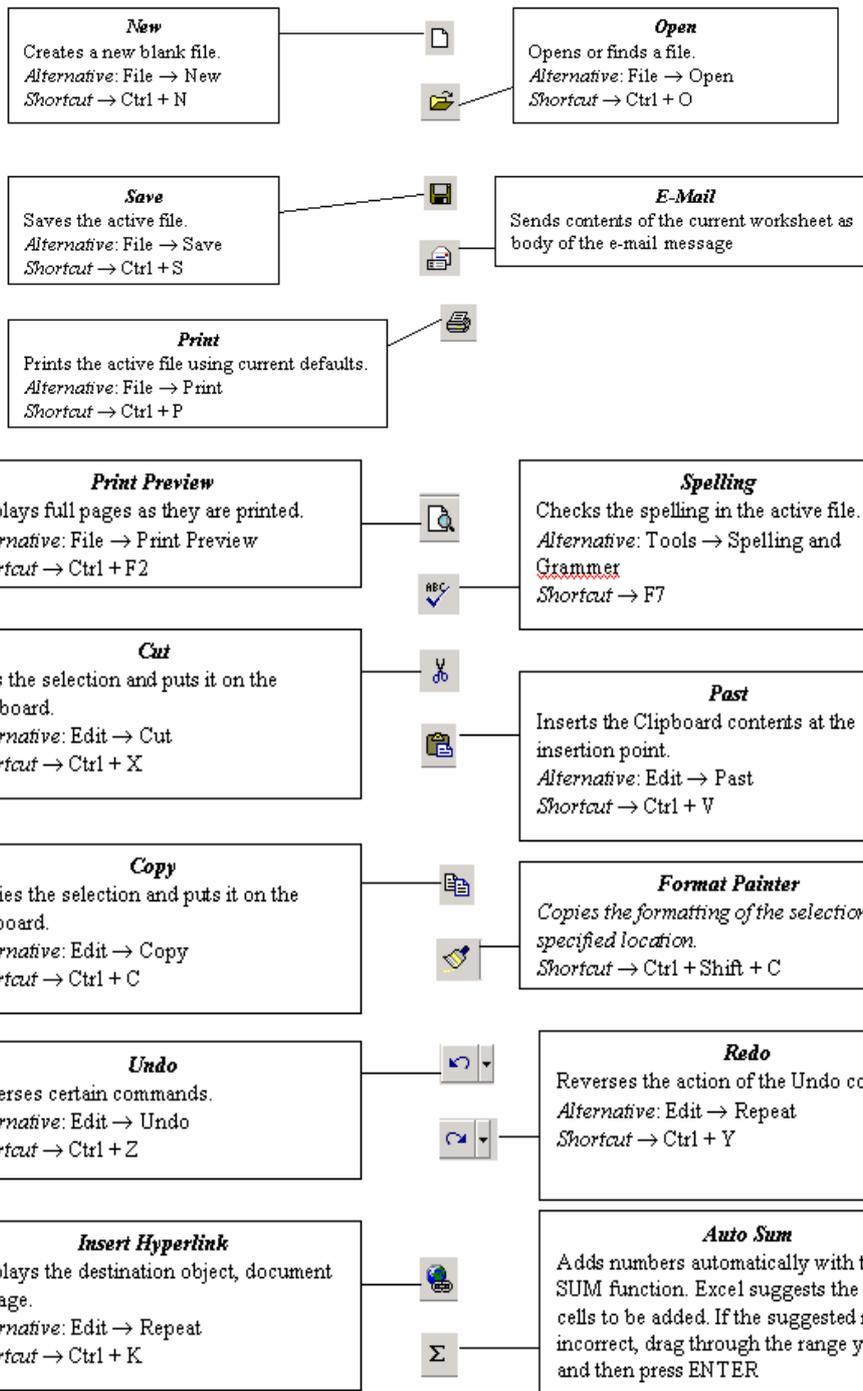
below is called as **Menu Bar**

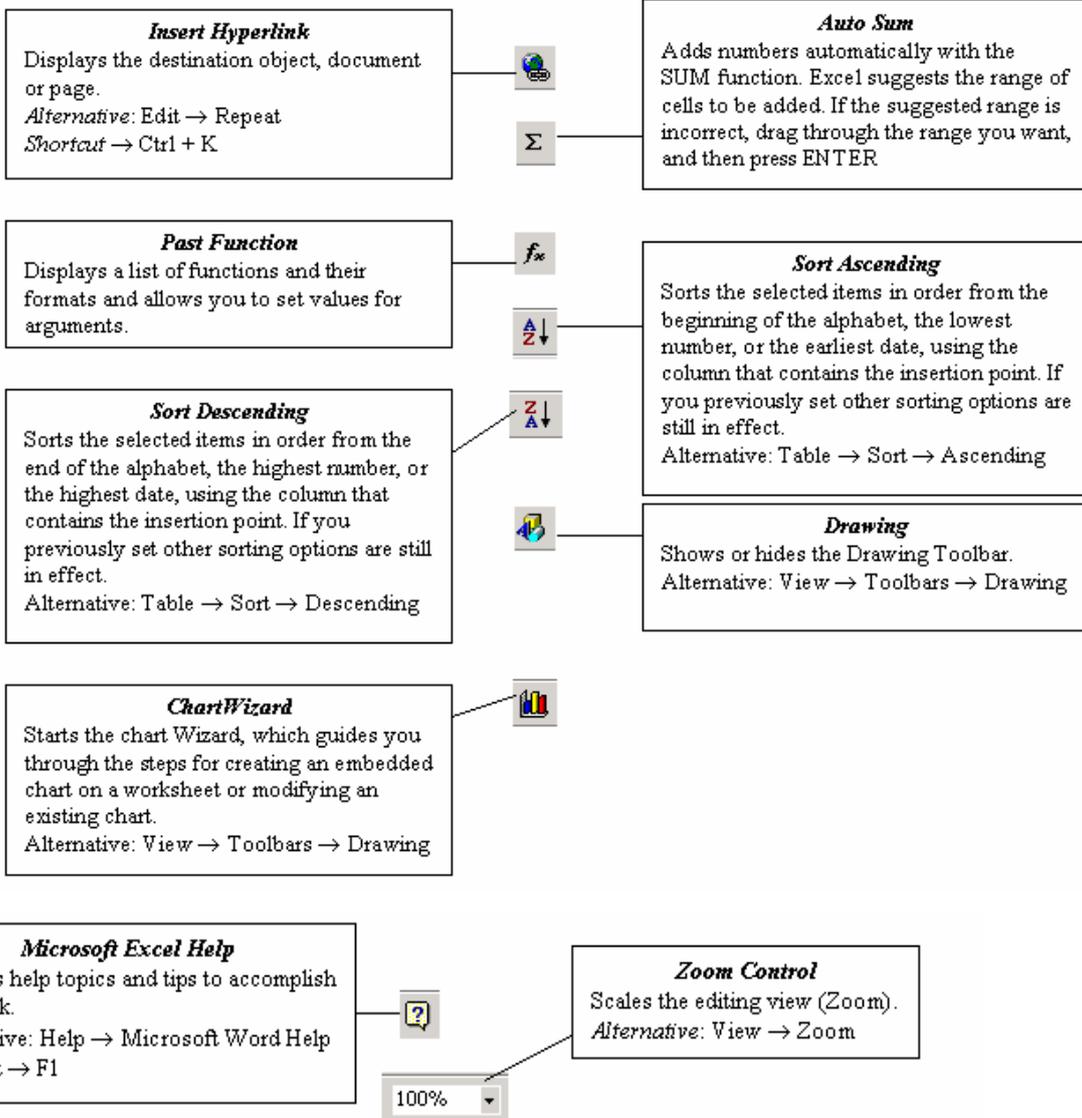




TOOLBARS AND THE ICONS

Standard Toolbar





The **formula bar** is the place in which you enter the formula(=A3*B5)



❖ The alphabets **A,B...** are known as **columns**



This is the name of the workbook. (**Book1**)



❖ The rows are numbered as **1,2,3...**



- ❖ Sheet1, Sheet2, Sheet3 are known as **worksheet tabs**



How to use Help Menu

- ❖ Click on **Help**, **Contents** and **Index**, then click on the **Index** tab. The following screen will appear

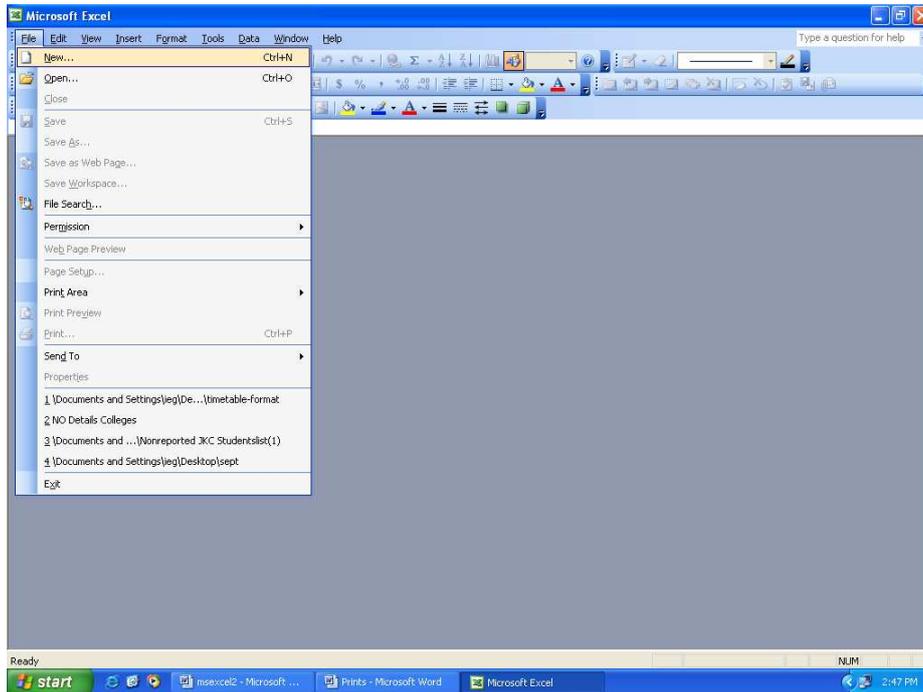


- ❖ Type the first few letters to see the help entries for those letters.
- ❖ You can get the printout of any help topic by selecting it, right clicking and then clicking **Print Topic**.

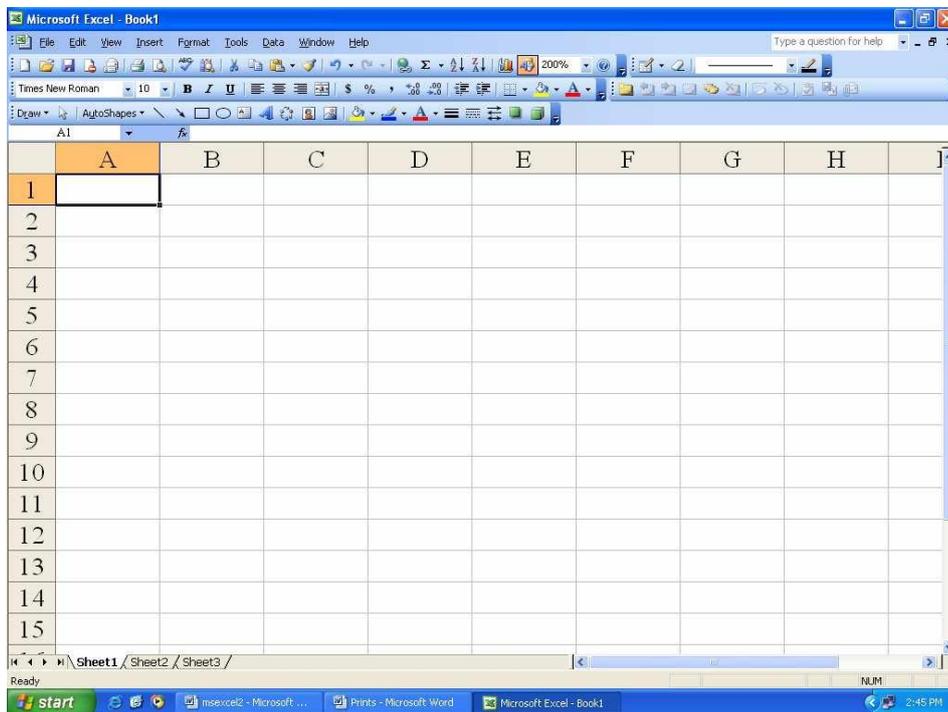
Workbook Management

Task 1: Creating a new workbook

- ❖ Click on **File** menu and then click on **New**.



❖ Click **Workbook** and then click **OK** button. You will get the screen as shown below.



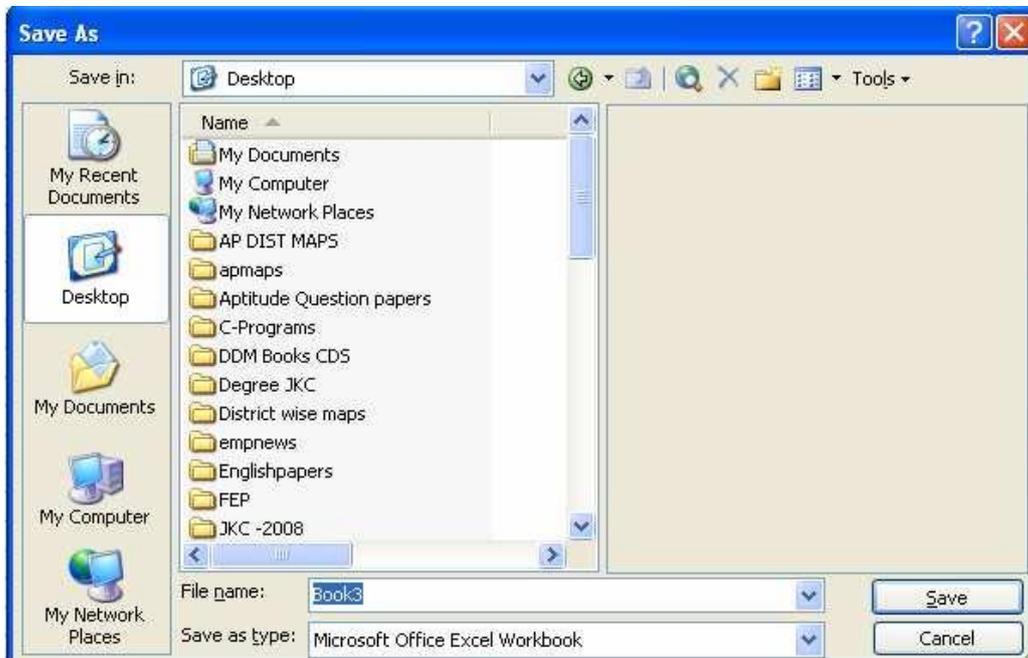
Enter data as shown in the figure below :



	A	B	C	D	E	F	G	H	I
1	Sales Report								
2	Region	January	February	March					
3	North	6000	7000	8000					
4	South	7000	6800	7500					
5	East	4000	5000	6000					
6	West	5000	6500	8000					
7									
8									
9									
10									
11									
12									
13									
14									
15									

Task 2: Saving Workbook

- ❖ Click on **File** menu and then click **save**. You will get the below screen

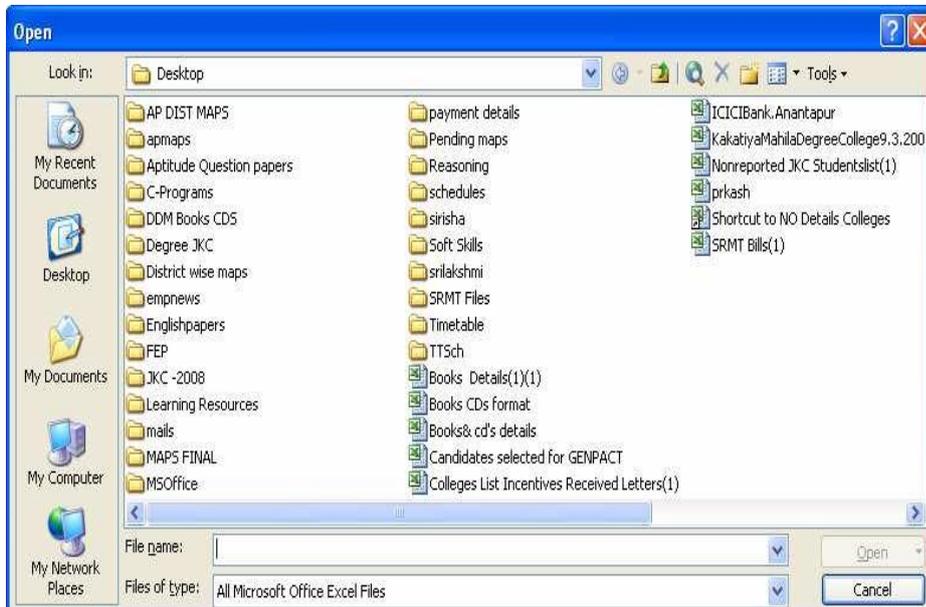


- ❖ In the **File name** text box, type **sample** and then click **Save** button



Task 3: Opening an existing workbook

- ❖ Click on the **File** menu and click on **Open**. The open dialog box will appear



- ❖ Click on some file (Example: **sample.xls**), then click on **Open**.

Task 4: Closing your workbook

- ❖ Click on **File** menu, then click **Close** to close your workbook

Cursor Management

Task 1: Moving around the worksheet

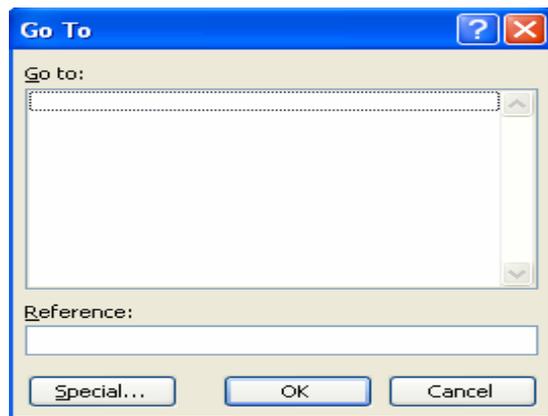
- ❖ Open **sample.xls** workbook.
- ❖ Move the cursor in your worksheet by using the **arrow keys** on the right hand side of the keyboard.
- ❖ When you have got lots of rows of data you can move the cursor more quickly by using the **PgUp** and **PgDn** keys to move up and down a screen at a time.
- ❖ To move one screen to the right, press the **Alt** key and **PgDn** keys together.
- ❖ To move one screen to the left, press the **Alt** and **PgUp** keys together.
- ❖ To move further to the right, just keep pressing the **right arrow key**



- ❖ To move back to cell **A1**, press the **Ctrl** and **Home** keys together.
- ❖ Pressing the **Home** key on its own takes you back to **column A**
- ❖ To move to the last column(**IV**) press the **Ctrl** and **right arrow** keys together.
- ❖ To move to last cell containing data, press **Ctrl** and **End** keys together.
- ❖ To move to the last row(65,536), press **Ctrl** and the **down arrow** keys together.
- ❖ You can also move the cursor with the mouse. Move the mouse pointer to the location you want. Press and release the left mouse button once when the cursor is where you want it.

Task 2: Moving to a Specified cell

- ❖ Click on the **Edit** menu, choose **Go To**. You will get the below screen

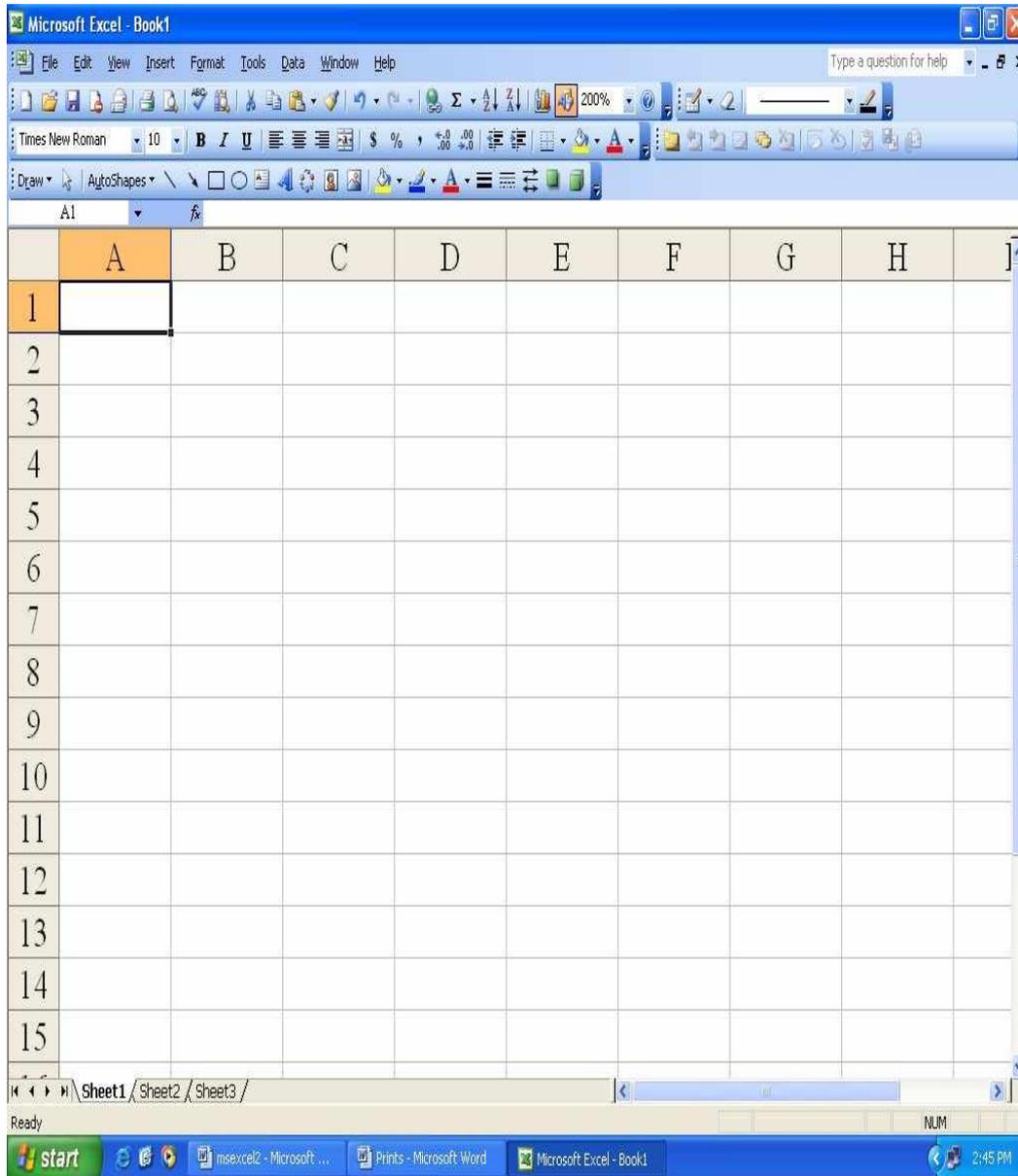


- ❖ Enter the destination cell reference in the **Reference** text box.
- ❖ Click **OK** to move directly to the specified cell.

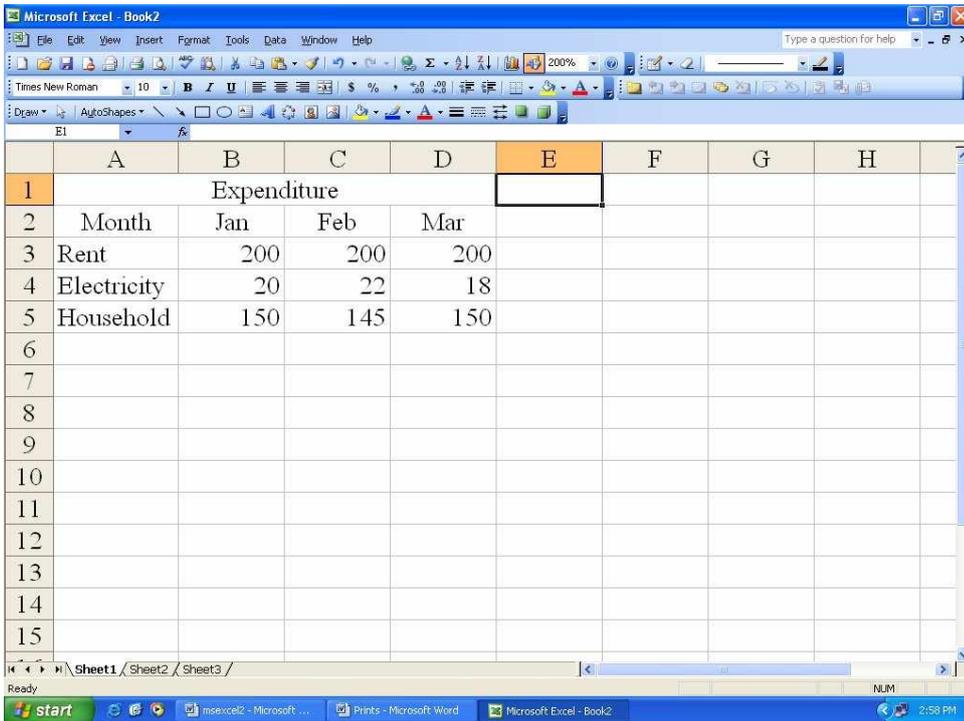
Data Manipulation

Task 1: Entering data

- ❖ Start **Excel**. Click **File** and then **New**. An empty worksheet appears as shown below



- ❖ Type Expenditure in cell **A1** then press **down arrow** key to move to cell **A2**.
- ❖ Type **Month** then press the **down arrow** key to move to cell **A3**
- ❖ Continue to type the data. The resulting worksheet should appear like the following screen.



❖ Save your work by clicking **File** and then **Save As**. This dialog box appears.



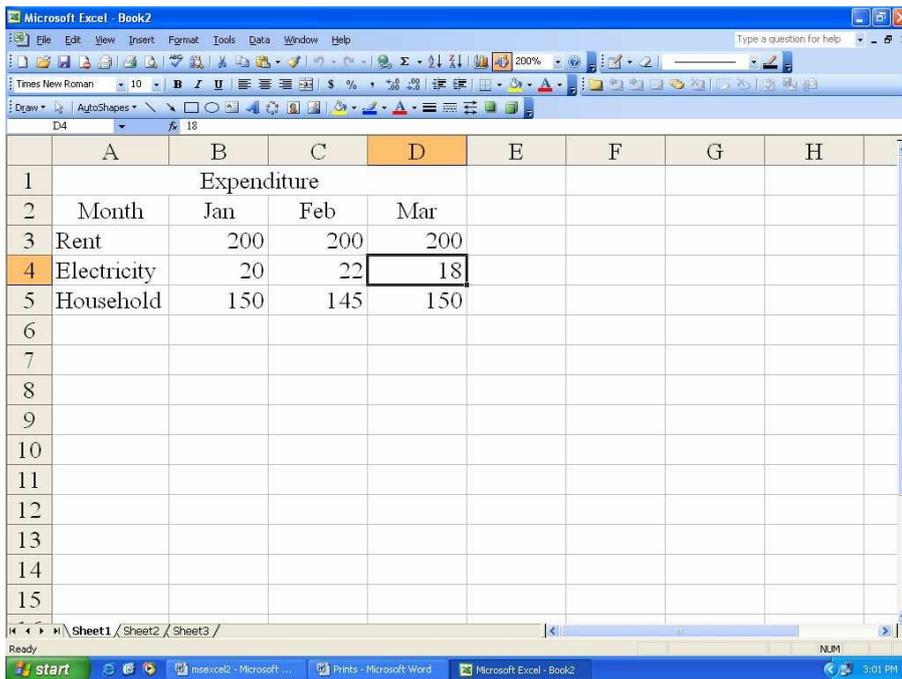
❖ Type **cash** in the **File Name** text box and then click **Save** button.

❖ Excel automatically adds the extension **.xls** to your file name.

Task 2: Editing data



- ❖ Click **File** and then click **Open**.
- ❖ Click **cash.xls** and then click **Open**.
- ❖ Move the mouse pointer to cell **D4**, click and release. The cell is highlighted and 18 appears in the formula bar.
- ❖ Move the mouse pointer to the formula bar and click once to the right of 18.



- ❖ Use the **Backspace** key to delete 8, then type 4 and press **Enter**. Cell D4 now contains the value 14.

Task 3: Replacing cell data

- ❖ Make the cell B5 active by clicking on it.
- ❖ Type 200 and press **Enter**. The cell B5 will now contain the value 200 replacing old value (150).

Task 4: Deleting cell contents

- ❖ Move to cell **C5** and click to **select**.
- ❖ Press the **Delete** key.



- ❖ The cell becomes blank.
- ❖ Drop down the **Edit** menu and click **Undo** to reinstate the 145.
- ❖ Excel 97 allows 16 levels of undo. You can use **Undo** and **Redo** buttons also.

Task 5: Copying data

- ❖ Open the **cash** spreadsheet.
- ❖ Select the cells **D3** to **D5**
- ❖ Click **Edit** menu and then click **Copy**.
- ❖ Select the cells **F3** to **F5**.
- ❖ Click **Edit** menu and then click **Paste**.
- ❖ Now the cells D3 to D5 are copied into F3 to F5.

Task 6: Moving data

- ❖ Open **cash.xls** spreadsheet.
- ❖ Select the cells from **B3** to **B5**.
- ❖ Click **Edit** menu and then click **Cut**.
- ❖ Select the cells **G3** to **G5**.
- ❖ Click **Edit** menu and then click **Paste**.

Task 7: Data Auto Fill

There is an easy method to fill the data in columns and rows. The data may be *Numeric* or *dates* and *text*.

To fill *Sln* by using auto fill

- ❖ Type *Sln* for 2 cells i.e 1,2 in the cells A1 and A2 respectively.
- ❖ Select two cells and drag the Fill Handle



	A	B	C	D	E	F
1	1	2	3	4	5	6
2	2					
3	3					
4	4					
5	5					
6	6					
7	7					
8	8					
9	9					

To fill dates in the cells

- ❖ Type date in the cell
- ❖ Select the cell and drag the **Fill Handle**

	A	B	C	D
1	01/01/2008	02/01/2008	03/01/2008	04/01/2008
2	02/01/2008			
3	03/01/2008			
4	04/01/2008			
5	05/01/2008			
6	06/01/2008			
7	07/01/2008			
8	08/01/2008			
9	09/01/2008			
10	10/01/2008			
11	11/01/2008			

We can customize the lists with different text data to minimize the redundancy of work.

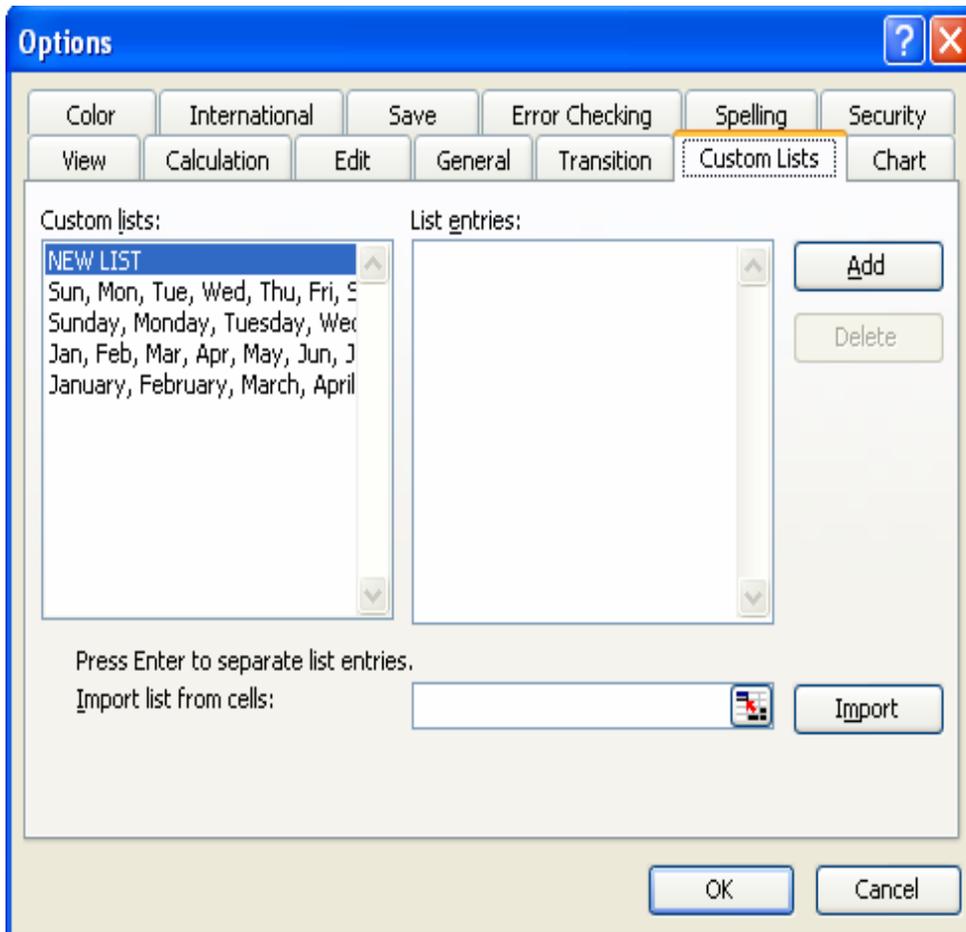
Some of the lists are listed below:

1. Jan, Feb, Mar, Apr, May, June, July.... like months
2. Sunday, Monday, Tuesday, Wednesday, Thursday...Like week days
3. Adilabad, Anatapur, Chittor, Cuddapah... like District names
4. Ravi, Kiran, Praveen, Rama.... like employees list



To create a customized list follow the steps given below:

- ❖ Click **Tools** Menu ,Click **Options** then click **Custom Lists** tab, Then you will find the figure given below:



- ❖ Click **NEW LIST** and enter the list in the List entries window Click **Add** button then click **OK** button then your list will be added to the **Custom Lists**. That list you can use as and when required to type.
- ❖ Now you can Drag the **fill handle** (+) to get the list automatically.

Using Formulae and Functions

Task 1: Entering a formulae

- ❖ Click **File** and then click **New**.



- ❖ Enter the data in the new worksheet as shown below

	A	B	C	D	E	F	G	H
1		Electricity						
2	Month	Jan	Feb	Mar	Apr	May	Jun	
3	Rent	200	200	200	250	300	250	
4	Electricity	20	22	18	25	30	28	
5	Household	150	145	150	130	150	140	
6	Power							
7								
8								
9								
10								
11								
12								
13								
14								
15								

- ❖ Cell B6 should contain formula. Move the cell pointer to cell B6.
- ❖ Type =B3+B5(formulae and functions should always begin with = sign)
- ❖ Cell B6 will now contain the value 350
- ❖ Look at cell B6; you will see the result of the formula in the cell B6 rather than formula.
- ❖ Now repeat the appropriate formula for cell C6, D6.
- ❖ Save your worksheet as cash3.xls.

Task 2: Editing Formulae

- ❖ Move the cursor to the formula bar with the mouse, clicking once.
- ❖ Make the desired changes.
- ❖ When you have finished editing the formulae, press the Enter key for the changes to take effect.

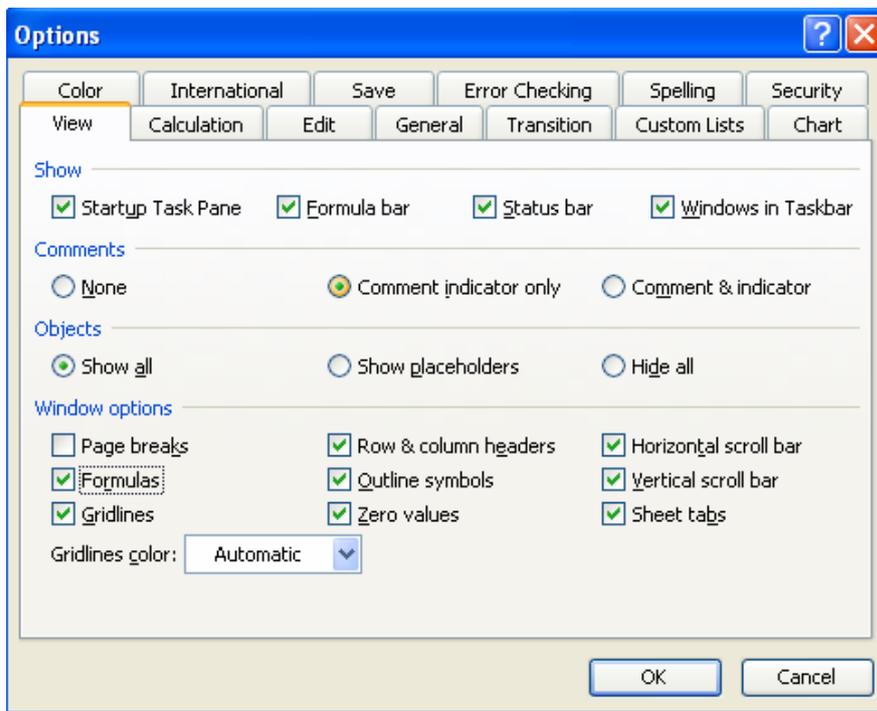
(OR)

- ❖ Edit the contents by pressing F2 key on the keyboard

Task 3: Displaying and Printing formulae



- ❖ Click **Tools** menu and then click **Options**.
- ❖ Click **View** tab.
- ❖ In Window options check Formulas check box. The below screen appears.



- ❖ Click **OK** button.
- ❖ To print the worksheet with formulae displayed, click **File** menu and click on **Print Preview**. If the layout is satisfactory, click on the **Print** button.

Task 4: Using the SUM function

- ❖ Open cash3.xls spreadsheet.

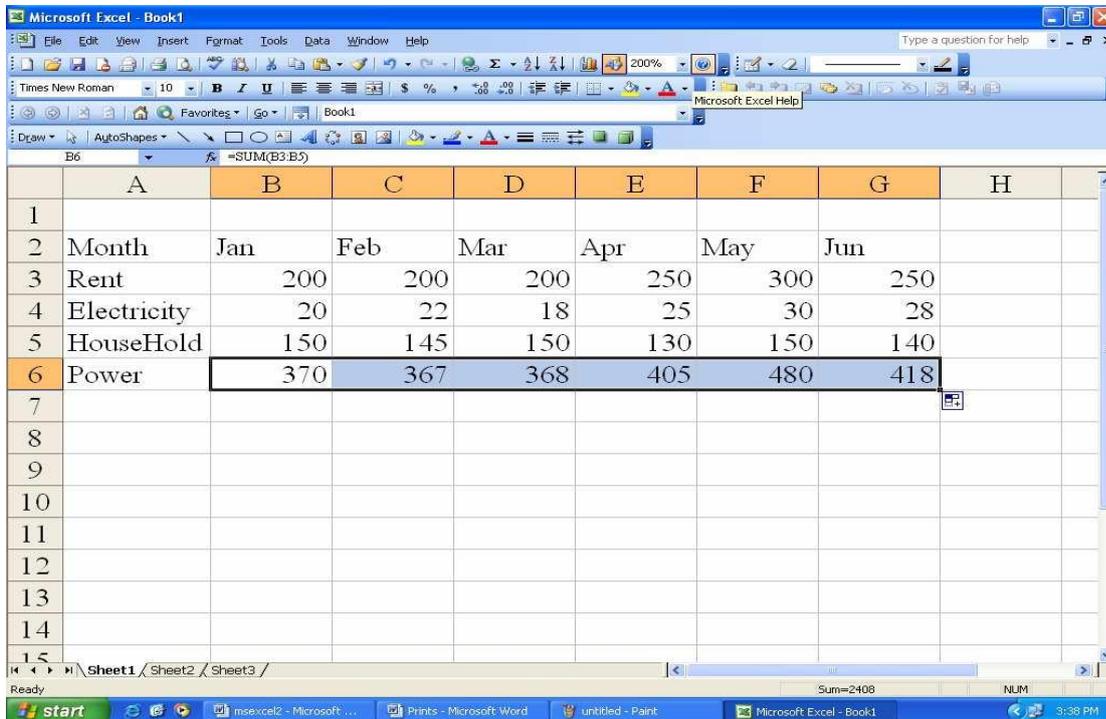
	A	B	C	D	E	F	G	H
1		Electricity						
2	Month	Jan	Feb	Mar	Apr	May	Jun	
3	Rent	200	200	200	250	300	250	
4	Electricity	20	22	18	25	30	28	
5	Household	150	145	150	130	150	140	
6	Power							
7								



- ❖ Suppose if you want the summation of the cells B3 to B5 should appear in the cell B6, then first select the cells from B3 to B6.
- ❖ Click the **Auto Sum**  icon on the toolbar.
- ❖ The result of **(B3+B4+B5)** will appear in the cell **B6**.

Task 4: Copying Formulae

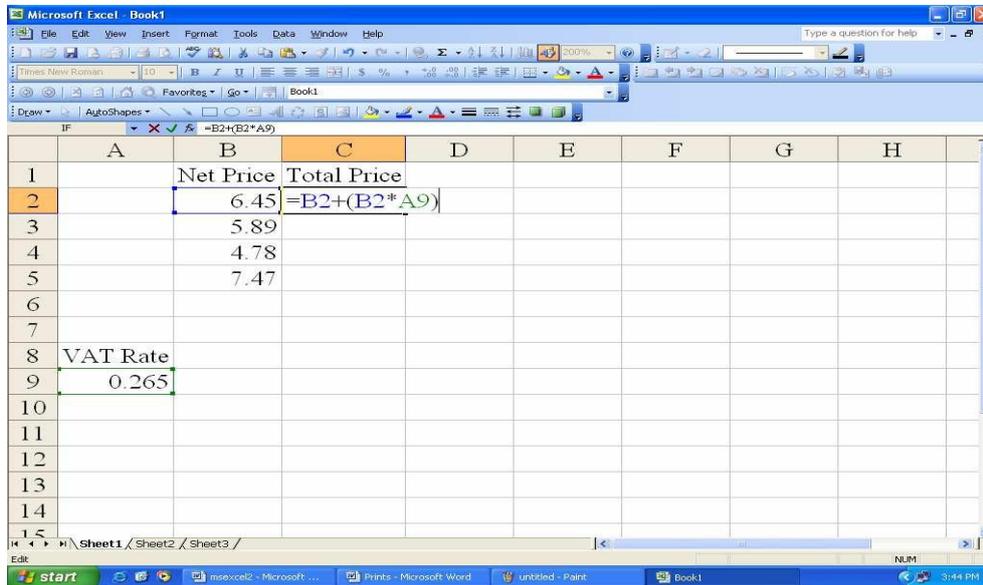
- ❖ Open **cash3.xls** spreadsheet.
- ❖ If you want to copy the formula in the cell B6 to C6,D6,E6 then first select the cell B6.
- ❖ Move the cursor to the lower right corner of the cell B6. The cursor will change to + icon.
- ❖ Drag the cursor from **B6 to E6** and release **left mouse** button.
- ❖ You will notice that the cells C6, D6 and E6 are updated immediately as shown below.



Task 5: Copying formulae using absolute addressing



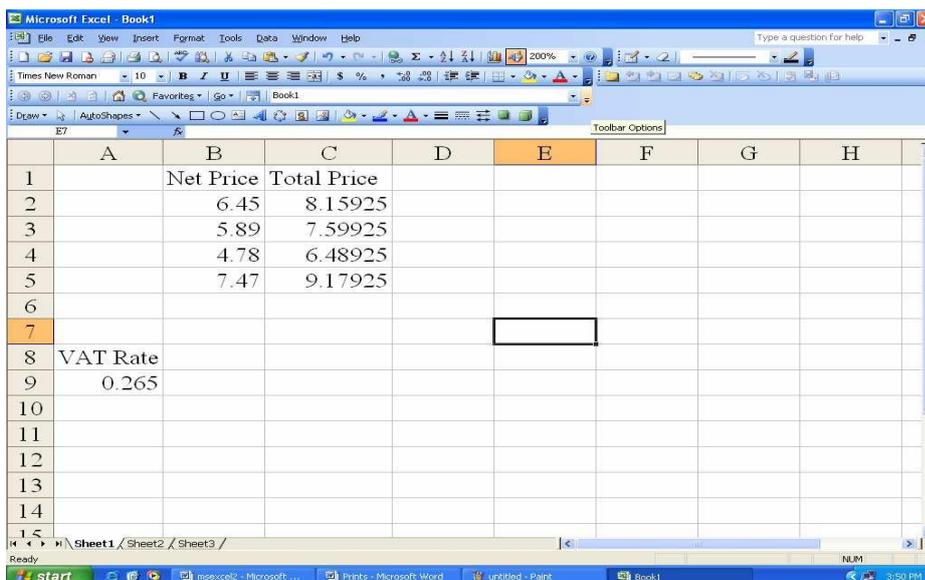
- ❖ Create the worksheet shown below and save ABS
- ❖ If you copy the formula in the cell c2 to c3, c4, c5 you will get the incorrect



❖ result because the formula will change in the cell (C3)to B3*A10 but the value in the A10 is not defined. The reason is that we are copying relative address but not absolute address. To use absolute address move to c2 cell.

❖ Edit the formula to =B2+(\$B\$2*\$A\$9) and press **Enter** key.

❖ Copy the formula to cells C3 to C5.

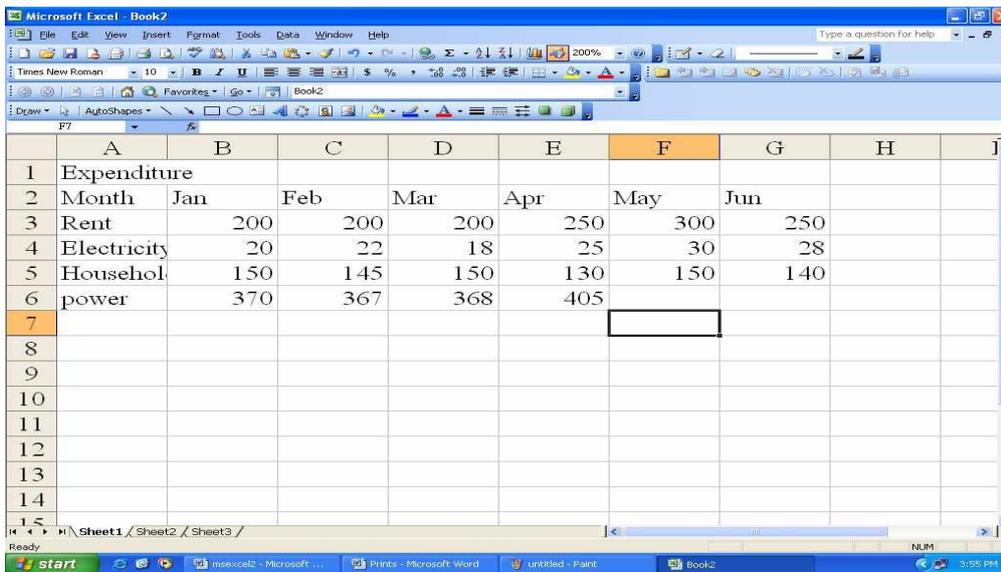




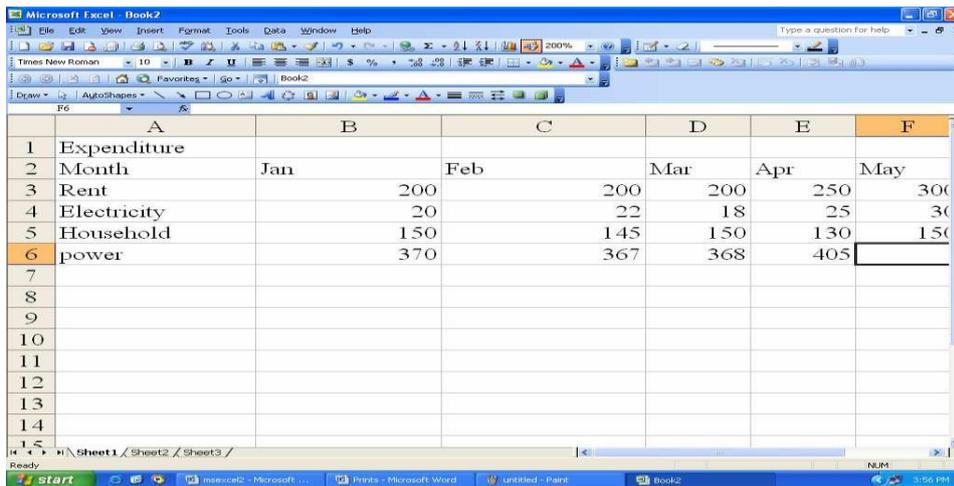
Formatting Spreadsheet

Task1: Increasing column width

- ❖ Open an existing worksheet(For example cash3.xls)



- ❖ Move the mouse pointer to the position(column B)shown below in the column header. When the black cross appears, hold down the left button and drag the mouse to the right to increase the column width by the required amount.



Task 2: Decreasing column width

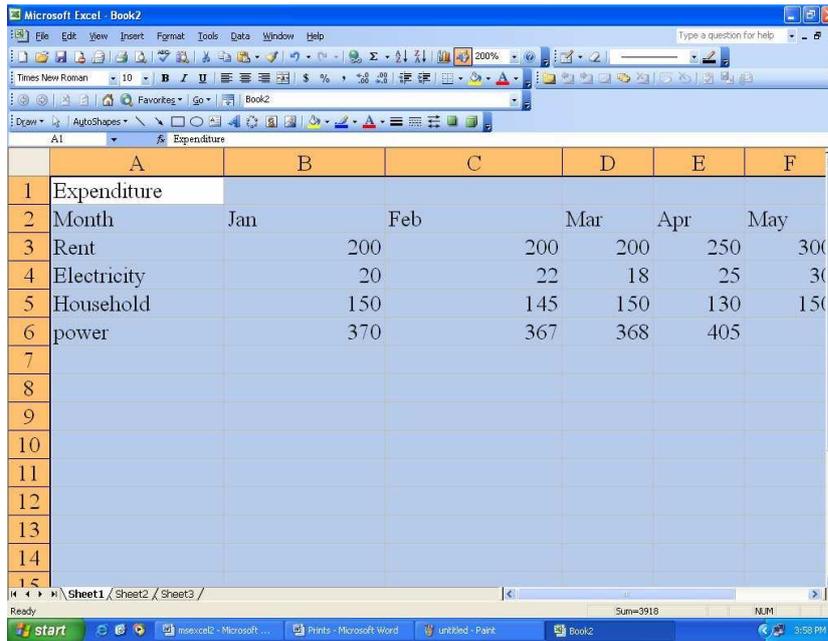
- ❖ Open cash3.xls spreadsheet.
- ❖ Move the mouse pointer to the column B. When the black cross appears, hold down the left



button and drag the mouse to the left to reduce the cell width.

Task 3: Changing width of all cells in a spreadsheet

- ❖ Open **cash3.xls** spreadsheet
- ❖ Select the entire worksheet by clicking the **Select All** button (to the left of A1 cell) at the top left corner of the worksheet. The worksheet changes from white to black.



- ❖ Click **Format** menu, click **Column**, then click **Width**
- ❖ In the column width text box type **20**, then click **OK** button. Your worksheet cells should all increase in width.



- ❖ You will get the below screen. You will notice that widths of all columns are now changes to 20



	A	B	C	D
1	Expenditure			
2	Month	Jan	Feb	Mar
3	Rent	200	200	200
4	Electricity	20	22	18
5	Household	150	145	150
6	power	370	367	368
7				
8				
9				
10				
11				
12				
13				
14				

- ❖ Click the **Undo** button to revert to the previous cell width.

Task 3: Inserting Columns

- ❖ Open **cash.xls** spreadsheet.
- ❖ Move to cell **B2** and **click**.
- ❖ Click **Insert** menu, click **Columns**. You will get the below screen.

	A	B	C	D	E	F
1	Expenditure					
2	Month		Jan	Feb	Mar	Apr
3	Rent		200	200	200	
4	Electricity		20	22	18	
5	Household		150	145	150	
6	power		370	367	368	
7						
8						
9						
10						
11						
12						
13						
14						



- ❖ A blank column will be inserted before(to the left of column B)

Task 4: Deleting Column contents

- ❖ Open **cash.xls** spreadsheet.
- ❖ Move the mouse pointer to column **E** header and click to select **column E**

	C	D	E	F
1	Expenditure			
2	Jan	Feb	Mar	Apr
3	200	200	200	250
4	20	22	18	25
5	150	145	150	130
6	370	367	368	405
7				
8				

- ❖ Press **Delete** button. The column contents will be deleted.
- ❖ Click **Undo** button to revert to the previous screen.

Task 5: Removing columns, rows, and cells completely

- ❖ Select individual columns or rows or cells.
- ❖ Click **Edit** menu and click **Delete**

Task 6: Inserting a row

- ❖ When you insert a row, it is inserted above the current row, so if you want to insert a new row above row 6(between rows 5 and 6), place the cursor on a cell in row 6 and Click on the **Insert** menu.
- ❖ Click Entire Rows insert a blank row between rows 5 and 6.

Task 7: Deleting row contents

- ❖ Open **cash.xls** spreadsheet.



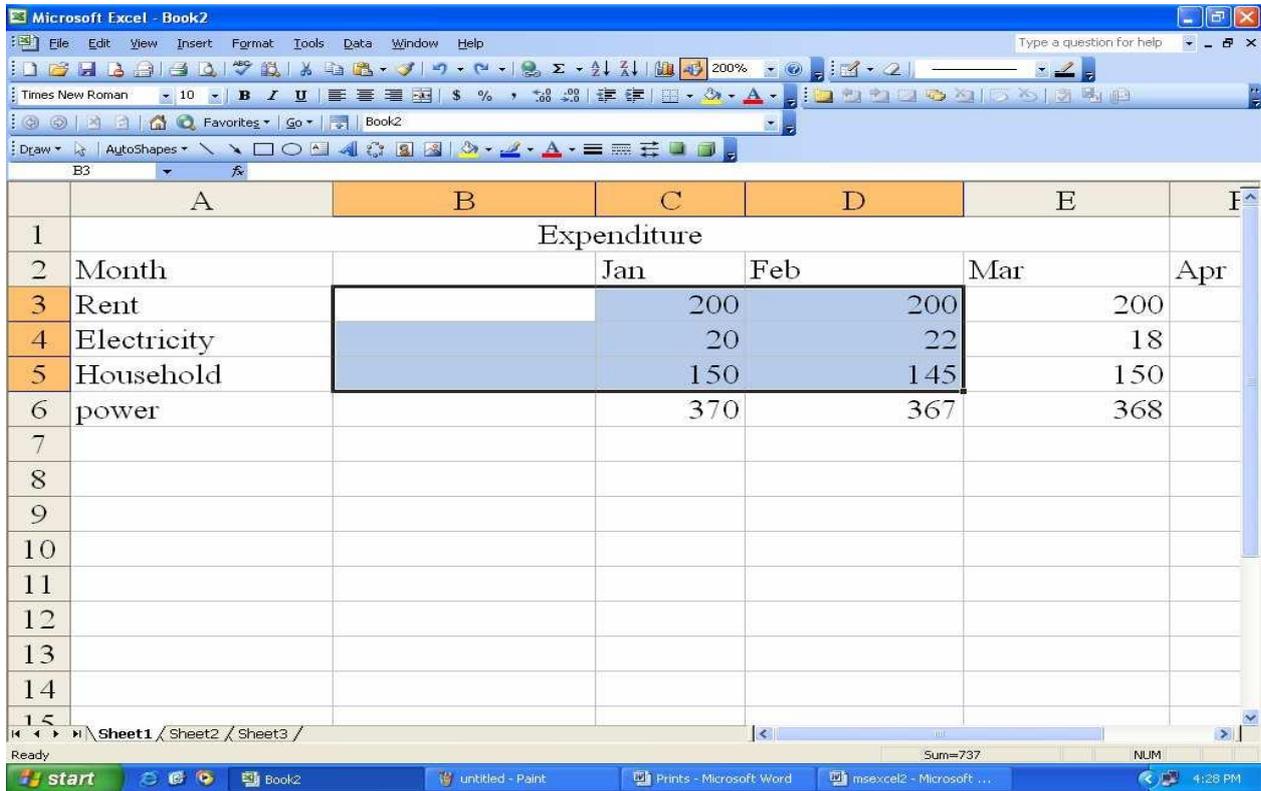
- ❖ Move the mouse pointer to row 2 header and click to select the row as shown below

	A	B	C	D	E	F
1	Expenditure					
2	Month	Jan	Feb	Mar	Apr	
3	Rent		200	200	200	
4	Electricity		20	22	18	
5	Household		150	145	150	
6	power		370	367	368	
7						
8						
9						
10						
11						
12						
13						
14						
15						

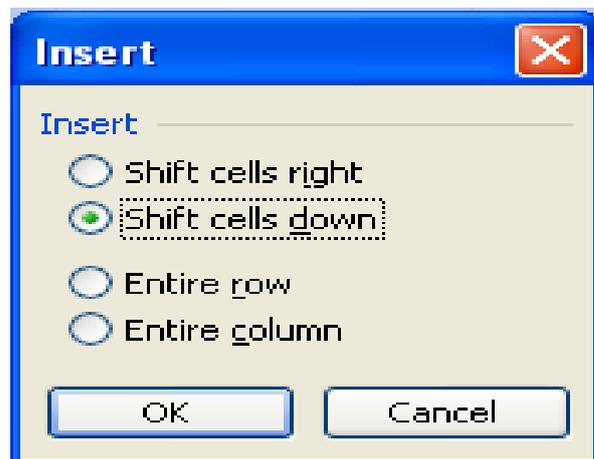
- ❖ Press **Delete** to remove the contents of row.
- ❖ Click the **Undo** button to cancel the delete operation.

Task 8: Inserting cells

- ❖ Open **cash.xls** spreadsheet.
- ❖ Select cells **B2** to **D4** by moving the mouse pointer to cell **B2**, holding down the **left mouse** button and dragging the mouse pointer to cell **D4**, then releasing the left button. The cells should be highlighted.



- ❖ Click **Insert** menu and click **Cells**. This dialog box appears.
- ❖ Click **OK** to shift the cell down.

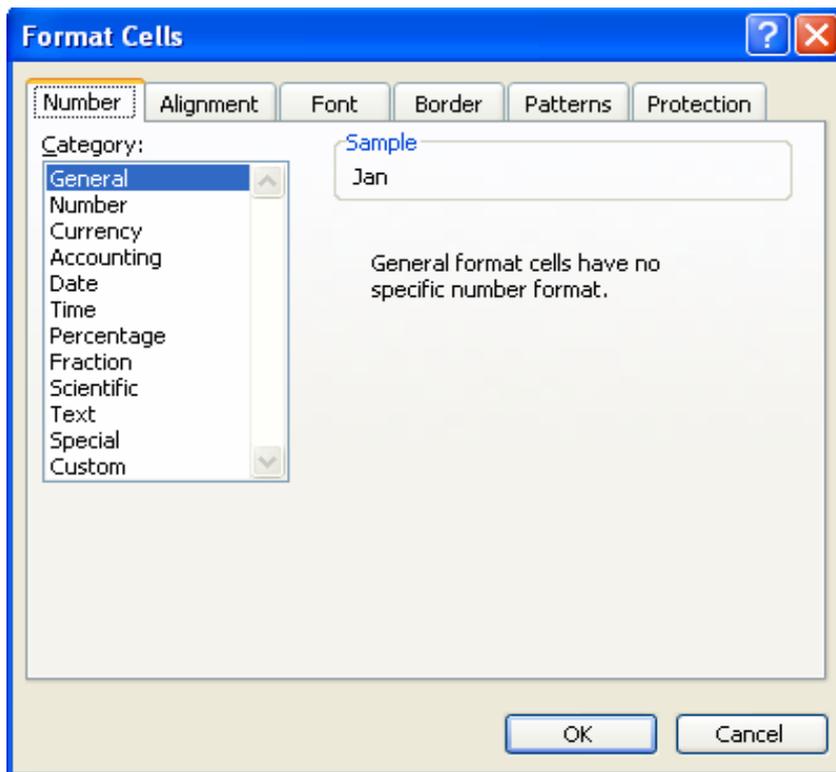


Task 9: Formatting cells



	A	B	C	D
1				
2		Marks		
3		200	66.66666667	
4		440	22.22222222	
5		640	213.33333333	
6				
7				

- ❖ Create a new spreadsheet as shown above and save it as “marks.xls”
- ❖ Now you can format the cells in column C by selecting column C by clicking on the column heading



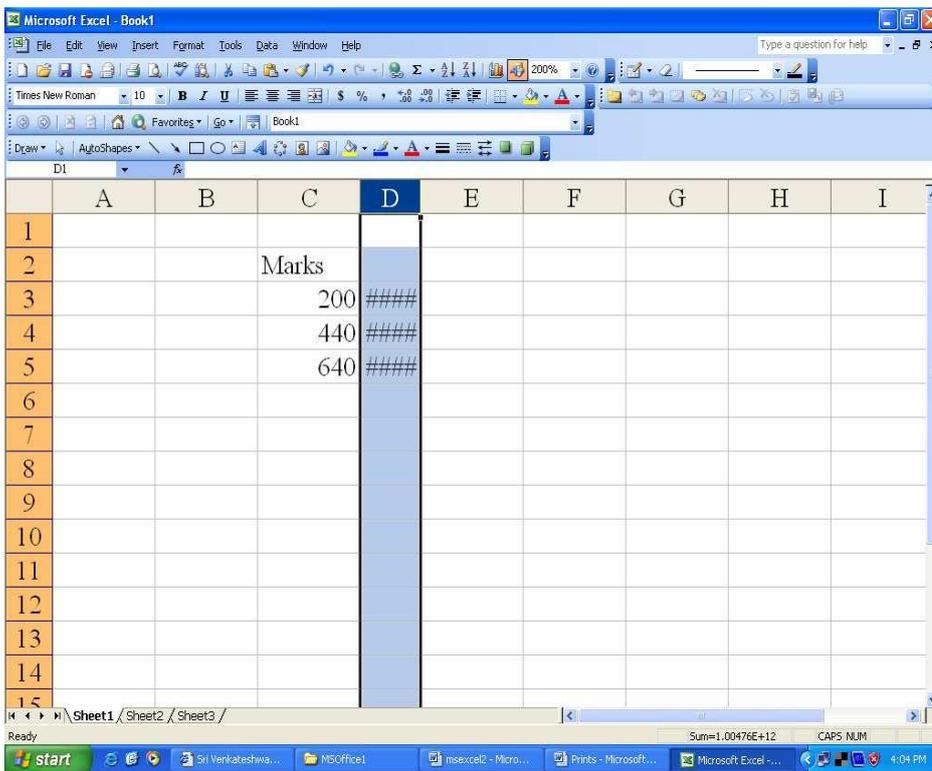
- ❖ Click **Format** menu and click on **Cells**. Click on **Number**.
- ❖ Use the Down arrow in the Decimal Places to set to 0. Click **OK**.
- ❖ Now repeat the formatting but this time format the cells to two decimal places.



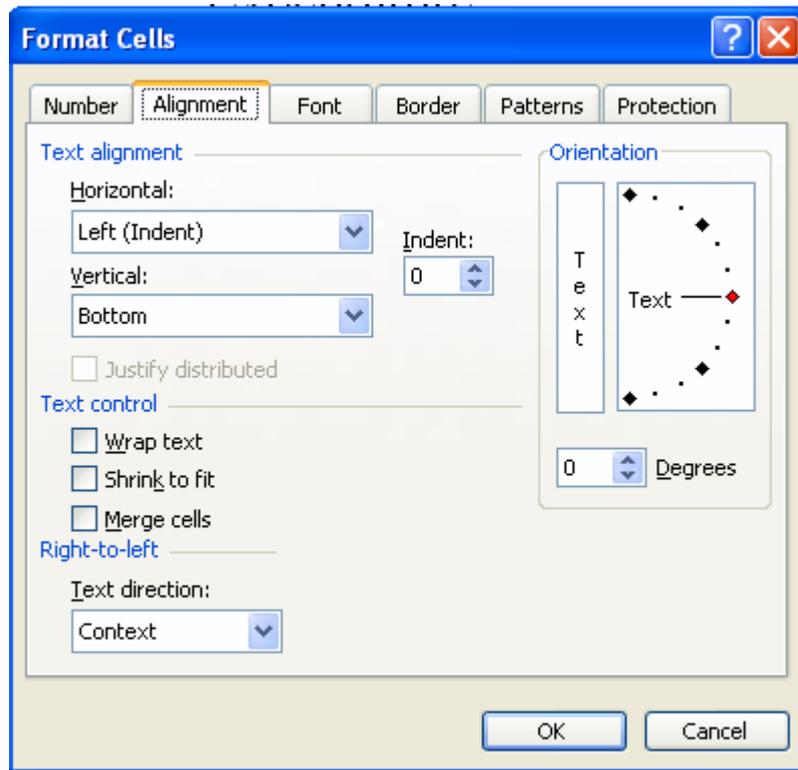
- ❖ Again, repeating the formatting operation, but this time to four decimal places.
- ❖ Finally, format the cells to eight decimal places. This screen will appear.
- ❖ The ##### symbols indicate that the cell is too narrow to display the data in the chosen format. However, if you increase the cell width sufficiently, the data will be displayed to eight decimal places.
- ❖ Increase the width column C until the data is displayed.
- ❖ Now change the formatting back to two decimal places, and reduce the column width to a suitable width.

Changing the data Orientation (Vertical, Horizontal etc.)

Excel offers three options that let you control the orientation of the text within a cell. These are *Text alignment*, *Text orientation*, and *Text control*.



Vertical text alignment can be any one of the following



To display text vertically in a cell:

- ❖ Choose Cells from the Format menu. Click the Alignment Tab.
- ❖ Specify the desired text orientation by selecting one of the orientation boxes.
- ❖ Select the Wrap text check box, if you want Excel to wrap the text
- ❖ Click OK

Here are some examples of the different alignment options

	A	B	C	D	E	F
1	Horizontal Text	Wrapped Horizontal Text	Vertical Text	Vertical Text with wrap	Slant text	Wrapped slant text



- ❖ Select vertical list box and select top to align the data at the top of the cell (Eg: cell A1)

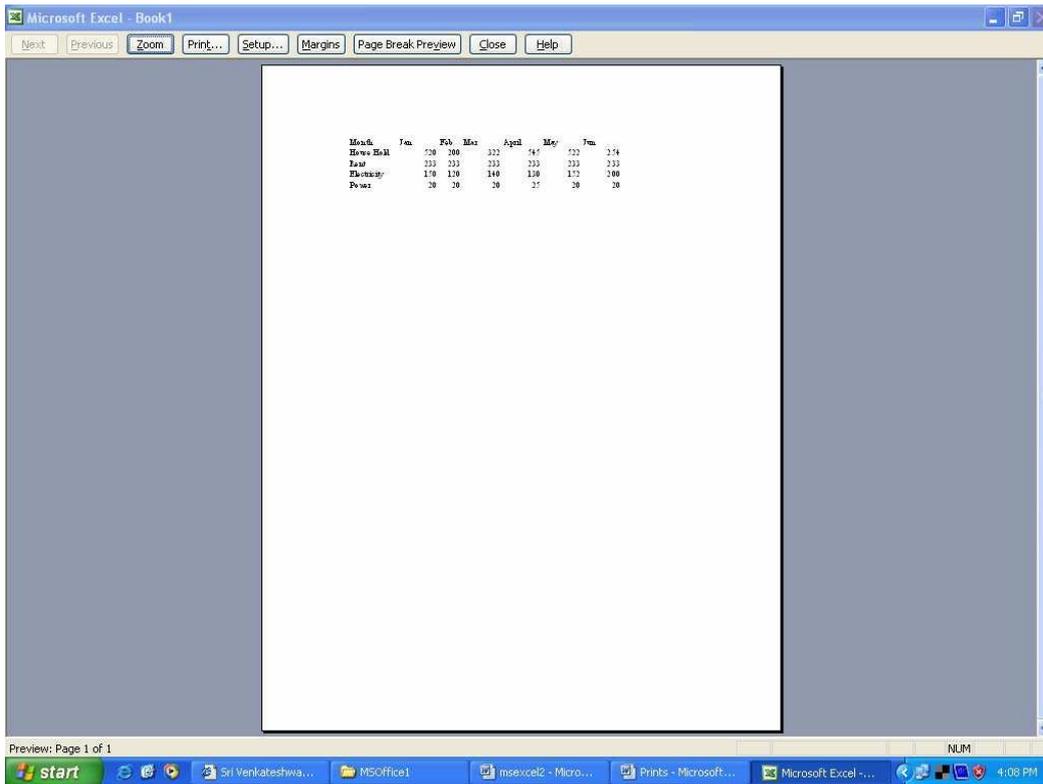
The below figure shows you different Text control options.

	A	B	C	D	E
1	Text control with Wrap text	Text control with Shrink to fit	Text control with merge cells		

Printing and layout

Task 1: Previewing a printout

- ❖ Open **cash.xls** spreadsheet.
- ❖ Click on the **File** menu and click on **Print Preview**. A screen similar to this should appear.



- ❖ Since the size of the text is very small, you can click on **Zoom** button, it magnifies the worksheet. Clicking on **Zoom** second time returns you to the original preview format.
- ❖ Press **PgDn** to move through your worksheet if it is more than one page long.



❖ Before printing make sure that your printer is switched on, is loaded with the appropriate paper, and is on-line.

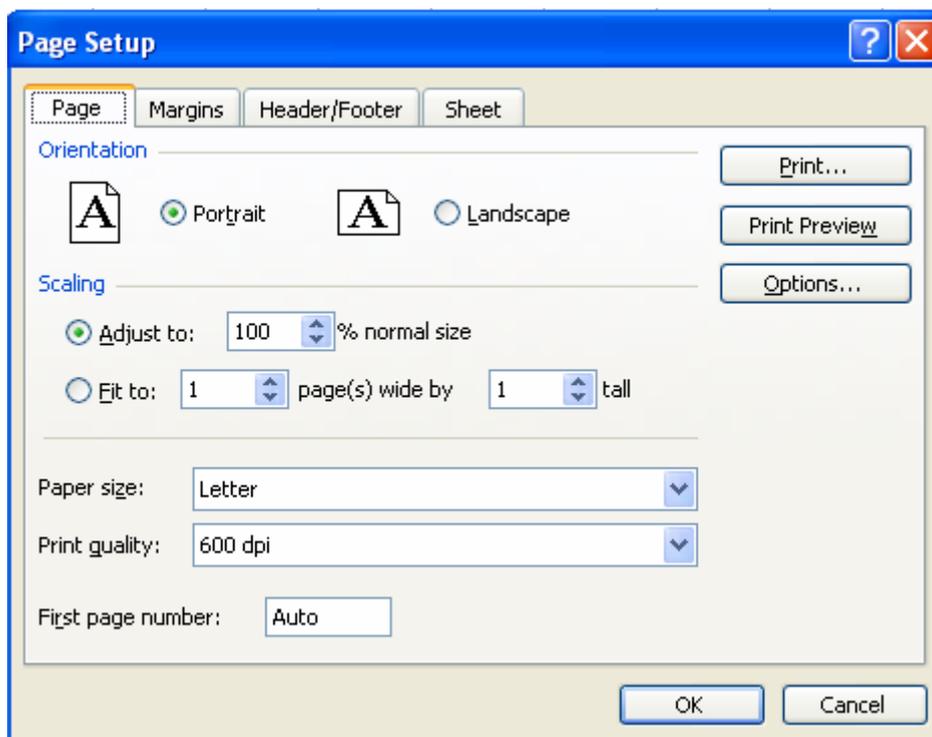
Print...

❖ If you are happy with the layout of your document, click on the **Print** button to obtain a printout. You should see a message on screen telling you that your file is being printer, and on which paper.

Task 2: Printing landscape

❖ To select landscape mode, click on the **File** menu, **Page Setup** this screen will appear.

❖ Click on the **Landscape** button.



Task 3: Fitting your worksheet to one page

❖ In the above screen click on the **Fit To:** box and type: 1 page wide by 1 page tall.

❖ If you need to make changes to your worksheet before printing, click on the **Close** button to return to your workbook.

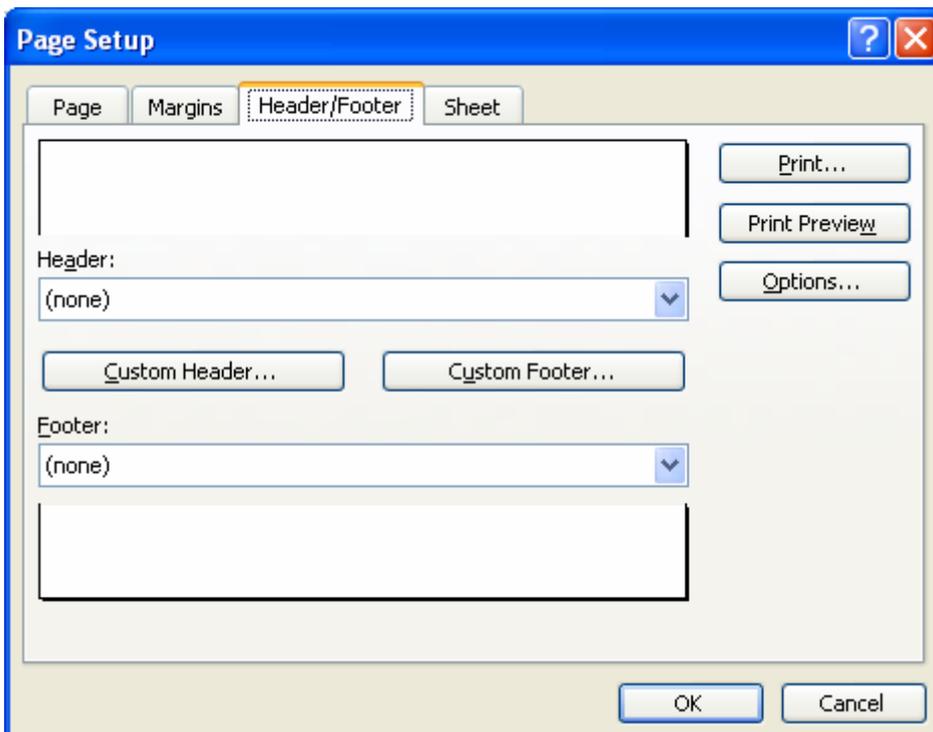
Task 4: Adjusting margins



- ❖ In the **Page Setup** dialog box, click the **Margins** tab and enter the appropriate sizes (in inches or centimeters)

Task 5: Setting Header/Footer to your worksheet

- ❖ From the **Page Setup** dialog box, click on the **Header/Footer** tab to display the below screen.



- ❖ In the **Header box** either you select a title from the **drop down** menu or enter your own title. Similarly for **Footer box** also you can set your own title.
- ❖ Click on **OK**.

Task 6: Printing selected cells

- ❖ Open **cash.xls** spreadsheet.
- ❖ Click on the row 2 button (or any other row containing data) to highlight the entire row.
- ❖ Click on **File, Print Area, Set Print Area**. The preview screen should only display the selected cells. (Row 2).



- ❖ If the preview is satisfactory, click the **Print** button to print out only row 2.
- ❖ Click on **File, Print Area, Clear PrintArea** to reset the PrintArea.

Creating charts and graphs

Task 1: Creating a Pie Chart

- ❖ Open **cash.xls** spreadsheet.
- ❖ Select the cells **A1 to G5** as shown below

	A	B	C	D	E	F	G
1	Expenditure						
2	Month	Jan	Feb	Mar	Apr	May	Jun
3	Rent	200	200	200	250	300	250
4	Electricity	20	22	18	25	30	28
5	Household	150	145	150	130	150	140

Click on **Insert** menu and click **Chart** option. This will start the Office Assistant, to guide you through creating chart.

- ❖ Follow the instructions in each step of the Wizard. The Assistant explains each step.
- ❖ At step 3, you can specify the **Chart title**, **X-axis title** and **Y-axis title** separately.
- ❖ At step 4, click **As object** in sheet 1, then click **Finish**.
- ❖ Your chart is now finished. Save as **cash4**. Your chart is saved with the spreadsheet. This type of chart is known as an **embedded chart** and is saved with its worksheet.

Task 2: Creating charts when the data range is not continuous

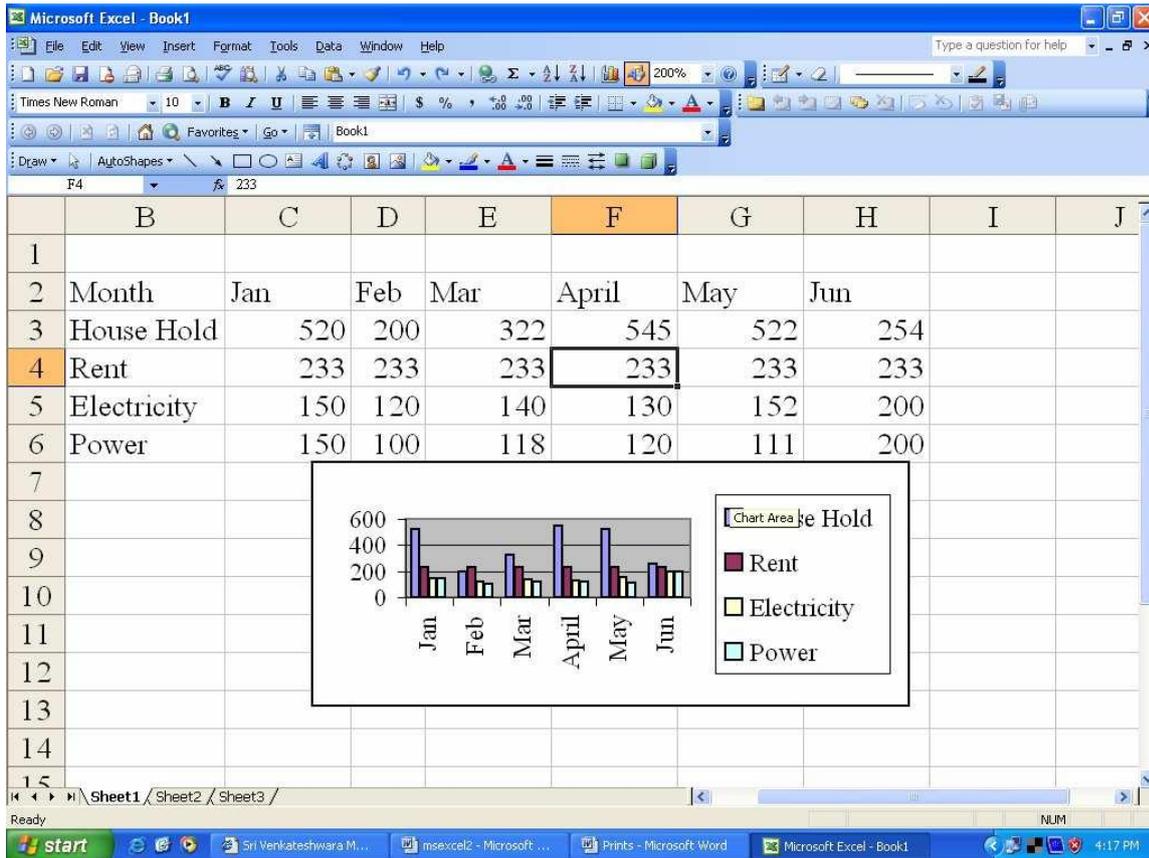
- ❖ Open **cash4.xls**
- ❖ If your requirement is create a chart to show expenditure for February, then first select cells **A2 to A5**.
- ❖ Hold down the **Ctrl** key and, while holding it down, select cells **C2 to C5**. Your screen should be similar to this one.
- ❖ Click on the **Chart** Wizard and create a **column chart**. Your screen should look similar to this.



- ❖ If your chart doesn't appear to show any data, you probably included some other cells, probably A1 and/or C1. If so, delete your chart and re-select the correct range.

Task 3: Sizing a chart

- ❖ Open the **cash3.xls** created earlier. A screen similar to this one should appear.



- ❖ The small black markers at each corner and mid-way along each side of the chart. These indicate that the chart is selected, and are called its selection squares.
- ❖ Click on the mid-point marker on the right-hand side, hold down the left mouse button and drag the mouse to the right about one inch(3cm), then release the mouse. The width of the chart will have increased.
- ❖ Now practice the same operation on the mid-point marker of each of the other sides of the chart.
- ❖ Now try the above, but this time on one of the four corner markers. Note that when you use



these techniques, the whole chart changes in size, but it retains its original proportions.

- ❖ Now use the same technique to reduce the size of the chart.

Task 4: Deleting Charts

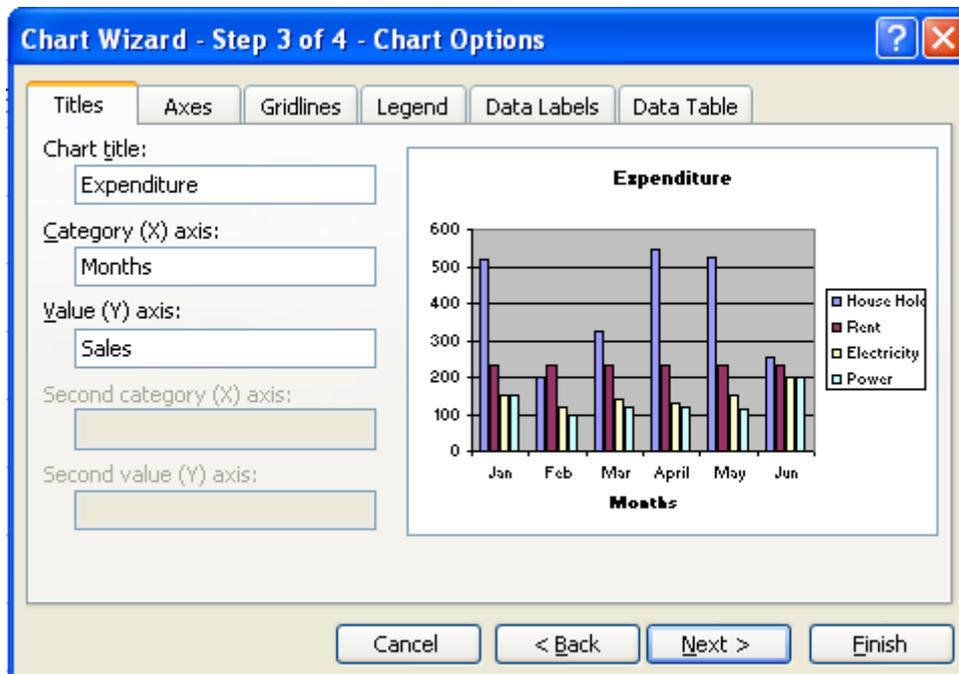
- ❖ Make sure the chart is selected (the small black markers are visible). If not, move the mouse pointer into the chart area and click and release the **left mouse button** once.
- ❖ Press **Delete** to delete the chart.

Task 5: Moving charts and graphs

- ❖ Make the chart active.
- ❖ Move the mouse pointer into the chart area.
- ❖ Hold down the left mouse button and drag the chart to the desired position.

Task 6: Chart headings and labels

- ❖ While creating charts the step 3 asks for Chart heading, labels for X-axis and Y-axis. You can define your own labels or click **Next** button so that the default values can be accepted.



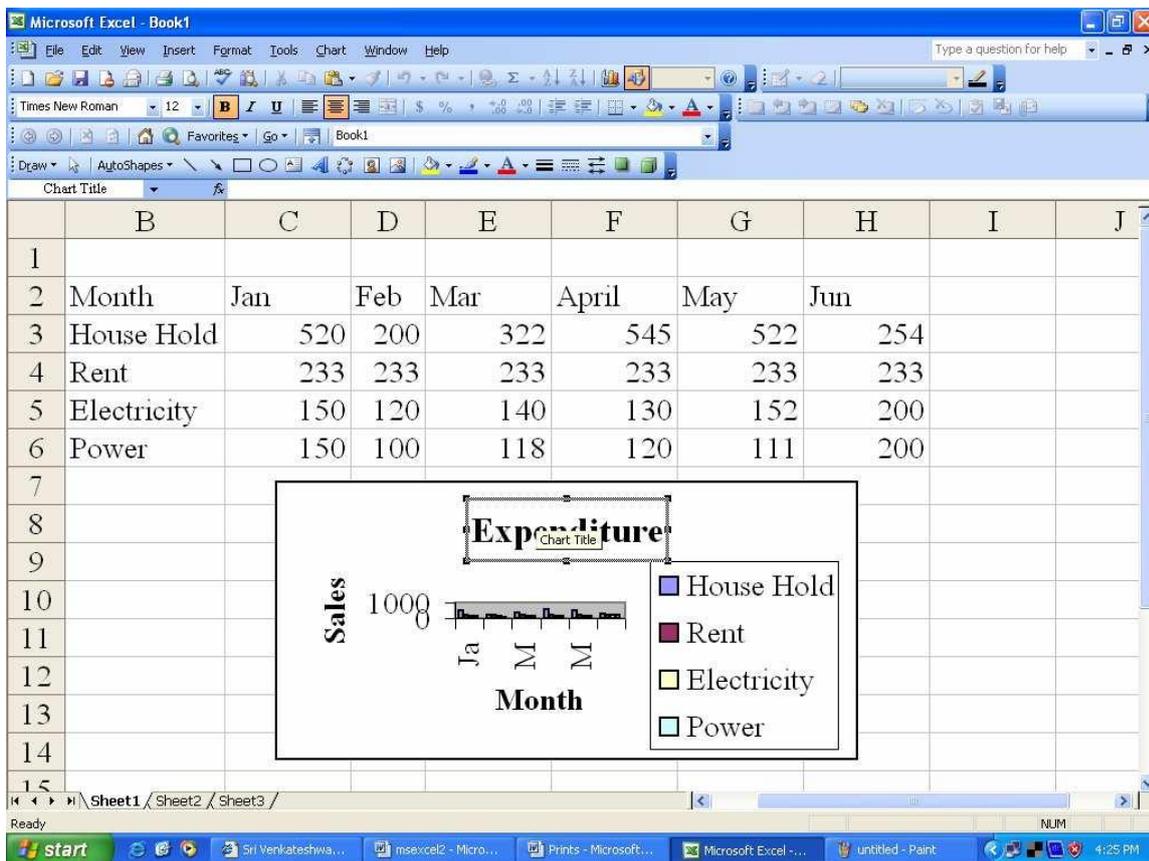
- ❖ For example Chart title is Expenditure, X-axis label is months and Y-axis label is



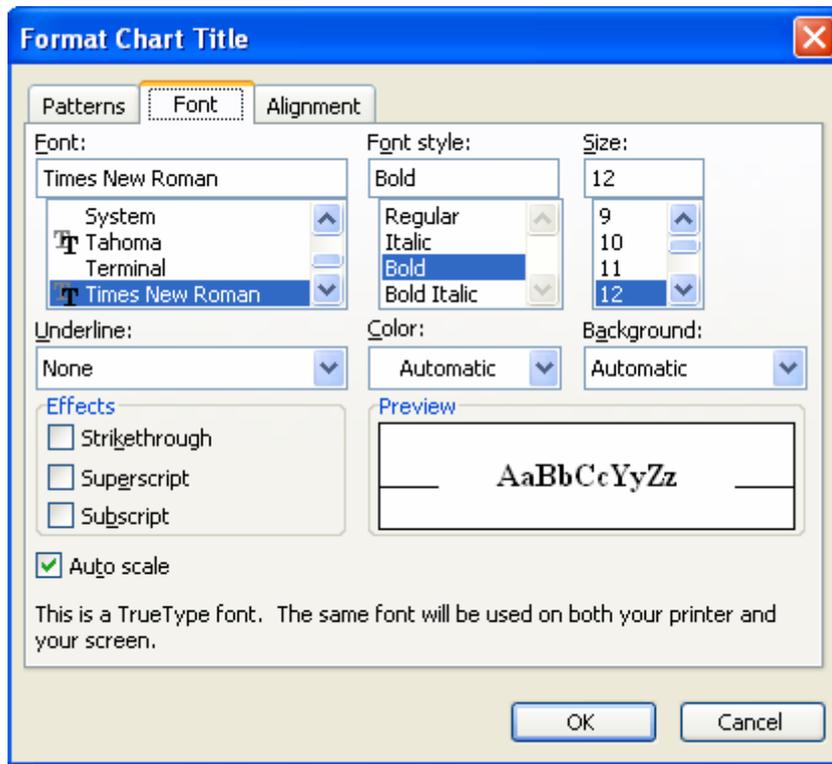
Sales.

Task 7: Editing chart items

- ❖ Create the chart as shown below and save it as **cash4.xls**.



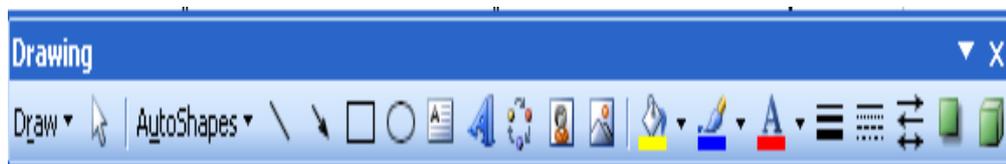
- ❖ Click the chart title(Expenditure). Selection markers(small black squares) will appear around the selected item.
- ❖ You can move or size the title in the same way that you can move or size a chart. Click the title box and drag it up by about one inch (3 cm), then release the mouse.
- ❖ You can format the title by selecting it, then right clicking and then selecting “**Format Chart Title**” from the drop down menu. You will get the below screen.

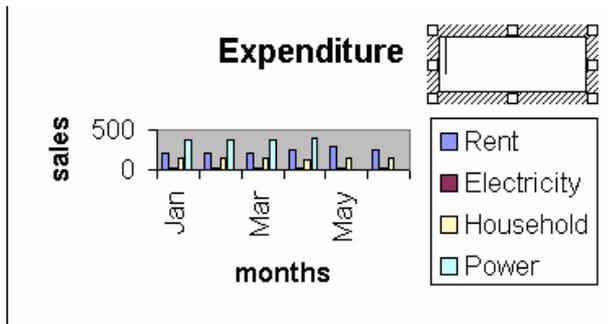


- ❖ You can select **font type**, **font style** and **font size** as shown above
- ❖ Click OK.

Task 8: Adding text to a chart

- ❖ Open **cash3.xls** worksheet.
- ❖ Click **View** menu, click **Toolbars, Drawing**.
- ❖ Click the **Text box** icon on the Drawing toolbar.
- ❖ Draw a text box inside the chart area as shown below

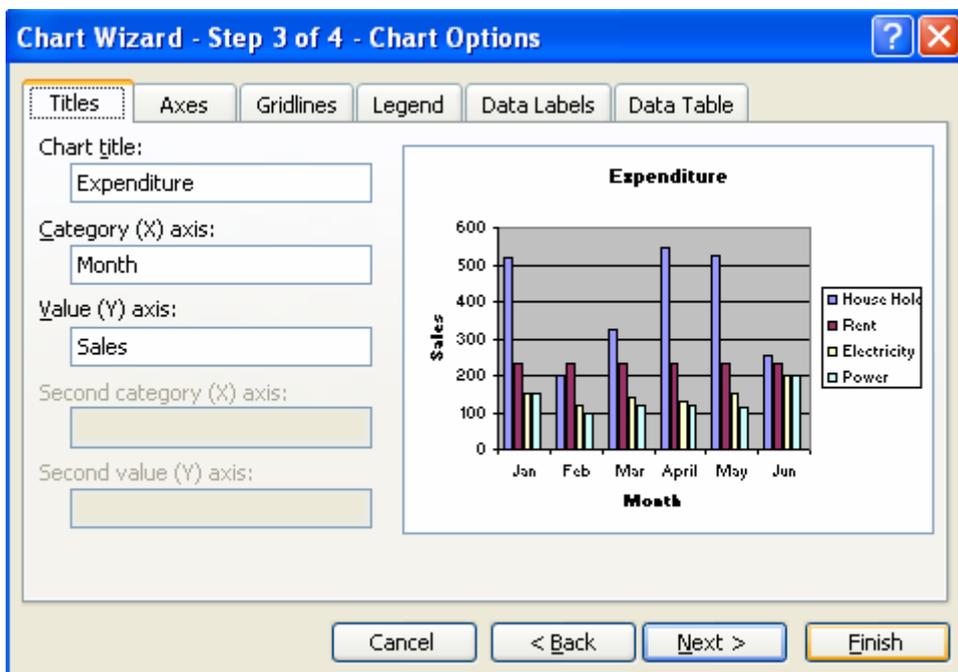




- ❖ Click inside the text box. A flashing text cursor will appear. Now type Household Expenditure
- ❖ You can use the same procedure for any other text that you want to appear in charts.

Task 10: Adding gridlines to a chart

- ❖ Open **cash3.xls** worksheet and change chart type to Column chart.
- ❖ Click **Chart**, Chart options to display this box.
- ❖ Click the **Gridlines** tab and tick the gridlines boxes required.



6.3 MICROSOFT WORD 2003

Word Processing is perhaps the most common and comparatively easier application to work on any



computer. A word processor lets you to change words or phrases, to move whole sections of text from one place to another, store blocks of text, align margins all in few seconds. Use of word processors has changed the look of official correspondence, reports, and proposals etc. to a great extent. MS Word is an advanced word processing product by Microsoft company. The powerful features of Word will allow you to create even graphic based multicolumn publications such as Fliers, Newsletters and Internet web pages.

This section provides an overview of MS - Word and deals with the following features:

- Starting MS-WORD-2003
- File management
- Editing documents
- Formatting documents
- Printing documents
- Inserting pictures into document
- Tables
- Password protect of document
- Inserting objects of other types (MS-Excel, Photo Editor etc.)
- Other features
- Mail merge

START WORD 2003

Switch on your computer. Click Start button then point to Programs and then click on MSWord. You will get a screen as shown below:

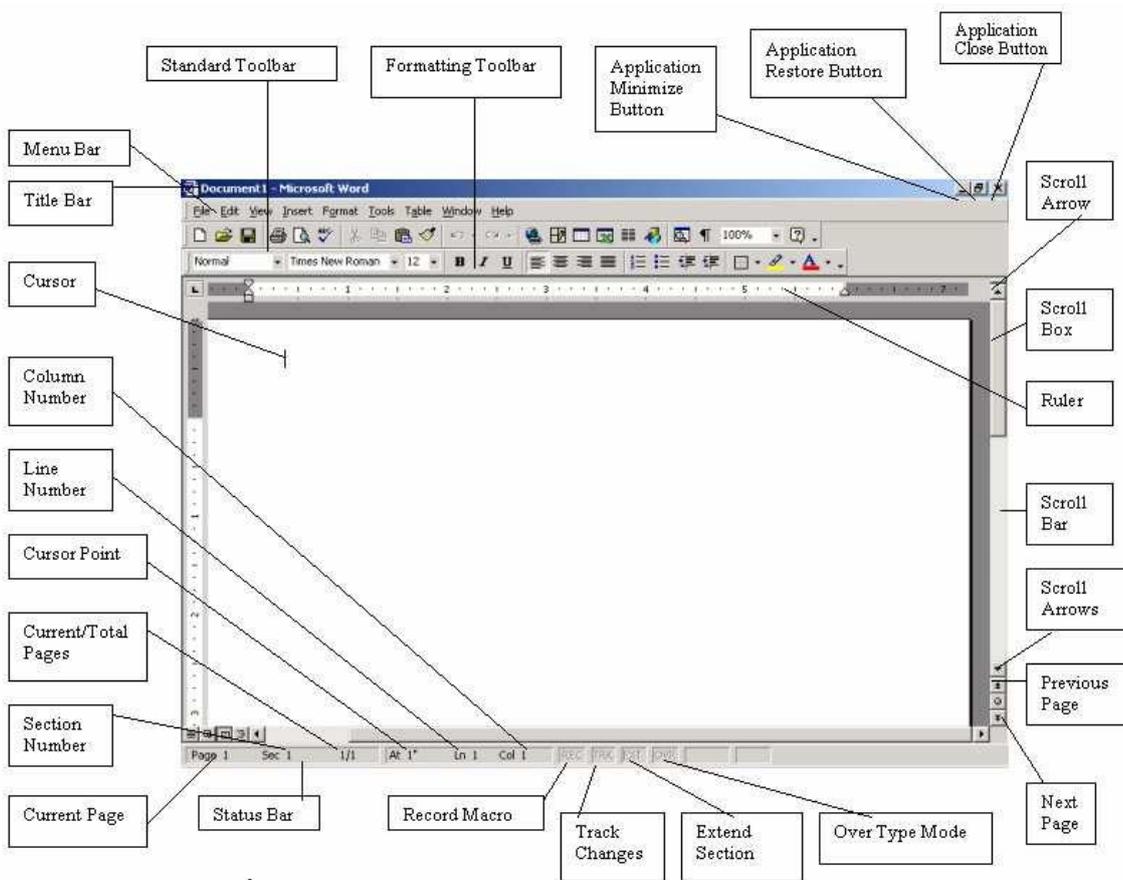
PARTS OF WORD WINDOW

Please see the picture below for a visual image of parts of an active window has:

Menu bar This is the traditional windows style drop-down menu. When you point to any menu title and



click once with the mouse, the menu will open displaying all the commands available under this menu. Clicking on the desired command would tell Word to execute that command. Some commands have ellipses (...) in front of them. These commands have further sub commands. Commands appearing in dim mode cannot be executed unless the prerequisite functions required by that command have been performed, e.g. you cannot use the Copy or Cut command from the Edit menu unless you have selected a piece of text first. Many commands also have a keyboard shortcuts specified against their names.



Title bar: This tells you which application package is currently running and which document is currently open.

Standard toolbar Toolbars contain buttons, drop-down menus and other controls that help you to quickly alter the appearance and arrangement of documents by executing a variety of word commands. Toolbars are very helpful and convenient in quickly executing commands without having to go through menus. The standard toolbar contains icons for basic functions like opening files, saving files, printing files, cut, copy, paste etc.



Formatting toolbar This contains icons for changing the look of your text (called “formatting” in computer jargon); for example, there are icons for changing fonts, styles, font sizes, text alignment etc.

Ruler The Ruler lets you make changes to margins and indents, and helps you create document as per dimensions required.

Scroll tools These helps you travel within your document. You can go anywhere, up and down, right and left in your document mainly by two ways: Using the horizontal and vertical scroll bars with the help of the mouse; Or using the keyboard to press PgUp, PgDn, Home, End and arrow keys.

Status bar Also called the Status Area, this is the normally the last line on your screen. This gives the following information about your work—

Current Page

Section Number

Current/Total pages in the document

Current Cursor Position (where the cursor is presently located) Current Line Number

Current Column Number

Record Macro-whether macro recording is On or not

Track Revision-whether revisions have been made or not

Extend Selection

Over type mode-whether you are in Insert mode or overwrite mode

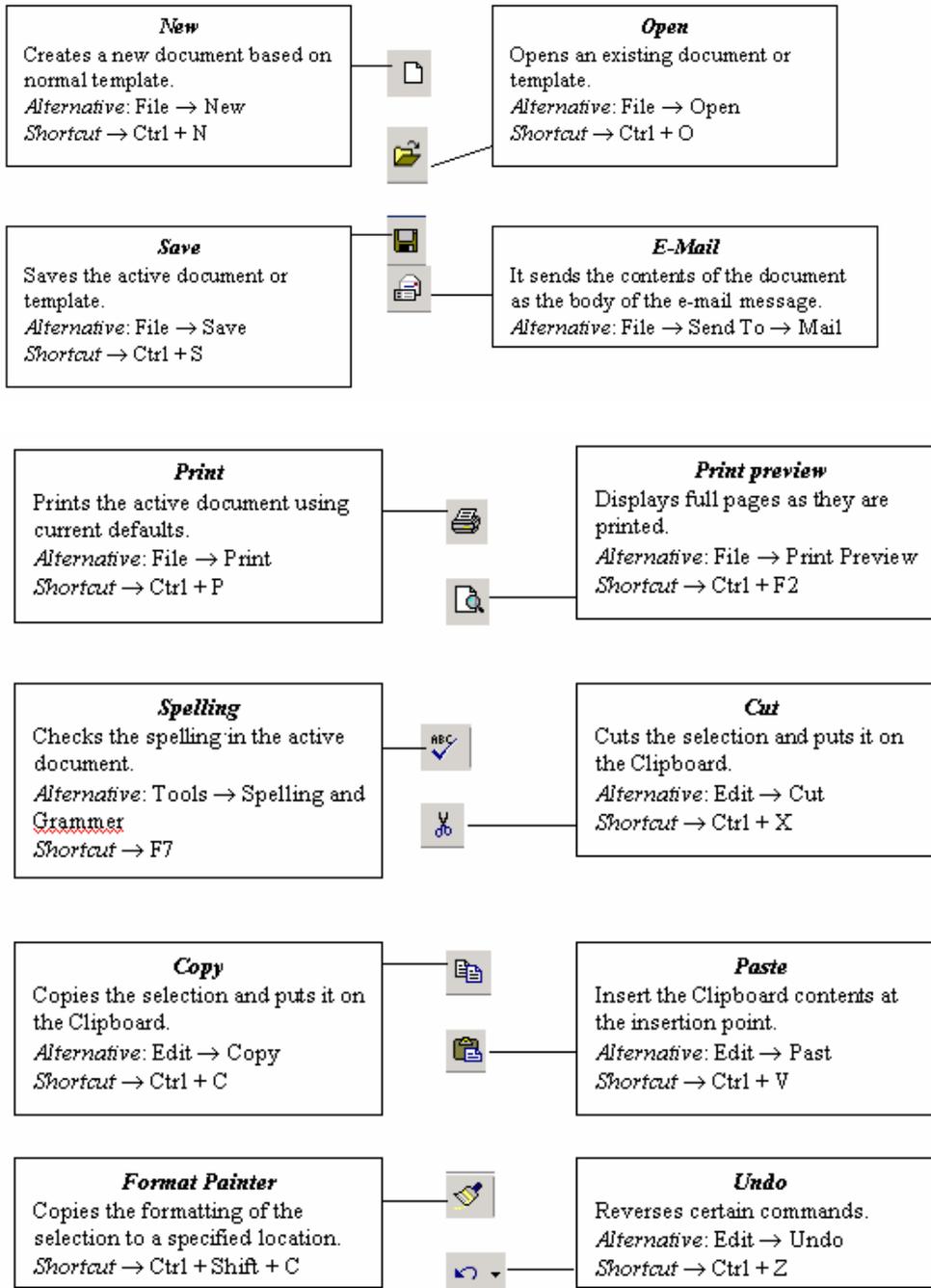
Cursor Also called the Insertion Pointer, this denotes the place where text, graphics or any other item would be placed when you type, overwrite or insert them. This looks like a tall, skinny toothpick and keeps blinking so that you can locate it easily.

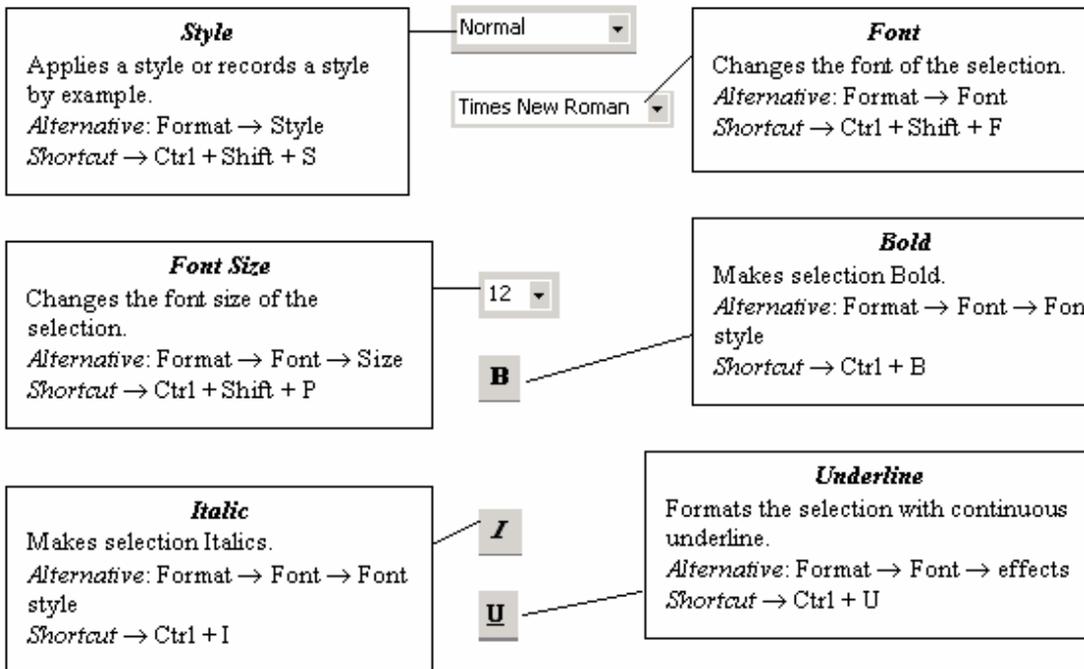
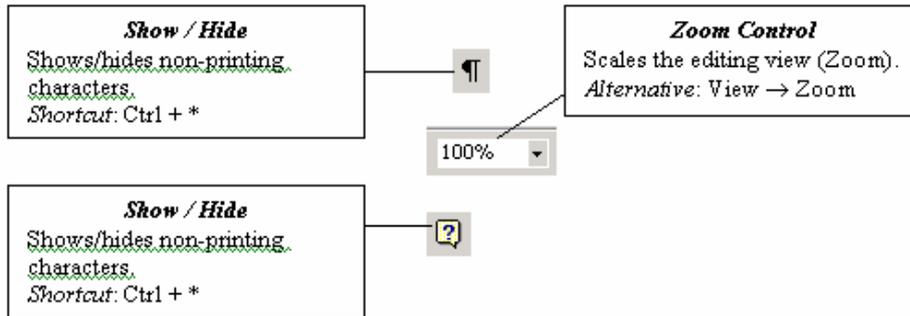
Mouse pointer When your mouse pointer looks like an I-beam you should be able to move it freely on the screen. This is used for either placing the cursor at the desired place (take the mouse pointer there and click) or choosing any command either from the menu or from toolbars. The mouse pointer changes shape when in the process of doing certain tasks and the cursor disappears.

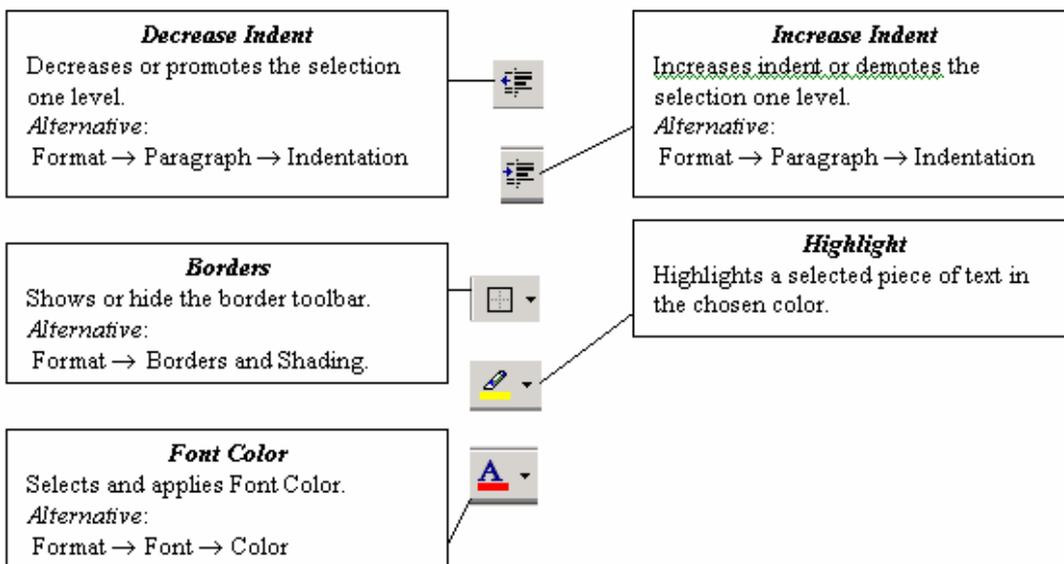
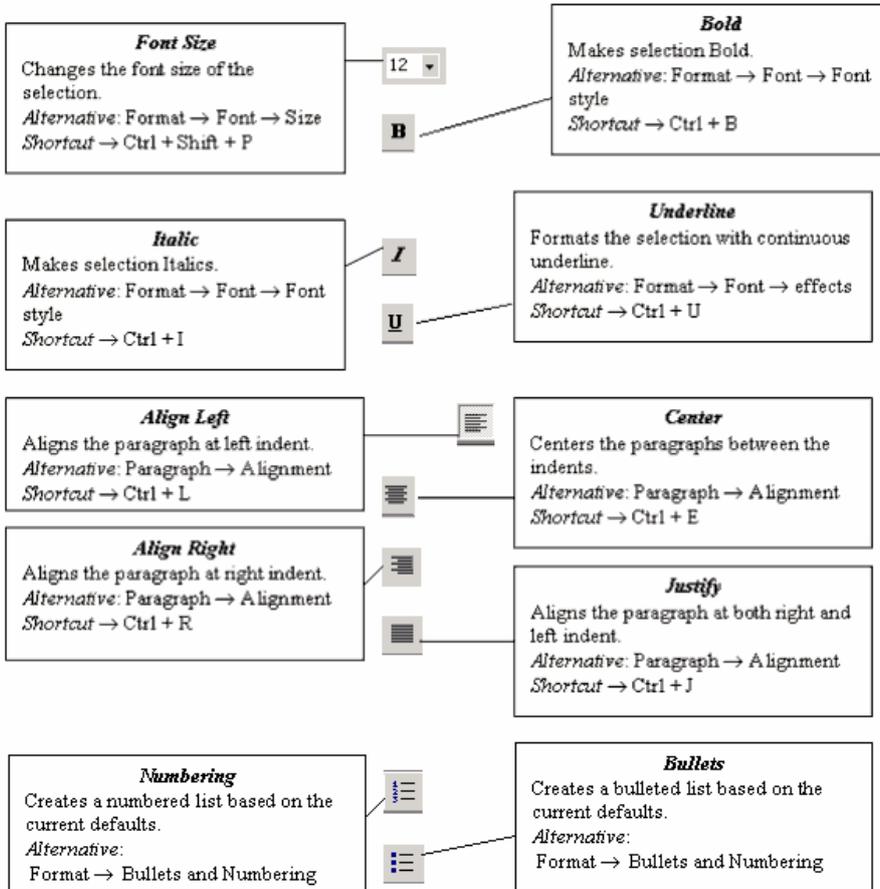


TOOLBARS AND THEIR ICONS

Word Standard Toolbar









File management

Creating a New Document

- ❖ Click on File Menu
- ❖ Select and click New option
- ❖ Otherwise click  button on the standard toolbar

Opening an Existing Document:

- ❖ Click File Menu
- ❖ Select and click Open option
- ❖ Otherwise click  button on the Standard toolbar.
- ❖ Double click on the file from the open window

Saving a Document

- ❖ Click File Menu
- ❖ Select and click Save button.
- ❖ Otherwise click button  on the Standard toolbar.

Moving through the document

- ❖ Open any word document. You can move the cursor to any location on the screen by using the arrow keys on the keyboard.
- ❖ Right arrow key is used to move one position to the right of the cursor
- ❖ Left arrow key is used to move one position to the left of the cursor.
- ❖ Up arrow key is used to move one position to the top of the cursor.
- ❖ Down arrow key is used to move one position to the down of the cursor.
- ❖ Page Up key is used to move down the screen at a time
- ❖ Page down key is used to move up the screen at a time



- ❖ Hold down Ctrl key and press Home to move to beginning of the document.
- ❖ Hold down Ctrl key and press End to move to end of the document.
- ❖ You can move to any position on the screen by moving the cursor with the mouse.
- ❖ You can use scroll bars to scroll the text upward and down ward.

Closing a Document

- ❖ Click File menu
- ❖ Select and click Close button. 
- ❖ Otherwise click on menu bar

Editing Word document

Cut, Copy and Paste options

These options will allow you to Cut or Copy a piece of text from one location and to paste at a new location.

To do these functions,

- ❖ Place the cursor at the beginning of the text to be selected.
- ❖ Drag the mouse pointer over the text. The text will now appear in reverse video as shown below:



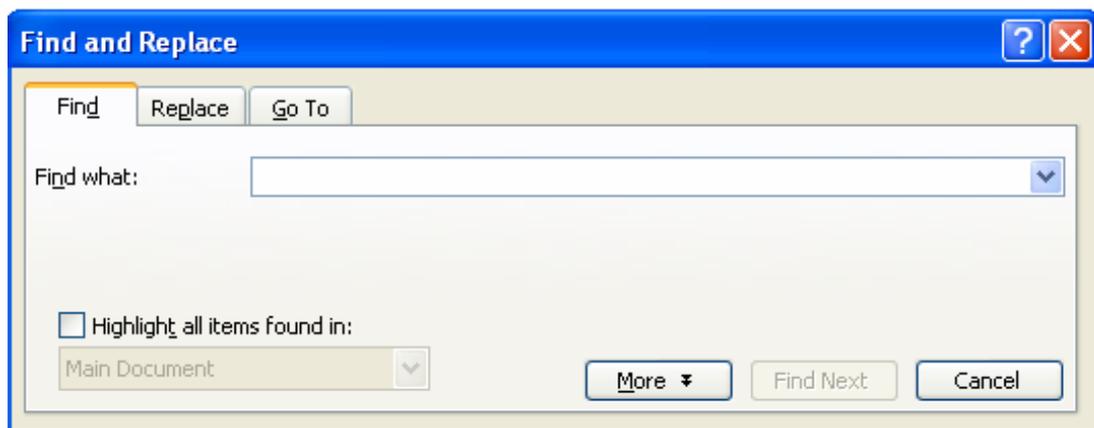
- ❖ Click Edit menu and then click on Cut option (or) click  icon on the Standard Toolbar. Move the cursor to the place where you want the text to be pasted.
- ❖ Click Edit menu and then click Paste option (or) click  icon on the Standard Toolbar.
- ❖ For copying the text from one location to other location the same procedure is to be followed. The difference between Cut and Copy is that while using the Cut option the text will be removed from its original location and pasted at a new location, whereas



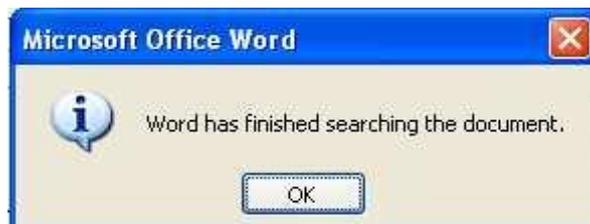
when using Copy option, a copy of the selected text is pasted at new location without disturbing the original text.

Searching text

- ❖ Open any document.
- ❖ Click Edit menu and then click Find option. You will get a screen as shown below.



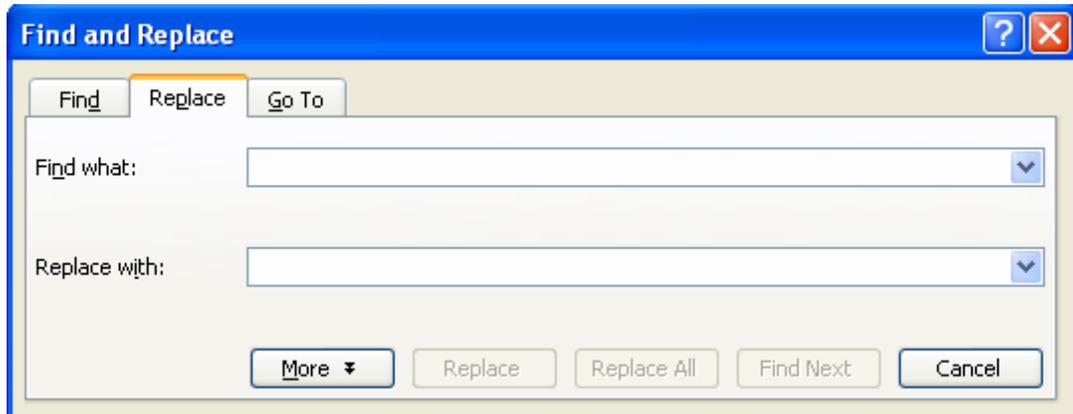
- ❖ In Find What text box type the word you want to find and then click Find Next button.
- ❖ Continue clicking Find Next button until you get the screen shown below.



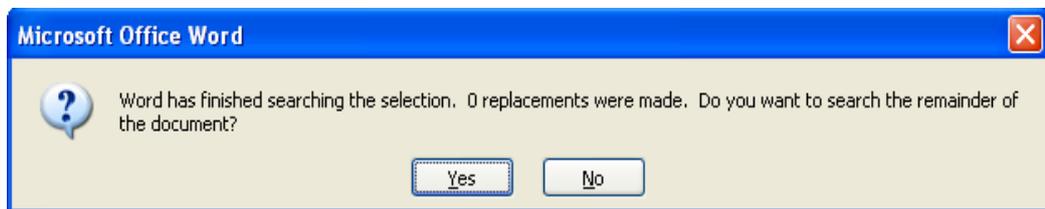
- ❖ Click OK button and then click X to close Find and Replace dialog box.

Replacing text

- ❖ Open any word document.
- ❖ Click Edit menu and then click Replace option. You will get the dialog box as shown below and type the word with which you want to replace.



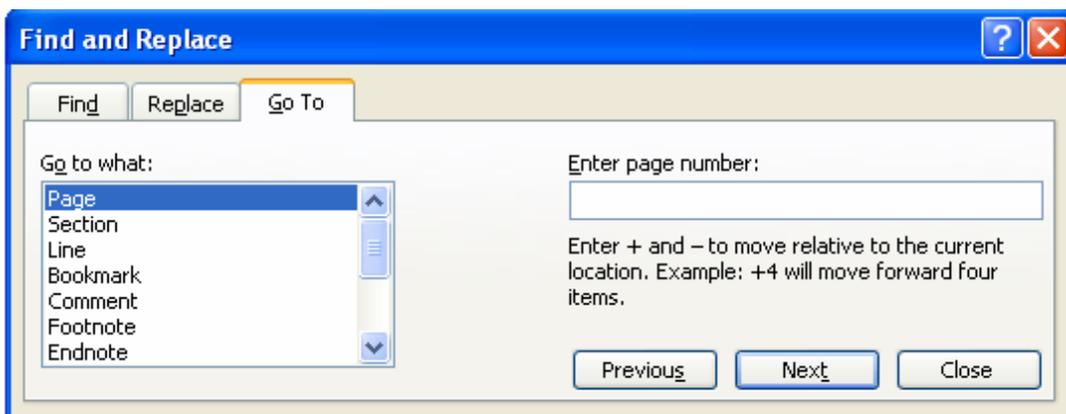
- ❖ Click Replace All button once. You get the below dialog box.



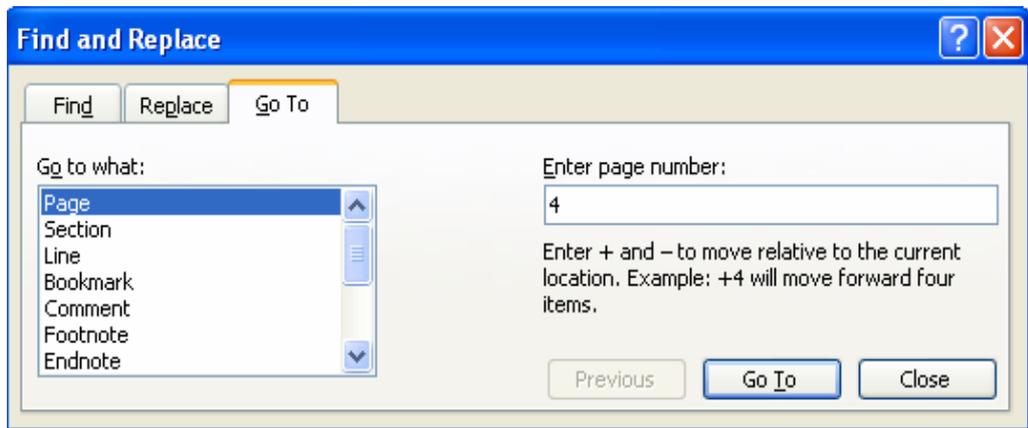
- ❖ Click OK button and then click X to close Find and Replace dialog box.

Moving the cursor to a specific page

- ❖ If your word document contains more than one page, you can directly go to specified page by clicking Edit menu and then clicking Go to option. You will get the dialog box as shown below.



- ❖ In the Enter page number text box, type the required page number as shown below.



- ❖ Click Go To button. Cursor will immediately jump to page 4.
- ❖ Click Close button to close Find and Replace dialog box.

Formatting documents

Bold, Underline and Italicize the selected text

- ❖ Open a word document.
- ❖ Block the text by first clicking at the start of the text and holding the left mouse button and drag to the desired position and then release the left mouse button. The selected area will be highlighted.
- ❖ Move the mouse pointer to the button on the  standard toolbar and click once.
- ❖ Move the mouse pointer outside your text and click to release the highlighting. Your text will now appear in BOLD FACE.
- ❖ Like this you can underline or italicize the desired text by using the buttons on standard toolbars

Left aligning, centering, right aligning and justifying text



Left Centre Right Justify

- ❖ Open a word document.



- ❖ Block the text by first clicking at the start of the text and holding the left mouse button and drag to the desired position
- ❖ and then release the left mouse button. The selected area will
- ❖ be highlighted.
- ❖ Move the mouse pointer to Align Left button on the toolbar and click once. Your selected text will be left aligned.
- ❖ Move the mouse pointer to Align right button on the toolbar and click once. Your selected text will be right aligned.
- ❖ Move the mouse pointer to Center button on the toolbar and click once. Your selected text will be centered.
- ❖ Move the mouse pointer to Justify button on the toolbar and click once. Your selected text will be justified.

Creating Bulleted and Numbered list

- ❖ If a list of items are to be numbered automatically it can be done using Numbered List option

Ex: Microsoft Office consists of

MS-Word

MS-Excel

MS-PowerPoint

MS-Access

MS-Outlook

- ❖ The above text is to be selected with mouse.
- ❖ Click on the Numbered List button on the toolbar 
- ❖ Move out of the text and click to release the highlighting.



❖ Your text will now look like this

1. MS-Word
2. MS-Excel
3. MS-PowerPoint
4. MS-Access
5. MS-Outlook

❖ Now re-select the text

❖ Click the Bulleted List button on the toolbar. 

❖ The numbers should be replaced with bullets as shown below

- MS-Word
- MS-Excel
- MS-PowerPoint
- MS-Access
- MS-Outlook

Indenting Paragraphs

❖ Select a paragraph with the mouse.

❖ Click on the Right (increase) Indent button on  the toolbar.

❖ Leave the highlighting on and click once more on the Right Indent button.

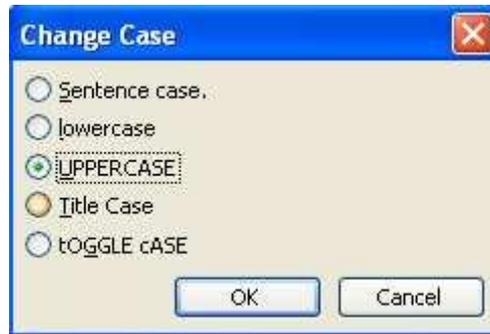
❖ Click once on the Left Indent button.  Your text should now be indented by one Tab stop. Each time you click, the paragraph is moved one tab stop.

Changing case of text

❖ You can change the selected text into either UPPERCASE, lowercase, Title case or tOGGLE cASE



- ❖ Highlight the text. Select the Format menu option
- ❖ Choose Change Case option. You will get the dialog box shown below.



- ❖ From the list of options select UPPERCASE to convert lower case into uppercase.

Indenting text with tabs

- ❖ Type your name and address as you would at the head of a letter, but aligned with the left margin e.g.

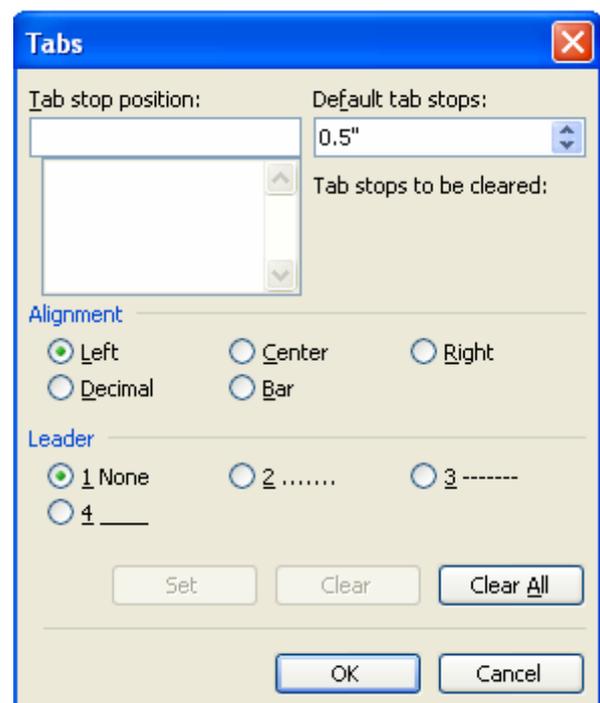
K.Manohar

H.No 10-334/3, V.P. Nagar,

Malakpet,

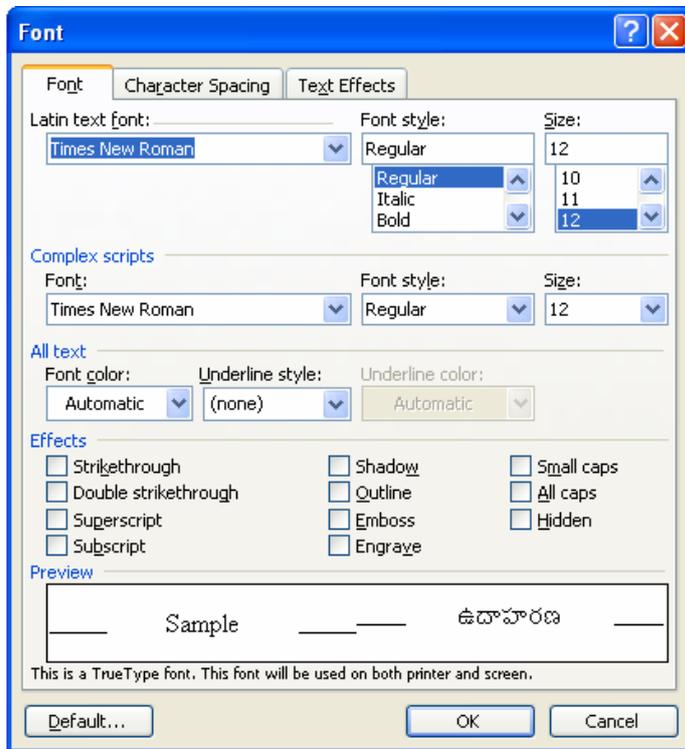
Hyderabad.

- ❖ Move the cursor to the start of each line and press the Tab key. Just as with the right indent button, your text will move right. How much it moves will depend on the tab settings, which you can change in the Format, Tabs menu as shown below.





Font Controlling



- ❖ To get different character styles we can change Font type
- ❖ Click on Format menu
- ❖ Select Font option. You will get the screen as shown above.
- ❖ You can set Font type, Font Style and Font size and Color of the selected text.
- ❖ Click OK button.

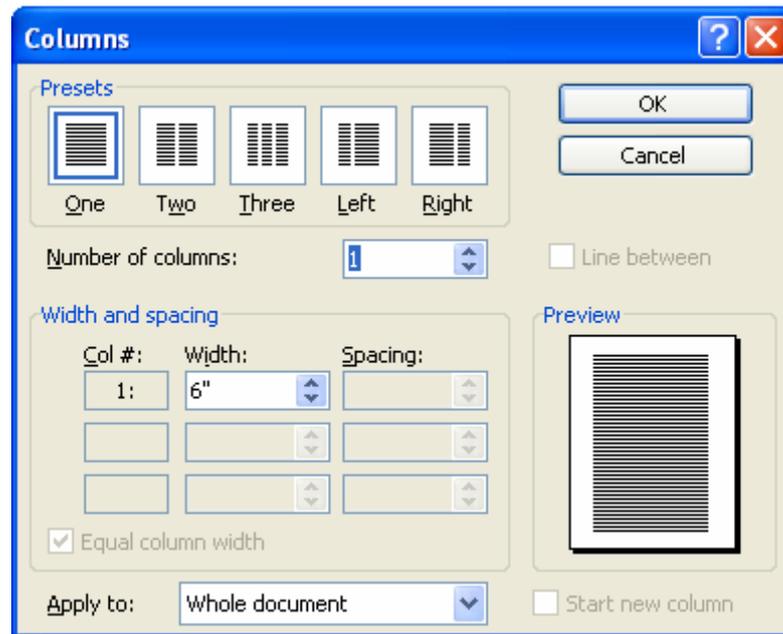
Note: The above options are also available on the Formatting Toolbar



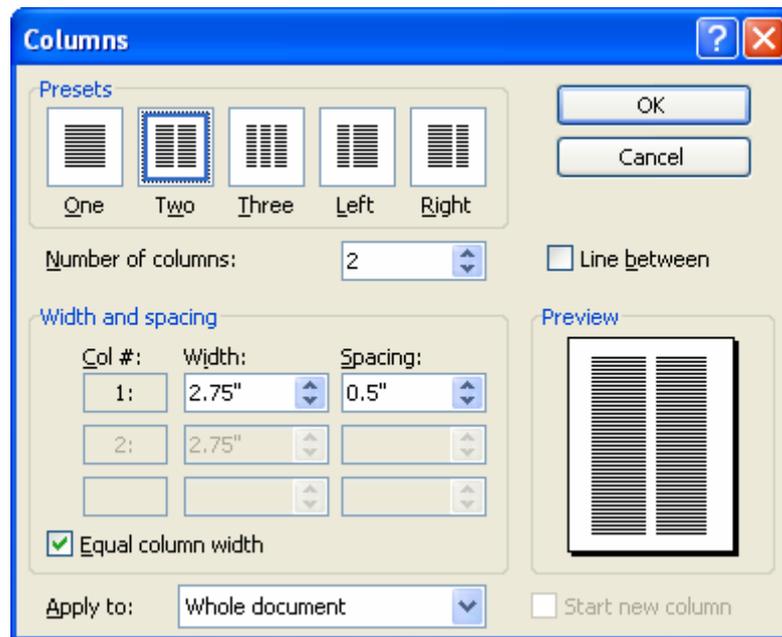
Font style Font Type Font size Color

Creating column wise documents

- ❖ Open any word document file.
- ❖ Click Format menu and click Columns option. You will get a screen as shown below:



- ❖ In the Presets tab, select Two option to get below screen.

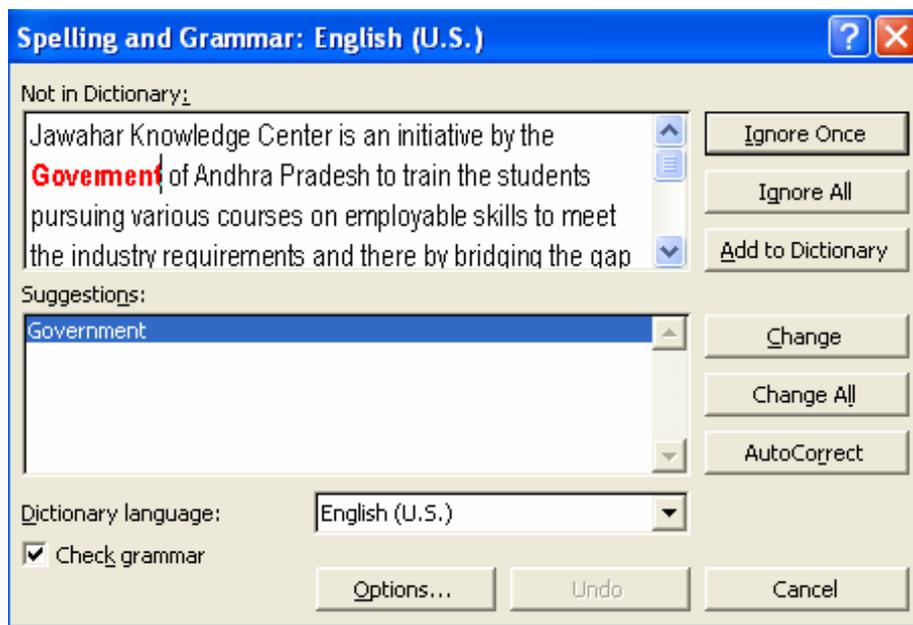


- ❖ Click OK button.
- ❖ Your document will be converted to two-column document.

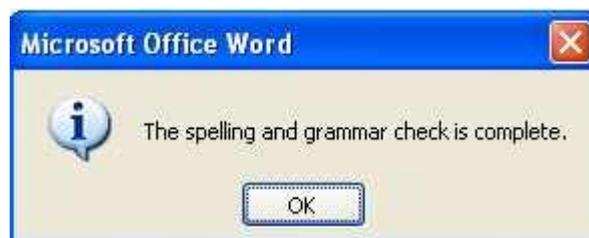
Spelling and Grammar Checking of word document



- ❖ Open any word document.
- ❖ Click Tools menu and then click Spelling and Grammar option. You will get the below dialog box.
- ❖ Note all words that appear red color in First box are spelling mistakes. If you want to accept the suggested word, in the second box click on Change. If not, click Ignore button. You can also add a word to the dictionary by clicking on the Add button.



- ❖ Continue this process until you get the dialog box, shown below:



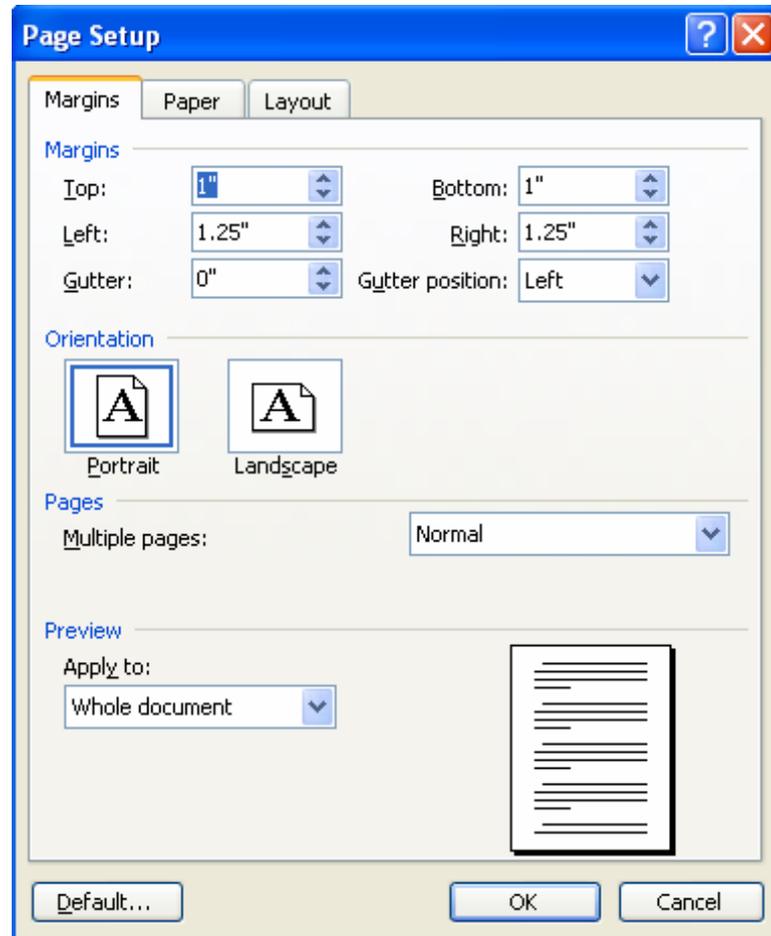
- ❖ Click OK button.
- ❖ Save your work when the spell-check is complete, so that the corrections are saved.

PRINTING DOCUMENT

Set Page Setup options



- ❖ Click File menu
- ❖ Select and click Page Setup option. You will get the following screen.



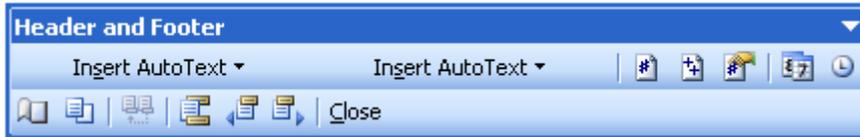
- ❖ Here you can set margins (top, bottom, right and left), paper size, paper source and layout.
- ❖ Click OK button.

Creating Header and footer

- ❖ You can create header and footer that include text or graphics. For example, page numbers, the date, a company logo, the document's title or file name, the author's name, and so on. You can use the same header and footer throughout a document or change the header and footer for part of the document. For example, use a unique header or footer on the first page, or leave the header or footer off the first page. You can also use different headers and footers on odd and even pages or for part of a document.



The Header and Footer tool bar is



To Create header or footer

Create a header or footer

- 1 On the **View** menu, click **Header and Footer**.
- 2 To create a header, enter text or graphics in the header area. Or click a button on the **Header and Footer** toolbar.

To insert	Click
Page numbers	Page Numbers 
The current date	Date 
The current time	Time 
Common header or footer items, such as running total page numbers (Page 1 of 10), the file name, or the author's name	Insert AutoText , point to Header , and then click the item you want.

- 3 To create a footer, click **Switch Between Header and Footer**  to move to the footer area. Then repeat step 2.
- 4 When you finish, click **Close**.

Creating different footers or headers for even and odd pages

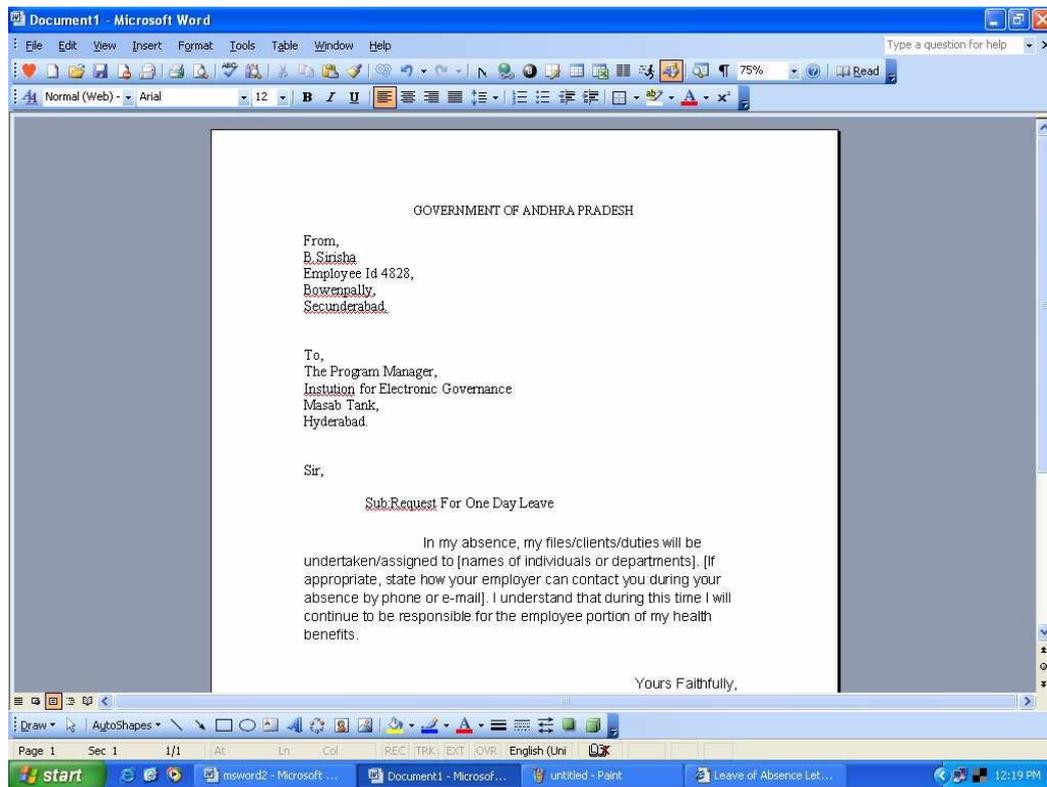
Create different headers or footers for odd and even pages

- 1 On the **View** menu, click **Header and Footer**.
- 2 On the **Header and Footer** toolbar, click **Page Setup** .
- 3 Click the **Layout** tab.
- 4 Select the **Different odd and even** check box, and then click **OK**.
- 5 If necessary, move to the **Even Page Header** area or **Even Page Footer** box.
 - How?
- 6 Create the header or footer for each even-numbered page.
 - How?
- 7 To move to the header or footer for each odd-numbered page, click **Show Next**  on the **Header and Footer** toolbar. Then create the header or footer you want.



Preview document

- ❖ Open any word document.
- ❖ Click File menu and then click Print Preview option. You will get a screen similar to this.



You won't be able to read your text, as preview is just for checking the layout. If you move the mouse pointer into the page a tiny magnifying glass icon appears. If you click on this, it magnifies the selected page.

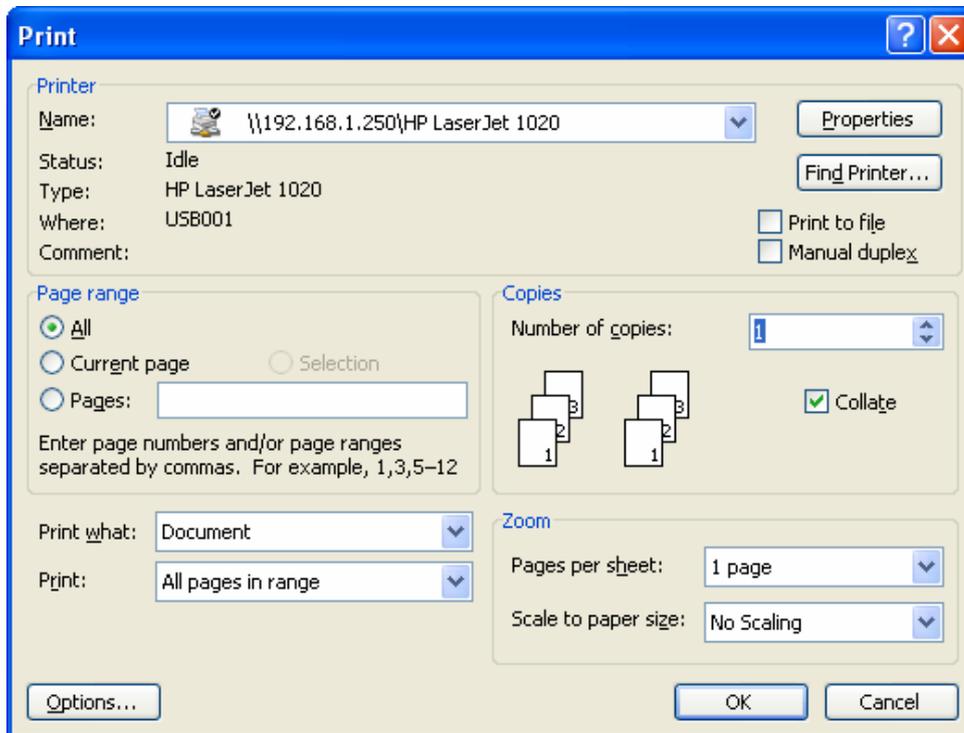
- ❖ Press PgDn to move through your document if it is more than one page long.
- ❖ If you need to make changes before printing, click the Close button to return to your document

Print document

- ❖ Click File menu
- ❖ Click Print option.



- ❖ You will get a screen shown as below.

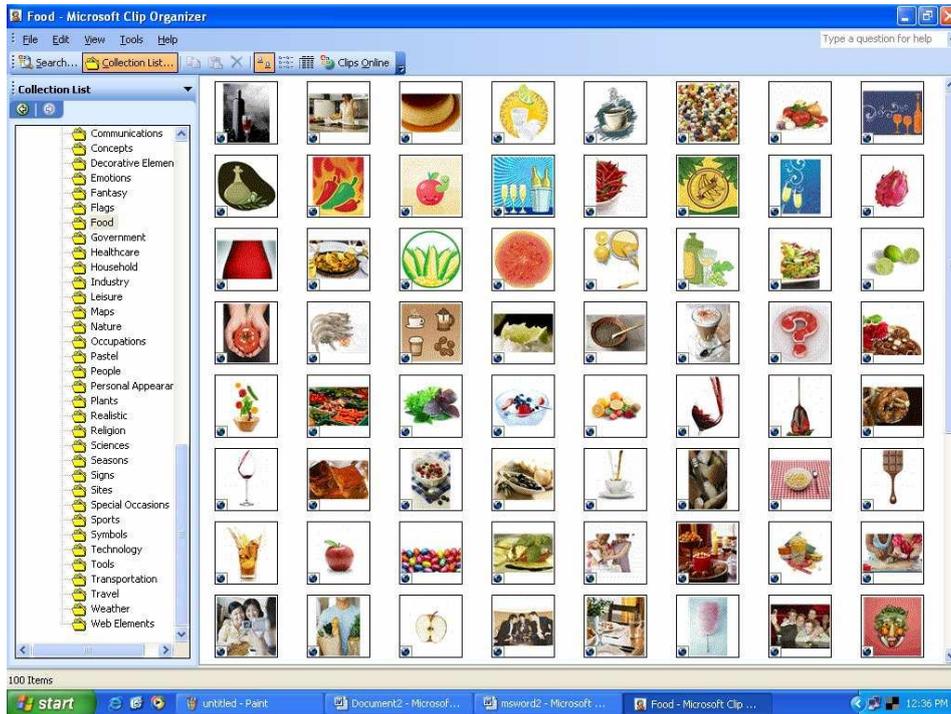


- ❖ In the above figure you can set default Printer name or you can select other printers from the drop down menu. You can set which pages to print, how many copies to print, the page range like "1-3,5-7", whether to print all pages and so on.
- ❖ Before printing, make sure your printer is switched on, is loaded with the appropriate paper [A4], and is on-line.
- ❖ If you are satisfied with the layout of your document, click on the Print icon on the toolbar to obtain a printout. You should see a message on screen showing that your file is being prepared for printing.
- ❖ Click OK button.

INSERTING PICTURES INTO THE DOCUMENT

Inserting Clip arts

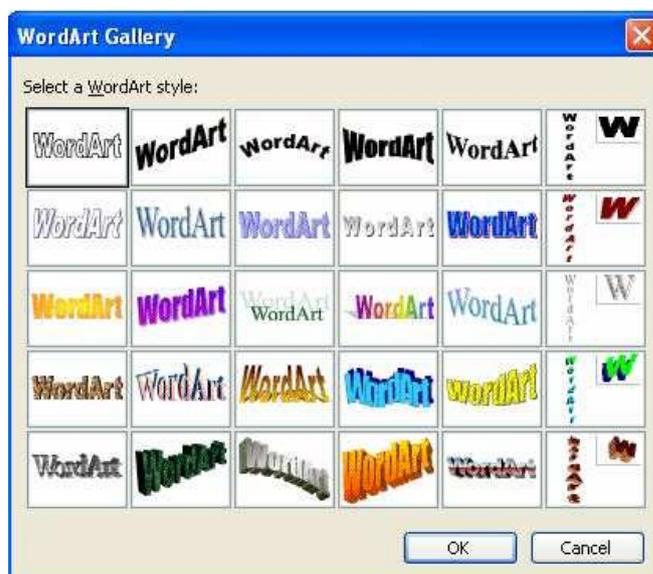
- ❖ Click Insert menu, click picture and then click Clip Art. You will get screen as shown below



- ❖ Select the picture and then click Insert button. The selected picture will be inserted at the cursor position.

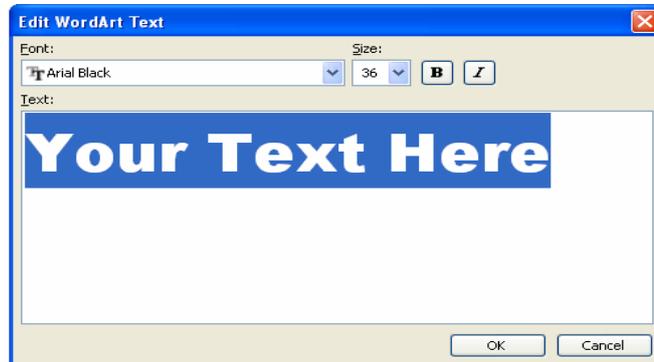
Inserting WordArt

- ❖ Click Insert menu, click picture and then click WordArt. You will get a screen as shown below:





- ❖ Select a WordArt Style format and then click OK button to get the below screen.



- ❖ Here enter your own text (for example type Welcome)and then click OK button.



Dragging Margins on the Ruler

- ❖ Change to Page Layout view
- ❖ Choose View Ruler, if the ruler is not visible
- ❖ Point to transition area (where the grey area turns white) on the ruler. The mouse pointer changes to double headed arrow.

Drag the margin to the desired position using the mouse. Watch the change in the Ruler's dimension as you drag.

Page Breaks

Page Breaks are the places in your document where one page ends and a new page begins. Many things affect where page breaks will occur. Factors include the size of your paper, Margin setting, Paragraph Formats and section breaks.

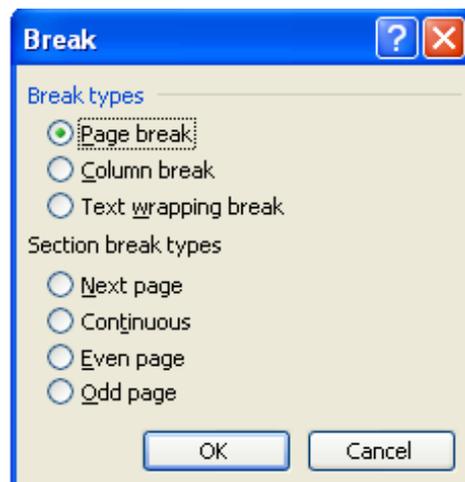
Page breaks appear as dotted lines in Normal view.

Forcing Page Breaks



- ❖ Move cursor to the place of the break.
- ❖ Choose Insert → Break

The Page Break dialogue box appears as below.



- ❖ Click OK & the page break appears in the required position.
- ❖ To insert page breaks press Ctrl+Enter. Page Break will be inserted at the place of the cursor.

CREATING TABLES

Tables are preferred when compared to using spacebar or tab for alignment to give a table format, but Word has another excellent feature for alignment called "Tables". This feature is used to create financial reports, catalogues, accounts etc.

Tables consist of rows and columns. The text can be typed in the cells. The size, shape and appearance of a cell are controllable features. You can also convert a text to a table and a table back to text. It also supports importing and exporting data onto a spreadsheet.

To create a table using Insert Tables Button

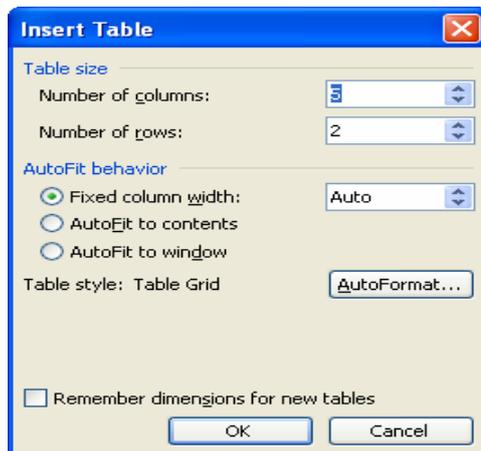
- ❖ Move the cursor to the place where you want to insert the table
- ❖ Choose tables button  from the Standard Toolbar
- ❖ Drag the mouse to highlight the desired number of rows and columns in the tables menu



- ❖ Release the button. An empty table is inserted.

To create a table using table menu

- ❖ Choose Insert table from Table Menu. You will find a dialog box as shown below:



- ❖ Now type the Number of Columns and rows as you require and set column width Auto. So that the Column width will be equal to the width of the text. Now click OK.

An empty table is inserted in the document. Now inserting rows, columns, deleting rows and widening the columns is very easy.

Insert Rows

- ❖ Place the cursor in the table, where rows are to be inserted
- ❖ Choose Table and click Insert Rows option to insert rows in the table

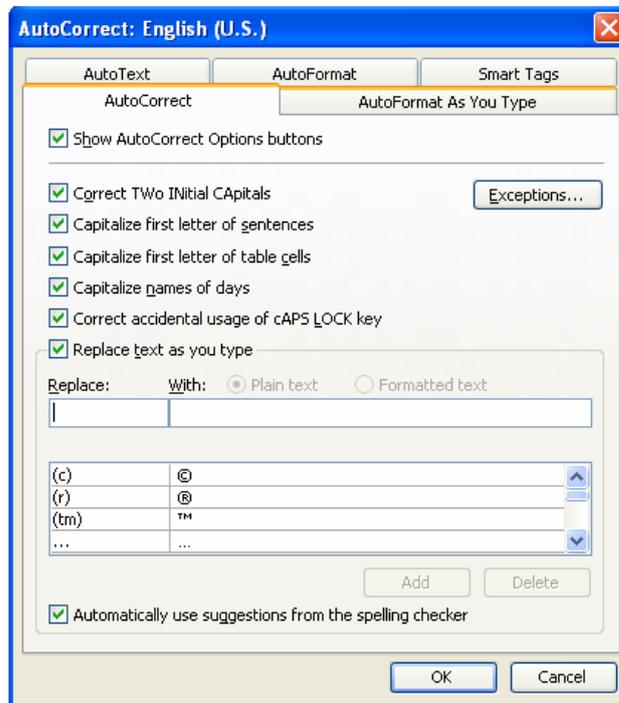
Delete Rows

- ❖ Select the Row which is to be deleted
- ❖ Click Table and click Delete cells option.

In the same way you can do with columns also.

AUTO CORRECT

AutoCorrect stores a list of common typographical errors and their spellings. When you



make an error, Word detects it and inserts the correctly spelled version of the word. You can add words to the AutoCorrect list, based on the mistakes you make. Look at the AutoCorrect dialog box. Note that tm within parenthesis is automatically replaced by ™ with trademark symbol. To Add an AutoCorrect

- ❖ Click Tools then click AutoCorrect, type the word in the place provided for Replace and with Options then click Add and then click OK. You can Delete an AutoCorrect option if you don't want it.

AUTOFORMAT

Use AutoFormat to reformat an entire document using a selected document template as a basis for the changes. Templates are supplied with Word, or you can create your own templates based on a document in which styles are applied to text, headings, lists and other text and graphic elements within the document. You can use Format/Style Gallery to view and apply available style templates to your document. Autoformat applies a style to every paragraph and heading. It typically replaces indentations created with spaces or tabs with paragraph indents, asterisks and dashes with bullets, and so on.

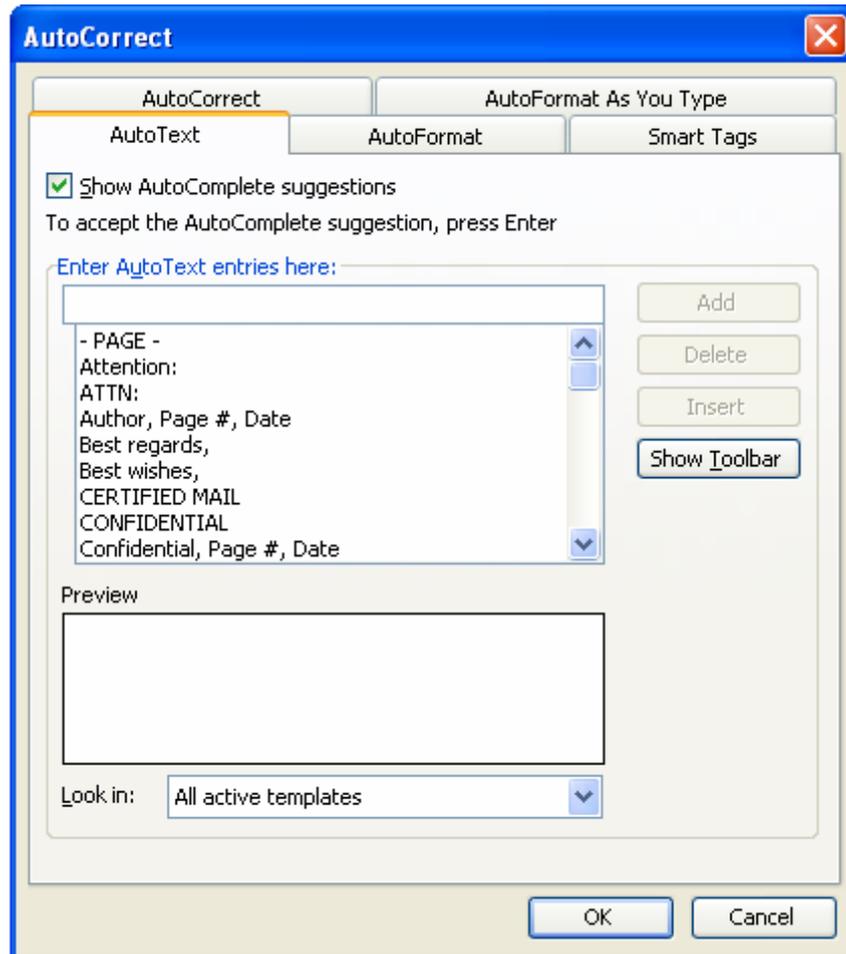
AUTO TEXT

The AutoText feature lets you store commonly used passages, such as addresses, contract clauses, etc.,



and insert them whenever needed with a click of your mouse to create an AutoText entry.

- ❖ Select a graphic or text block such as your name and address in your document.
- ❖ Pick the Insert / AutoText menu selection: The Auto Text dialog box is displayed as shown below



- ❖ Type a Short name in the Name box and click Add.

To use Stored Auto Text

- ❖ Type the short name of your Auto text and Highlight it.
- ❖ Click Insert/ AutoText from menu and then click Insert. The text is inserted in place of the selected AutoText name.

To remove an AutoText item



- ❖ Pick Insert/AutoText to get the AutoText dialog box.
- ❖ Pick an AutoText name and click Delete and Close.

5.4 MICROSOFT ACCESS 2003

A database manager is a computer program for storing information in an easily retrievable form. It is used mainly to store text and numbers (for example, the Library catalogue, which includes the author, title, class number and accession number for each book). Most modern database managers also allow the storage of other types of information such as dates, hyperlinks, pictures and sounds. As well as being able to store data, a database allows you to select information quickly and easily (for example, a list of the books written by a particular author or those on a certain subject). Finally, it may allow you to produce printed summaries (reports) of the information selected.

When setting up your own database, it is important to plan its use in advance. This is particularly important if you are setting one up which will be used by other people. Among the things which you should consider are:

- What information you will need to store
- What information you want to get out
- Who the data is intended for and how other users will use it
- Whether you want to restrict access to parts of the data to some users only
- Who is allowed to add or change data
- If your data refers to actual people, it may need to be registered under the *Data Protection Act*

Although you can change the specifications of your database as you develop it, you will save yourself a lot of work if as much as possible is planned in advance.

Microsoft Access is a relational database management system (which allows you to link together data stored in more than one table). It is fully supported by IT Services and is available for departmental purchase under the Microsoft *Select Agreement*.

Starting Microsoft Access



If you are using an IT Services machine, login as usual by entering your *username* and *password*. Then, to start up the program:

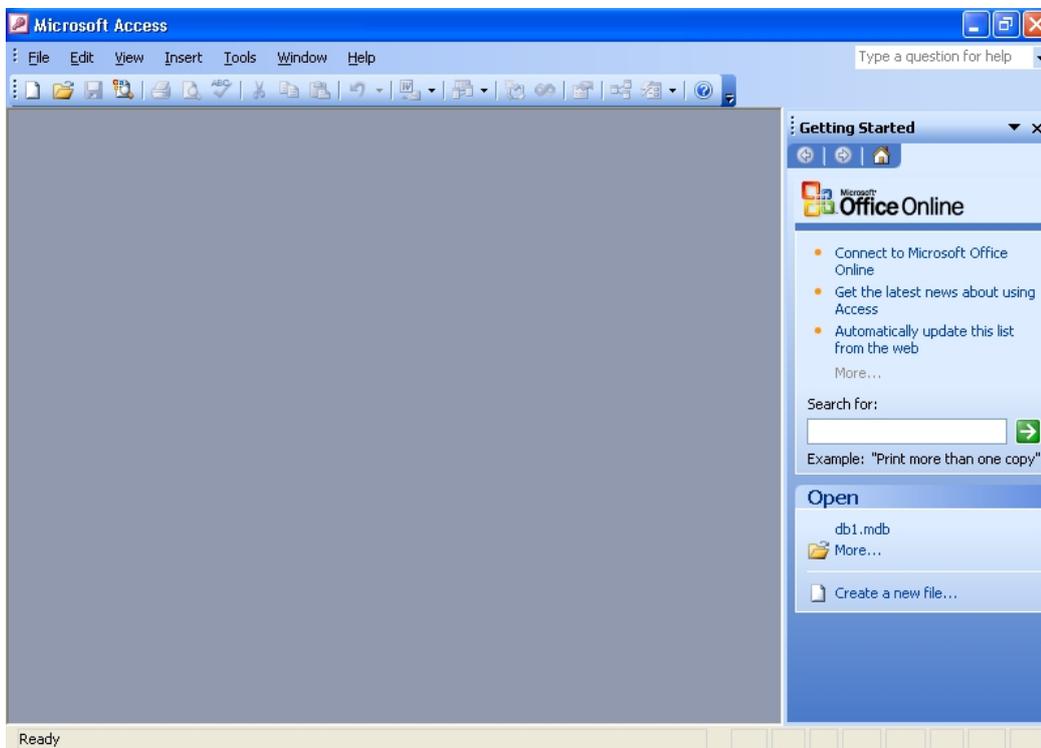
1. Open the Windows **Start** menu and choose **All Programs**
2. Select **Microsoft Office** then **Microsoft Office Access 2003**

Tip: You can drag the **Microsoft Access** entry from the menu onto the *Desktop* to create an icon for future easy access.

The Access Screen

On entering Access, you are presented with a blank screen, apart from the menus, toolbar and *Getting Started Task Pane* (on the right). You can now either create a new database or open an existing one. In this course you

are going to use an existing database, to see how it is set up and how it can be used. When setting up your own new database, you can start off with a blank database or, for certain business applications, use a template wizard.



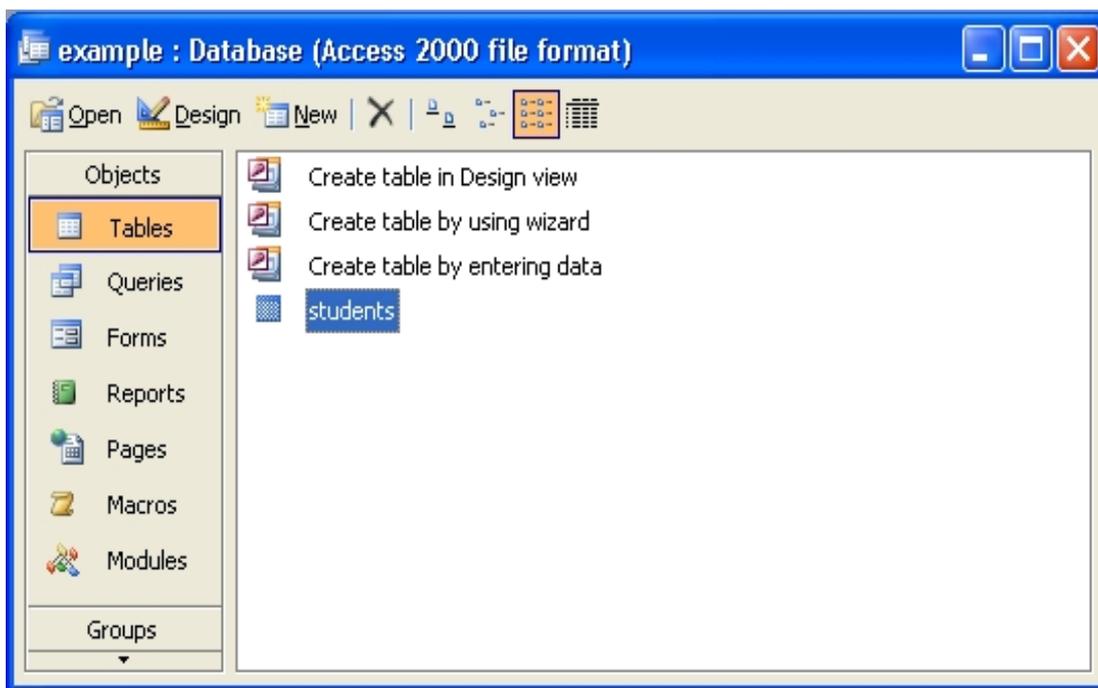


1. Click on the [**Open**] button (or open the **File** menu and select **Open...**)
2. An *Open* window appears - change *Look in:* to **User (D:)**
3. *Double click* on the folder called **Training** to open it
4. Click on **example.mdb** from the list which appears and press <**Enter**>
or click on [**Open**]

Note: For those using these notes on a computer not run by IT Services, the example file can be downloaded from the link provided at step 4 above.

Users are welcome to take a copy of the example file if they want to practice.

The Database Window



The next screen which appears shows the *Database* window. This controls navigation within a particular database. A database is made up of several *objects*, grouped into a single file:

- **Tables** - hold the raw data
- **Queries** - extract part of the raw data to produce *dynasets* - dynamic sets of data which can change each time the query is run (to reflect any changes to the data in the tables)



- **Forms** - user-friendly layouts to display data on the screen (either in a table or from a query)
- **Reports** - output files, ready for printing
- **Pages** - for creating/editing WWW pages
- **Macros** - lists of commands to perform particular functions
- **Modules** - programs which expert users write in a programming language called Access Basic to perform tailor-made functions not generally available

The objects are accessed using the *buttons* down the left of the *Database* window. As you use the different components, the menu bar and buttons on the toolbar change appropriately. Currently, the *Tables* are listed. Pages, Macros and Modules are not dealt with in this *Beginners'* course.

Database Window:



Tip: The [Database Window] button always takes you back to the *Database* window.

Part 1: Using an Existing Table

Begin by investigating the table named **students**. This contains data

relating to imaginary students in a fictitious department in the University, but it could equally be members of a club or just information about your friends and relatives. To examine the table, check the name is highlighted, then press <Enter> or click on [Open]. You can also open a table by *double clicking* on its name.

A new screen, the *Table* window, appears revealing the data set out in a table. This method of display (known as *Datasheet View*) shows the data in columns and rows, similar to a spreadsheet. There are a number of entries (*records*), one for each student, which each take up one line or row of the table. For each student, various items of data are recorded in columns - each column contains one variable (or *field*).





Immediately below the data is the *status bar*, which shows you are positioned at Record 1 (of 390). The *current record* is indicated by an arrow in the column to the left of the data. You can move the indicator down to the next record by clicking on the button immediately to the right of the number 1 on the status bar. The next button to the right takes you to the end of the table - click on this and you should be at Record 390. Matching buttons on the left take you back a single record and back to Record 1 - try out these too. You can also move up and down using the arrow keys on the keyboard. The scroll bar down the right edge of the table window moves the display up and down.

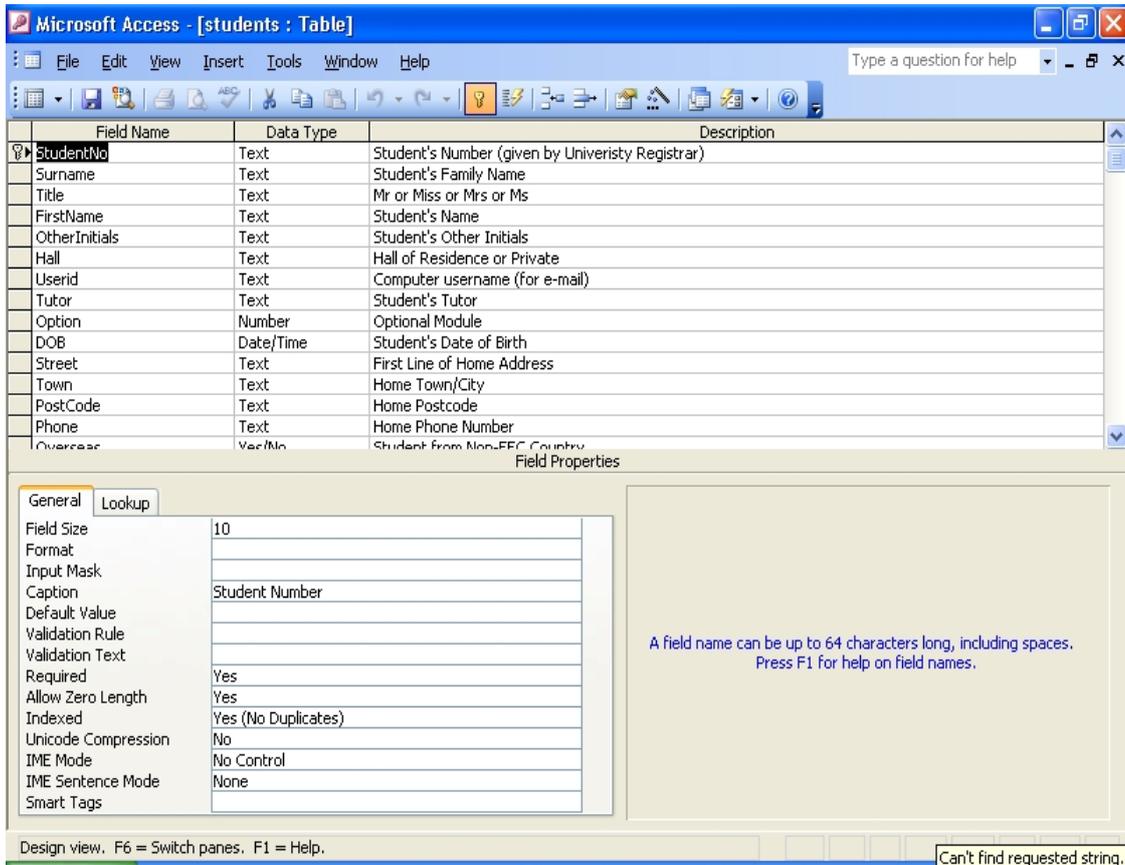
Another scroll bar is provided at the foot of the window for moving the display to the left and right when the records extend over more than one screen. If you want to move from field to field across a record, you can use the *<right arrow>* and *<left arrow>* keys or *<Tab>* and *<Shift Tab>*. The *<End>* key takes you to the last field, the *<Home>* key to the first. *<Page Up>* and *<Page Down>* take you up and down a screen, while *<Ctrl Home>* and *<Ctrl End>* take you to the first field of the top record and final field of the last record, respectively.

View:  or 

To see exactly what each record contains and how it has been set up:

1. Click on the [**View**] button (the first on the toolbar, or use **Design View** in the **View** menu)

The *Table Design* window lists the field names, indicates their data types and also shows the *field properties*. The screen appears as below:



The fields (and properties) are as follows:

- StudentNo:** A *text* field containing each student's personal id, as allocated by the University Registrar's Office. Text fields are the commonest type of fields and can be used to store any characters (letters, punctuation, numbers etc). Numbers should be stored as *text* if not being used in calculations. This field is set up to hold up to 10 characters and a *Caption* is used to expand the field name. This number uniquely identifies each student - the *Required* property has been set to **Yes** and *Indexed* is set to **Yes (No Duplicates)**. This field has also been used to set up a *Primary Key*, which you will learn more about later.

Tip: It's good practice not to include spaces in field names (or in the names of tables / queries / forms / etc). Instead, make use of *Captions* to expand the field name (to include any spaces). Not only do you have less characters to type but it makes manipulation of the data much easier if you find you need to use more advanced database features.



2. Press <*down arrow*> to move to the next field (then repeat this for each field):

- **Surname:** A *text* field containing the Family Name of each student.
This field is can hold up to 25 characters
- **Title:** Another *text* field but this time for up to 4 characters. Here, we know the possible values (Mr/Mrs/Miss/Ms) and can set up a *Validation Rule* to check that the data entered is correct - if it is not, the *Validation Text* is displayed. A *Default Value* (Mr) has also been set
- **FirstName:** Another *text* field for student's first name - up to 20 characters
- **OtherInitials:** A *text* field for any other initials - up to 6 characters
- **Hall:** Another *text* field where the possible values are known (the University only has certain Halls of Residence) so a *Validation Rule* has been set - up to 12 characters. A *Default Value* (Private) has also been set
- **Userid:** This is the student's computer username, which doubles as an e-mail address - a *text* field for up to 8 characters
- **Tutor:** The student's tutor - again a *text* field for up to 20 characters
- **Option:** A *number* field which points towards different optional course modules the student can study. Numbers can be stored using different field sizes; here, as the number of options is small (and always +ve) a *byte* is used - see the [Appendix](#) for a full explanation. A slightly different *Validation Rule* is used to check the data entered
- **DOB:** The data type here is *Date/Time*, which has been set up in *Medium Date* format. Note that a *Caption* is used to expand the field name.
- **Street:** First line of the student's home address - a *text* field storing up to 50 characters
- **Town:** The student's home town/city - a *text* field storing up to 20 characters
- **PostCode:** The student's home post code - a *text* string storing up to 10 characters
- **Phone:** The student's home telephone number - note that even though this is a number it is



stored as *text* (you won't be doing any mathematical calculations with it!)

- **Overseas:** A *Yes/No* (or logical) field storing whether the student is from an EEC country or not. The *Default Value* is set to *No*.
- **Notes:** For any other pieces of information - for longer pieces of text, a *memo* is used
- **Photograph:** Graphics (eg a passport photograph) are stored as *OLE Objects*

Other data types exist which are not included here, namely: *currency*, *autonumber* and *hyperlink* (see the [Appendix](#) for details).

Tip: Note that the student's surname is stored separately from the first name (similarly each line of the address is in a separate field). Information should always be stored in its component parts. You can then, for example, sort by surname then first name, or reference the students formally (ie Mr X) or informally. You will see later how to combine this data into a single field, if you need to.

To close the *Table Design* window and return to the top of the datasheet:

3. Click again on the **[View]** button (or use **Datasheet View** from the **View** menu) - note that the icon on the button changes as you move between *Design* and *Datasheet view*

Searching for a Particular Record



Find:

To search for a particular record, you should first move to the field you want to search:

1. Press **<Tab>** to move to the *Surname* field
2. Click on the **[Find]** button (or press **<Ctrl f>** or use **Find...** in the **Edit** menu) and a *Find and Replace* window will appear
3. The cursor is already positioned in the *Find What:* box - type in **Smith**

The default options should already be set correctly. The *Look In:* box shows the search is restricted to the current *Surname* field (alternatively, you can search the whole table). In the *Match:* box, you can



choose to match the *Whole Field*, *Any Part of Field* or the *Start of Field*. *Search:* is set to *All records*; the other options are *Up* and *Down*. *Match Case* lets you distinguish capitals from lower case (if you need to). Finally, *Search Fields as Formatted* is useful for finding data as displayed (a date format, for example). Note that you also have access to a *Replace* tab for editing data.

4. Press <Enter> for [**Find Next**] and the search should be carried out
5. Press <Enter> again and another *Smith* will be found
6. Keep pressing <Enter> until you get the message that the search item is not found

Obviously, this is not a very elegant way of retrieving information from the database - but it works!
To close the *Find* window:

7. Press the <Esc> key or click on [**Cancel**] - or click on the [**Close Window**] button
8. Finally, press <Ctrl Home> to move back to the first record

Sorting

The records, as you have seen them so far, are shown in the order that they were first entered into the database - as the data came from the Registrar's Office, it is in Student Number order. For this reason, it wouldn't have been easy to search for *Smith* simply by scrolling through the records (and imagine trying to find a book in the Library if they were all listed by their accession number!). If the data is sorted, however, then you can scroll through the records to search for a particular one.

Quick Sort

Sort Ascending:  Sort Descending: 

To sort any field into alphabetical/numeric order, a quick sort facility is provided. First, you have to move to the column on which the sort is to be based:

1. Press <Tab> to move to the *Surname* field
2. Click on [**Sort Ascending**] (or use **Sort** then **Sort Ascending** from the



Records menu)

The names of the students are now in alphabetical order. Note that only the screen display is sorted - the records are still stored in the order in which they were typed, and they always will be.

3. Use **Remove Filter/Sort** in the **Records** menu to reset the data to its original unsorted order

Changing the Display Order Permanently

If you want to keep the new display order for the next time you open the table, all you have to do is close the table, saving the changes to its design. Try this next:

1. Move to the field you want sorted (eg *Surname*)
2. Click on [**Sort Ascending**] (or [**Sort Descending**] if you want the data in reverse order)
3. Close the table by clicking on its [**Close**] button (or use **Close** from the

File menu)

4. Save the changes to the table design when asked - press <**Enter**> or click on [**Yes**]
5. At the *Database* window, [**Open**] the table again - you should find it in the new order

Note: it's very easy to accidentally save unwanted changes to the table design (if you perform a quick sort on another field, for example). Use **Remove Filter/Sort** to get back your original table.

Sorting in a Query

Sorts can also be carried out and stored in a *query*. Moreover, within a query you *must* set an explicit sort otherwise the records are displayed in their original order of entry. Queries are particularly useful where you have more than one field you need sorted - a simple quick sort only lets you sort on the one field (you can't for example sort by surname then firstname). By using a query you can produce a display sorted on any of the fields and can even create complex sorts within sorts. You will be looking at queries shortly, and carrying out sorts in them, so there is no need to carry out an example here.

Indexes

An index, like in a book, is used to speed up searching, sorting and grouping data - one should be set



on any fields used frequently in these ways. What happens is that Access records the sort order in a hidden file so that it doesn't need to repeat the sort each time. Indexes also perform a second useful function in that they can be used to guard against duplicate data entry. They are always used when a field is set up as a *Primary Key*. Try setting up an index on another field:

1. Click on the **[View]** button to switch back to *Design View*
2. Note that the *StudentNo* field already has an index - set to *Yes (No Duplicates)*. As this is used as the *Primary Key*, it must have this setting

The *Surname* field has an index of **Yes (Duplicates OK)**. This field is frequently used for sorting and duplicate values are allowed - as you have already seen with *Smith*. Try setting an index on *Hall* - another field likely to be used in sorting/selecting:

3. Click on the *Hall* field and, using the *list arrow*, set *Indexed* to **Yes (Duplicates OK)**
4. Next click on the *Userid* field and note the index here is set to **Yes (No Duplicates)**. The values in this field should be unique and the index will ensure this
5. Click on the **[View]** button again to switch back to *Datasheet View*.

When asked, press <Enter> or click on **[Yes]** to save the changes to the design of the table

Adding, Editing and Deleting Records

New Record:  **Delete Record:** 

Whenever you make any changes (additions, deletions or edits) to a table, it is the original data file that you are altering. Unlike most other applications, a database does not make a working copy of the file first. For this reason, it is essential to keep a back-up copy of your file (to which you can always return), just in case you make mistakes when carrying out amendments.

To add a new record to the database, use the **[New Record]** button (to the right of **[Find]** or the far right button on the status bar) or **New Record** from the **Insert** menu. New records are always added at the end of the existing data. As soon as you start to type, Access creates a new empty record (marked with an asterisk), while the current record indicator changes from an arrow to a pencil:



1. Click on the [**New Record**] button - you should now be on Record 391
2. Type in a number for the *StudentNo* (anything under 1000 will do) then press <Enter> (or <right arrow> or <Tab>) to move to *Surname*
3. Type in your own name then move to *Title* (press <Tab>, <Enter> or <right arrow>)
4. Repeat step 3 until you have filled out most of the record

Note that some fields already have a default value. To change a value in a field you simply type in a new one. Note also that some fields (eg *Hall* and *Option*) can only accept certain values, others (eg *StudentNo*, *Surname* and *FirstName*) cannot be left blank.

The *Photograph* field can hold a picture. The best way to add one is via the *Clipboard* (ie **Copy** and **Paste**). If you use the menu system (choosing **Object...** from the **Insert** menu) then it may appear as an icon which you then have to *double click* to open. As pictures cannot be displayed in *Datasheet View* anyway, don't try filling out this field here.

Note: An alternative method for entering new data is provided by the **Data Entry** command in the **Records** menu. With this, an empty table is displayed into which you type in the data. The best method for entering data, however, is via a *form*, which you will be meeting later.

To delete the current record (in this case your own):

1. Click on the [**Delete Record**] button (to the right of [**New Record**] on the toolbar)

Deleting records from a database is potentially very dangerous as they are erased once and for all, hence you are given one final chance to change your mind:

2. Press <Enter> for [**Yes**] to confirm the deletion

Note that you can't now use [**Undo**] to recover the record. If you have several records to delete:

3. Using the mouse, point to the left-hand edge of the first record to delete

(where the current record indicator is held) - you will find that the mouse cursor changes to an arrow



4. Hold down the mouse button - the record is marked (it becomes white on black) - then drag through the records required
5. To delete them, click on the [**Delete Record**] button (or just press the <Delete> key or use **Delete** from the **Edit** menu)
6. When asked to confirm the deletions, this time click on [**No**] and the records will reappear

Note: Records must be next to each other in order to delete them (you cannot use <Ctrl> click like you can in other Microsoft software, though

<Shift> click can be used to select a block of records). You will see next how to select a subset of non-contiguous records, which you could then delete.

Selecting Records

Databases offer you the facility of extracting sub-sets of records according to some pre-set conditions - in the Library, for example, you can search for all the books written by a particular author or all those dealing with a given subject. Access offers you two methods for selection, *Quick Select using a Filter* and *Selection using a Query*.

Quick Select

Filter by Selection:  **Remove Filter:** 

Simple selections can be made directly on the table itself, using a filter. Try out a few examples:

1. Press <Ctrl Home> to move to the first record
2. Move across to the *Hall* field - to find all the students living in a particular hall
3. Using the <down arrow> key, select the Hall of Residence you require
(or you could use [**Find**] to search for a particular Hall)
4. Click on the [**Filter by Selection**] button (to the right of [**Sort Descending**])



Note that at the bottom of the screen it says *Record 1 of XX (Filtered)*. To turn off the filter:

5. Click on the highlighted [**Remove Filter**] button (to the left of [**Find**]) You can also filter on part of a field - for example, you might want all the students registered in 2004.
6. Move to the *Userid* field
7. Find a record containing **04** and drag through the figures to select them
(ie just *04*)
8. Click on the [**Filter by Selection**] button to carry out the filter

If you now also wanted to find the students in this year who had a particular tutor:

9. Move to the *Tutor* field
10. Move down to a record with the required tutor (or use [**Find**])
11. Click on the [**Filter by Selection**] button

Note that this command is also available from **Filter** in the **Records** menu. Another command here (which is not on a toolbar button) is **Filter Excluding Selection**.

Having made your required selection, there are several things you might want to do next. For example, you might want to delete these records - even though they are not next to each other in the full dataset, you could drag through them here and delete them as before (but don't do so here).

Another thing you might want to do is to print off the data. However, you probably wouldn't want all of the fields, so you'll see next how to hide unwanted columns.

Changing the Fields Displayed

Tables often contain a lot of data, only some of which may be required. You can control which fields are shown and which hidden. Here, you may want just the student name and hall of residence:

1. Click in any *StudentNo* record then open the **Format** menu and choose

Hide Columns

To hide several adjacent columns in one go:

2. Position the mouse cursor into the *Userid* column heading (the pointer changes shape to a down



arrow)

3. Hold the mouse button down and drag through the remaining column headings to the end - the columns go black
4. Open the **Format** menu and again choose **Hide Columns**

If you want to change the order of the fields on the screen, you can either use *cut and paste* or, more simply, *drag and drop*. Both these techniques should be familiar to the Microsoft Office user. To list the students starting with their full name (including title) in the correct order:

5. Click on the *Surname* column heading to select the column
6. Move the mouse cursor back into the column heading, hold down the mouse button then (with the button still depressed) drag the column to the right to a position immediately before the *Hall* field
7. Let go of the mouse button to drop the field in its new position

Note: you are only changing the screen display - the data is still stored in its original order.

Finally, you might want to print your list. First, it's a good idea to preview it:

8. Click on the [**Print Preview**] button - the mouse cursor becomes a magnifier

You will notice that Access automatically adds a header and footer to your page, which you may or may not want. Normally you would now print your list, but here:

9. Click on the [**Close**] button to turn off the preview

To redisplay some of the hidden fields:

10. Open the **Format** menu and choose **Unhide Columns ...**
11. Click in the box against a hidden column to redisplay it
12. Once all the required fields are ticked, press <Esc> or click on [**Close**]

Tip: The simplest way to redisplay all the fields is to close the table without saving the changes to its design. When you reopen it, it will appear in its original format.



Advanced Filters

The relationship between queries and filters is a very close one. You can in fact save a filter as a query by turning on the advanced filter option. This can be a useful aid in designing a query. Save the current filter (students with a set tutor who came in 2004), as an introduction to queries.

To save the filter:

1. Open the **Records** menu, choose **Filter** then **Advanced Filter/Sort...**

A *Filter Design* window appears. This is very similar to the *Query Design* window, which you will be using next. Examine how the criteria have been set up.

2. Open the **File** menu and choose **Save as Query**
3. Save the filter as **Tutor04** (press <Enter> for [OK]), then [Close] the filter window
4. Close the **students** table - don't save the changes to the design (click on [No])

To rerun the filter:

6. Move to **Queries** in the *Objects* list of the *Database* window
7. Select **Tutor04** and press <Enter> to [Open] it
8. End by closing the query - click on its [Close] button

Once a filter has been saved as a query, it's easy to modify its design if necessary.

Using a filter in this way is straightforward but a little limited. You can't, for example, find all the students with either Tutor X or Tutor Y. To do more complicated selections such as this you have to use a *Query*. Queries also offer various other facilities, as you will see.

Selection using a Query

New Object:  Run: 

To introduce you to queries (which may look a little complicated at first, but which are in fact very easy), try repeating some of the selections you have just done. There are four ways to start a query:

- You can use the [New Object] button, choosing **Query**

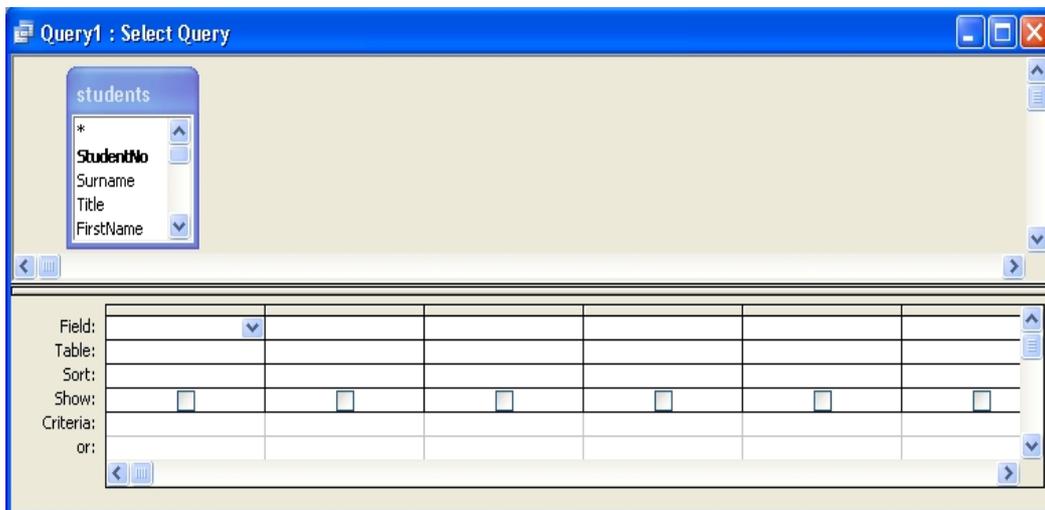


- You can choose [**Create query in Design view**] from **Queries** in the *Objects* list
- You can choose [**Create query by using wizard**] from **Queries** in the *Objects* list
- You can click on the [**New**] button when viewing **Queries** in the *Objects* list

Here, try the first method:

1. Click on **Tables** in the *Objects* list and check the **students** table is selected
2. Click on the *list arrow* attached to the [**New Object**] button on the right and choose **Query**
3. In the next window, accept the default *Design View* - press <Enter> or click on [**OK**]

Note: Whenever you start up a query from a table, the query is automatically based on that table.



The *Select Query* window may look a little confusing, but in fact it's very simple to use. The cursor should be flashing in the *Field:* row in the lower part of the screen waiting for you to define which fields are to be displayed. The first quick selection you carried out was to display all the data for students in a particular hall of residence, so try to repeat that here:



1. Click on the *list arrow* on the right of the *Field:* cell and choose **students.***

The *asterisk* notation means *all* the fields in the *students* table (if you only wanted certain fields displayed you must choose them individually).

You are going to select all students from a particular hall, so you need the *Hall* field in a separate column to set up the selection criteria. Another way to fill up a field is to drag it from the **students** field list in the top half of the *Select Query* window. You can try this next:

2. Scroll down to display the **Hall** field then drag it from the **students** list to the *Field:* row in the second column. Release the mouse button to drop the field heading into position
3. Unset the *Show:* box in column 2 by clicking anywhere in the cell (the check box will become blank) - if you don't, the hall will appear twice as it's already in **students.***
4. Move down to *Criteria:* in column 2 and type the name of the required hall - eg **Childs**
5. To carry out the query, click on the **[Run]** button (or you can click on **[View]** to move from *Design View* to *Datasheet View*)

The main difference between this query and the earlier quick select is that you can keep it for future use - quick select just applies a filter to the

underlying table whereas a query can be saved as a separate entity. You can build up a range of queries and then run them as required - for example, next term or next year you might want a new list of students living in a particular hall of residence.

6. Click on the query window's **[Close]** button (or use **Close** from the **File** menu)
7. When asked, press **<Enter>** or click on **[Yes]** to save the query
8. Save the query as **Hall** - press **<Enter>** or click on **[OK]**

Note: You can't give a table and query the same name. Now try re-running the query:

9. At the *Database* window click on **Queries** in the *Objects* list



10. Select the **Hall** query and press <Enter> or click on [**Open**] - you have your results again

Parameter Queries

The selections you have carried out so far have only met fixed criteria - in this case: *Show me the students who live in Childs (or whichever) Hall*. With a query, however, you can change the criteria each time you run it by making it a *parameter query*. The design is very similar to what you have already seen except that instead of setting a fixed criteria Access asks for the information at run time. Modify the Hall query to do this:

1. With the *Hall* query still open, click on the [**View**] button to change to the *Design View*
2. Click in the *Criteria:* field in the second (Hall) column and <Delete> the current criteria
3. Type in a new criteria saying: [**Which Hall?**]

Note: square brackets tell Access that this is a question, to be displayed at run time.

4. Click on the [**Run**] button (or switch to *Datasheet View*)
5. When asked the question *Which Hall?* type in the required hall of residence - eg **Bridges**
6. Press <Enter> or click on [**OK**] and the query will be run

Normally, you would run the query each time from the *Database* window (or from a user-friendly interface - a form called a *switchboard*). Here, however, to run the query again:

7. Click on the [**View**] button to change to the *Design View*
8. Click on the [**Run**] (or [**View**]) button again
9. Type in the name of a different hall - eg **Windsor** - and press <Enter>

or click on [**OK**]

As you can see, this query is much more useful than when it only worked for a set hall.

More Complex Queries

Next, try some more complicated queries. What if you want to have an alternative criteria? For example, you might want a list of students living in *either* one hall *or* another. To do this, you have to set up criteria on two different lines.



1. Click on the [**View**] button to change to *Query Design*
2. In the *second* line of the *Criteria*: in column two, type: [**or?**] for a second question
3. Click on the [**Run**] button (or switch to *Datasheet View*)
4. When asked *Which Hall?* type in the name of the first hall - eg **Wells**
(press <**Enter**>)
5. When asked *or?* type in the name of another hall - eg **Wessex** (press <**Enter**>)
6. You now have the students from both halls - [**Close**] the query, saving the new design

You have seen how to match values in a query but you can also use criteria such as greater than, less than, not equal to, between one value and another, or matching part of a field. For example, how do you set up a

query to pick out the students who came in 2004? The answer is that you have to use a special notation called *Like*.

The **Like** notation indicates that the words which follow must be embedded within the data in that field for a record to be selected - wildcards (* or ?)

can be used to denote characters which may precede or follow the required text. ? represents a single character whereas * represents any number of characters. For example, **Like C*** could be used to give you all the students with names beginning with the letter *C*, while **Like *son** would match students whose names ended with *son*. For the 2004 students:

1. Check you are viewing *Queries* in the *Database* window
2. *Double click* on **Create query in Design view** or use [**New**] and accept *Design View*
3. In the *Show Table* window, click on the *Tables* tab, select **students**
and [**Add**] it

Because the query wasn't started from a table you have to add it explicitly this time.

4. Press <**Esc**> or click on [**Close**] to close the *Show Table* window



5. Set the *Field:* in the first column to **students**.*

Tip: A third way to set up the fields is to *double click* on the field names in the field list in the top half of the *Select Query* window. This automatically fills up the next empty *Field:*

6. Set the *Field:* in the second column to **Userid**
7. Move down to *Sort:* and type **a** to get a list sorted on the students' usernames
8. Turn off *Show:* by unticking the box
9. In *Criteria:* in the second column type: ***04*** and press **<Enter>**

(Access automatically changes this to **Like "*04*"** for you)

10. Click on the **[Run]** button to run the query - or switch to *Datasheet*

View

To set up a second condition on this subset of data (eg 2004 students who have a particular tutor) is very easy. Whereas alternative conditions are set up on different lines, simultaneous conditions must be set up on the *same* criteria line:

11. Click on the **[View]** button to move back to *Design View*
12. Set the *Field:* in the third column to **Tutor**
13. Turn off *Show:* by unticking the box
14. In *Criteria:* in the third column, top line, type: **[Which Tutor?]** - or set a fixed value
15. Click on the **[Run]** button to run the query - or switch to *Datasheet*

View

16. When asked *Which Tutor?* type in the name of a tutor (eg **Foot**) - press

<Enter> for **[OK]**

17. **[Close]** the query, saving it as **2004**

Adding a New (Calculated) Field



Earlier, you did a very simple selection to show just the student's name and hall of residence. You are going to repeat that next, to demonstrate how to include only certain fields in a query. One fault with the original example was that the students' names (first name and surname) were printed in separate columns. In a query you can calculate a new field, joining these together:

1. Check you are viewing *Queries* in the *Database* window
2. Double click on **Create query in Design view** or use [**New**] and accept *Design View*
3. In the *Show Table* window, click on the *Tables* tab, select **students** and [**Add**] it - press <Esc> to [**Close**] the window
4. In *Field:* in column one, type: **FullName: FirstName & " " & Surname** (don't forget the space between the double quotes or the names will merge into a single word) - press <Enter>

Tip: You should always use an ampersand (&) rather than plus (+) sign when joining text together. Though both appear to work, plus signs can occasionally cause problems.

5. Set the *Field:* in the second column to **Hall**
6. Set the *Field:* in the third column to **Surname** - you need surname for sorting your list into alphabetic order, however, you don't want it displayed twice
7. Set *Sort:* in column 3 to **Ascending** - type **a** in this cell
8. Turn off *Show:* in column 3 by unticking the box
9. Click on the [**Run**] button to run the query - or switch to *Datasheet View*
10. Double click on the dividing line between the column headings to widen the *FullName* column

With a query you can sort on more than one field if you want - a sort within

a sort. Here, you might want to sort first by Surname and then by FirstName (for example, if you move down to the students named *Berry* - use <Page Down> - you will see they are out of order). Sorts are carried out from left to right across the columns in the query - if the fields are not in the correct order, simply drag and drop them as required.



11. Click on the [**View**] button to move back to *Design View*
12. Set the *Field:* in the fourth column to **FirstName**
13. Set **Sort:** in the fourth column to **Ascending** - type **a** in the cell
14. Turn off *Show:* in column 4 by unticking the box
15. Click on the [**Run**] button (or switch to *Datasheet View*) again to see the results
16. Check the *Berry's* then [**Close**] the query, saving it as **Names**

Using a Form

The next object to investigate is a *Form*. Forms are used to facilitate data input and allow you to set up your own data entry screen. Forms can also be used for queries. A data entry form has already been set up for the students table:

1. At the *Database* window, click on **Forms** in the *Objects* list
2. Select the **students** form and press <**Enter**> to [**Open**] it

The screenshot shows a Microsoft Access form window titled "students". The form has a light green background and contains the following fields:

- Student Number: 10012
- Surname: Brachen
- Title: Mr (dropdown)
- First Name: David
- Other Initials: (empty)
- Hall: Bridges (dropdown)
- Userid: squ03db
- Tutor: Evans (dropdown)
- Option: 7
- Date of Birth: 03-Jan-81
- Street: 52 Jubilee Road
- Town: Birmingham
- PostCode: B11 5FN
- Phone: 0121-720156
- Overseas:

There is a "Photograph" field containing a cartoon image of a duck in a blue suit holding a briefcase, standing next to a computer monitor on a red stand. Below the form is a "Notes" field which is empty. At the bottom of the form, it says "Record: 1 of 391".



A user-friendly screen is displayed, with a title at the top and the various fields listed and boxed. The menus, commands and buttons work as they did before, allowing you to move around, add new records, delete records, filter, sort and search etc.

3. Move to the *Surname* field (press <Enter>, <Tab> or <right or down arrow>)
4. Click on [**Sort Ascending**] to sort the forms into alphabetical order
5. [**Close**] the form then reopen it - the sort order remains, as it did with the table

Forms also provide short-cuts to data entry, including letting you select from a list of valid values. Use this form type in your own information again:

6. Click on the [**New Record**] button or use **New Record** from the **Insert** menu
7. Fill in the fields with your own information, as you did before
8. In the *Title* field, select the required title using the *list arrow*
9. In the *Hall* field, start typing the name of the hall and watch Access select from the list of possible values (alternatively, choose from the list using the *list arrow*)
10. The *Tutor* field also has a *list arrow* attached
11. The *Overseas* field appears as a check box - click on it to set it on if necessary
12. In the *Notes* field, type several lines of text (type rubbish text, if you like) and watch how the box accommodates it. Press <Tab> to move to the next field (the <down or right arrow> keys don't work, while <Enter> gives you a new paragraph!)
13. For a *Photograph*, as you probably haven't got a picture file handy, press <Alt PrintScreen> to dump the current window then [**Paste**] it from the *Clipboard* into the field
14. End by deleting your own record - click on the [**Delete Record**] button
(press <Enter> for [**Yes**] - or click on [**No**] if you want to keep it)

Form Design



Though forms are very easy to use, they are not that easy to design. Fortunately, Access has wizards to do most of the work for you. However, if you wish to modify a wizard-designed form, you will find it very difficult until you are familiar with the program. To view the form design:

1. Click on the [**View**] button to move to *Design View*
2. Note that Access provides you with a *Toolbox* to help you with the design

You are not going to modify the design of this form - you will see how to later, in Part 2 of these notes. For the moment:

3. Click on the [**View**] button to move back to *Form View*

Filter by Form

Filter by Form:  Apply Filter:  Clear Grid: 

When using forms, if you want to select a subset of the records using a filter, you can still use the [**Filter by Selection**] button as before. However, this isn't very convenient if you want to base the filter on information not displayed on the current form. Here, for example, you might want to search for all the students living in Wells Hall (which isn't the hall on the current record). Access provides a special filter button for use with forms (the middle of the three filter buttons).

1. Click on the [**Filter by Form**] button (the middle one of the three filter buttons)
2. If the form is not empty, click on the [**Clear Grid**] button
3. Click on the *list arrow* attached to the *Hall* field and select **Wells**
4. Click on the [**Apply Filter**] button - you should now have just 21 records (use <Page Down> to move through them)
5. Click on the [**Remove Filter**] button to see all the records - note that the same button is used for applying or removing a filter
6. Close the form by clicking on its [**Close**] button - or use **Close** from the

File menu

Note that you are not asked to save the changes to the design of the form (you are with a table). Any



sorting is saved automatically; any filtering is discarded. Note also that you can use **[Filter by Form]** on a table. Here you are given a blank record into which you type the required criteria.

Using a Report

The fourth object button in the *Database* window is *Report*. This allows you to create (and store) reports which can then be printed.

1. Click on **Reports** in the *Objects* list

A report for the students table has already been prepared (you will see how to create a report later):

2. Check **students** is highlighted it and press <Enter> for **[Preview]** - you may need to **[Maximize]** the window
3. The mouse button acts as a zoom facility - position the magnifying glass over a particular piece of text and click on the mouse button to magnify it
4. Use <Page Down> or the page selection buttons at the foot of the *Preview* window to move to other pages

To see how the report is designed:

5. Click on the **[View]** button to move to *Design View*

Note how similar the *Report Design* and *Form Design* windows are - you have the same *Toolbox* to draw the various components. Again, you will see how this is done later.

6. Click on the **[View]** button again to move back to *Print Preview*
7. Close the Report - click on its **[Close]** button or use **Close** from the **File** menu

Part 2 : Creating a New Table

In this next section you will be creating your own table (and form). You will then type in a couple of records - the rest you will retrieve from a file.

Designing the Table

As much as possible of a table design should be done in advance on paper. Here, however, you will



be creating the table on the screen so that you can see the stages as they are implemented. The table you are going to create contains information about the Halls of Residence at the University. In Part 3 of these notes, you will see how to link this information to the data in the **students** table:

1. Click on **Tables** in the list of *Objects* in the *Database* window
2. In this window, click on **[New]** for a new table

You are now offered various alternatives (the first three of which can also be accessed from special buttons on the tables tab in the *Database* window):

- *Datasheet View* creates a dummy datasheet for you, with the fields named as *Field1*, *Field2* etc. As you enter data into the fields, Access recognizes the type of data entered and allocates a *Data Type* to it (eg if you type a date, the field will be set up as a Date/Time field). To name the fields, double click on each column heading and type in its new name
- *Design View* lets you do everything yourself, from scratch
- *Table Wizard* has predefined *Sample Tables* (eg Employees, Addresses, Inventories) for both Business and Personal applications. Each sample table has suggested fields, which you may or may not want to include in your own table design. Wizards have the disadvantage that they sometimes try to be too clever and are very much geared to the American market (eg Addresses have States, not Counties)
- *Import Table* and *Link Table* allow you to import data from or link the table to another file, respectively. This file could be an Excel spreadsheet, for example, or another database

To understand the fundamentals of table design:

3. Choose **Design View** - press **<Enter>** or click on **[OK]**
4. The first field is for the name of the hall - type in **Name** and press **<Enter>**

Note: It's important that you name the fields exactly as specified in these notes for one of the later



exercises to work.

5. The *Data Type* is **Text** by default - press <Enter> as this is what you want for this field
6. The *Description* is optional - type in **Name of Hall of Residence** if you want
7. Move down to the *Field Properties*

Tip: Key <F6> can be used to *Switch* panes - or you can use the mouse.

8. Set a *Field Size* of **12** and press <Enter>

If you need to increase the field size at some time in the future there should be no problem. However, if you ever choose to decrease it then you could lose some data.

9. Set up a *Caption* of **Name of Hall** then *Required* to **Yes**
10. Set *Indexed* to **Yes (No Duplicates)** - it's worth putting an *index* on this field since it is likely to be used for sorting and it also insures that the data for a particular hall is not entered twice
11. Move to the second row - press <F6> and <Enter>, or use the mouse
12. Set the *Field Name* to **Warden** and the *Data Type* to **Text**

You could now fill in the *Description* and set some *Properties* but, to speed things up, just leave the settings for this (and subsequent fields) as they are.

13. Press <down arrow> to move to the third field
14. Set the *Field Name* to **Phone** and the *Data Type* to **Text**
15. Press <down arrow> to move to the fourth field
16. Set the *Field Name* to **Road** and the *Data Type* to **Text**
17. Press <down arrow> to move to the fifth field
18. Set the *Field Name* to **Town** and the *Data Type* to **Text**
19. Press <down arrow> to move to the sixth field
20. Set the *Field Name* to **Students**, the *Data Type* to **Number** (for a *Description* add **Number of students living in the Hall**) and the *Field Size* property to **Integer**



21. Move to the seventh field

22. Set the *Field Name* to **Meals**, the *Data Type* to **Yes/No** (for a *Description* add **Are meals provided?**) and the *Default Value* property to **Yes**

Note: The *Lookup* tab in the *Field Properties* allows you to set up a different *Display Control* on a form or table. For a *Yes/No* field, this is set to *Check Box* but can be *Text* or *Combo Box*:

23. For the *Meals* field, click on the *Lookup* tab and set *Display Control* to

Text Box

Setting up a Primary Key

Primary Key: 

Whenever you design a new table, it's a good idea to set up a *Primary Key* on one of the fields. Primary Keys help Access uniquely identify each individual record in a table and hence work more efficiently. If a table doesn't contain a unique identifier then Access will ask to set up an ID field for you. Here, the *Halls of Residence* table already has a unique field - the name of the hall:

1. Click on the **Name** field (row 1)
2. Click on the **[Primary Key]** button - a key symbol appears in the *field indicator* column
3. Click on the **[View]** button to move to *Datasheet View*
4. When asked (press **<Enter>** for **[Yes]**), save the table as **HoR** - press **<Enter>** or click on **[OK]**

You could now type in your data, if you wanted to. Using a datasheet isn't very friendly, however, so try setting up a special *data-entry form*. A form gives you more control over what data is entered and can be designed to cut down on typing mistakes, as you saw with the students form.

Creating a Data Entry Form

There are two simple ways of creating a form, you can either use a *Form Wizard* or *AutoForm*. AutoForm is a very quick and easy way to produce a form - it does so at the click of a button:



1. With the **HoR** table still open, click on the *down arrow* attached to the **[New Object]** button and choose **AutoForm** - the form appears instantaneously in a new window
2. Click on its **[Close]** button to **Close** the form - don't save it this time
(click on **[No]**) as you will be creating the form using a *Wizard* next
3. Close the **HoD** table by again clicking on its **[Close]** button

The *Form Wizard* is equally easy to use and offers you various additional options.

1. At the *Database* window, click on **Forms** in the *Objects* list and then on **[New]**
2. In the *New Form* window, click on the *list arrow* and set the data source for the form to **HoR**
3. Click on **Form Wizard** then press **<Enter>** or click on **[OK]**

You are now asked which fields you want to appear on your form (here you have the choice - *AutoForm* gave you them all). As it happens, for a data entry form, you need all the fields:

4. Click on the double arrow [**>>**] to move them all (alternatively select individual fields in the order you want and use the [**>**] button) - press **<Enter>** or click on **[Next>]**
5. Choose a *layout* for your form (explore the alternatives, if you like, but ignore *PivotTable* and *PivotChart*) - **Columnar** is best (press **<Enter>** or click on **[Next>]**)
6. Set a *style* for your form - choose **Standard** (press **<Enter>** or click on **[Next>]**)
7. Add a title - accept **HoR** (press **<Enter>** to **[Finish]**)

The form is now opened for you to use. As it stands it is neat and simple, but a little boring - in fact it's exactly the same as that produced using *AutoForm*. To improve it

Toolbox:  **Label:** 

8. Click on the **[View]** button (to move to *Design View*)



9. Enlarge the *Form Design* window - click on the [**Maximize**] button (to the left of [**Close**])

Forms have three (sometimes more) sections - a *header*, *footer* and the *detail*. The data itself is entered into the detail section; the header and footer can be used for titles etc. To add a title:

10. Position the mouse over the border between the *Form Header* and *Detail* - the cursor should change shape to a double-headed arrow. Hold the mouse button down and drag the border down one unit (there's a scale on the left-hand side)

11. Click once on the [**Label**] tool in the *Toolbox* - the mouse pointer now has an A attached

Tip: If you accidentally close the *Toolbox*, you can redisplay it by clicking on the [**Toolbox**] button (or select **Toolbox** from the **View** menu).

12. Move the pointer into the form header (top left corner) and click once

13. A small label box is drawn - type your form title: **Halls of Residence - The University of Reading**

14. Press <**Enter**> and the label box is completed

15. Change the [**Font Size**] (eg to **14** point) and click on [**Bold**] to make the title more imposing

16. To display the enlarged title, *right click* on the label box and choose **Size** then **To Fit** (this command can also be issued via the **Format** menu)

To add colour:

17. *Right click* on the *label* box and choose **Font/Fore Color** - pick a colour to apply to your title

18. *Right click* on the header background (away from the label) and choose a **Fill/Back Color**

19. Repeat the process to change the colour of the detail background, other labels/text boxes etc

Tip: Use the [**Format Painter**] to copy the colour scheme of one label or text box to the others - this speeds things up and gives a better overall design.

20. Press <**Ctrl s**> (or click on the [**Save**] button) to save the changes to the design of the form - the name of the form is picked up automatically as **HoR**

21. Click on the [**View**] button to move to *Form View*



The form is now ready for you to type in the data.

Entering Data Using the Form

You are now going to use the form to enter a couple of data records:

1. For the first record, type in the following: Name: **Bridges** (and press <Enter>)

Warden: **Dr R.P.B. Smith** (<Enter>) Phone: **x8647** (<Enter>)

Road: **Whiteknights Road** (<Enter>) Town: **Reading RG6 6BG** (<Enter>) Students: **458** (<Enter>)

Meals: the *option box* is already set on for **Yes**

2. Press <Enter> to move on to the second record, which is as follows: Name: **Childs** (and press <Enter>)

Warden: **Prof A.L. Jones** (<Enter>) Phone: **x8800** (<Enter>)

Road: **Upper Redlands Road** (<Enter>) Town: **Reading RG1 5JW** (<Enter>) Students: **458** (<Enter>)

Meals: again, the *option box* is already set on for **Yes**

This is all you are going to enter explicitly; the remaining records are going to be *imported* from a data file created using another package.

3. Close the *Form* window by clicking on the [**Close Window**] button
4. Click on the [**Restore Window**] button (the middle one of the three in the top right corner of the window) to return the *Database* window to a smaller size

Importing Data

Access allows you to bring in information from other sources - this is called importing. Databases vary on how they bring in the data and on which sort of files they can import. If you have a really large dataset, it is a good idea to try importing a small section to a new table first and only if that works successfully to try to import it all.

Access can import data in various formats, including Dbase (another widely-used database) and



HTML (from web pages). Microsoft Excel spreadsheet files can be imported directly. Here, the data has been saved as *tab separated values*, which is a standard format which any spreadsheet (or indeed word processor) should be able to produce. Other basic formats

include *comma separated values* and just plain *text*. One thing to note when importing a file is that the first line may contain headings - Access has an option to cope with this and can use them for field names.

You should currently be back at the Database window. To *add* the data to an existing table (or create a *new* table) from a file:

1. At the *Database* window, click on **Tables** in the *Objects* list and choose **[New]**
2. Click on **Import Table** then press <Enter> or click on **[OK]**
3. Check that the current directory is set to **Training** on the **D:** drive (if using a lab PC; if not, the file can be downloaded via the hyperlink at step 5)
4. Change the *Files of type:* box to read **Text Files** by using the *list arrow* attached
5. Select the file called **halls.txt** then press <Enter> to **[Import]** it
6. The *Import Text Wizard* now starts up. This has several stages, as follows:
 - a. Choose whether the data is character (eg tab, comma or space) delimited or fixed width (where extra spaces have been used to line up the data in columns) - press <Enter> or click on **[Next>]** for *Delimited*
 - b. Choose the delimiter (here, *tab* is correctly chosen) and whether or not the *First Row Contains Field Names* (**here, it does, so click to set it**) - press <Enter> for **[Next>]**

Tip: If you are adding to an existing table and the first row doesn't match the table field names then import them as an extra record, which you later delete.



- c. You are now asked whether you want a new table or to add to an existing one. Click on the *list arrow* and set *In an Existing Table:* to **HoR** - press <Enter> for [Next]
- d. The final step of the wizard confirms the table name (or lets you type in a new one, if creating a new table) - press <Enter> for [Finish]

You should have imported 14 new records - press <Enter> for [OK] to move on.

7. At the *Database* window, select and [Open] the **HoR** table to see the new records
8. Resize the columns by double clicking on the column heading dividers
9. End by closing the table - click on its [Close] button, saving the changes to the layout of the table (press <Enter> for [Yes])

Note: you can also export data from Access for another package to read using **Export...** from the **File** menu. Amongst the formats available are Excel and character or tab delimited (suitable for many applications, including SAS, SPSS and Minitab).

Part 3: Relating Tables Together

A relational database management system lets you store information in many tables which can then be linked together. This is particularly useful when you have information which is either heavily duplicated or sparse (many records having empty fields). For example, if you have an inventory of equipment, it's better to record information about the suppliers (the name, address, phone/fax numbers, contact etc) in a separate file. Then, in your inventory, you need only record the name of the supplier to find out the

other information. As each supplier will be supplying several pieces of equipment, this avoids massive data duplication.

It's the same situation here with the students. There is no need to store information about Halls of Residence for each student - that can be picked up from the *HoR* table. You'll see next how this is done. The aim of the exercise is to create a list of students, living in hall, such that you can send them a letter to their University address.

1. Click on **Queries** in the *Objects* list at the *Database* window



2. Double click on [**Create query in Design view**] or use [**New**] then
Design View
3. [**Add**] both the **HoR** and **students** tables to your query - press <**Esc**>
or click on [**Close**]

You next have to join the two tables together on a common field. Joins can be created between tables when you design the database (in a special *Relationships* window), or made in a query (in which case they only apply to that particular query).

Tables are automatically joined in a query if two fields have the same name. Here, however, the common field (the Hall of Residence) is called *Hall* in the *students* table but *Name* in the *HoR* table. In this case you have to create the join manually by dragging the field name from one table over to the corresponding name in the other table.

4. Position the cursor over the **Name** field in the **HoR** table
5. Hold down the mouse button and drag the field over the **Hall** field in the
Students table

When you release the mouse button, a *join line* appears. If you made a mistake, simply click on the join line to select it then press <**Delete**> and try again. Now you need to set up your query:

6. In column 1, set the *Field:* to **FirstName** from the **students** table
7. In column 2, set the *Field:* to **Surname** from the **students** table
8. In column 3, set the *Field:* to **Hall** from the **students** table
9. In column 4, set the *Field:* to **Road** from the **HoR** table
10. In column 5, set the *Field:* to **Town** from the **HoR** table
11. Sort the data by Hall - set *Sort:* to **Ascending** in column 3
12. Click on [**Run**] to run the query - you should find 265 records are displayed (if you spelt Bridges and Childs correctly - the 125 students living in private accommodation are excluded)
13. Click on the query window's [**Close**] button, saving it as **Addresses**



Creating a Report

Earlier you viewed an existing report; now, try to generate some yourself. Reports are saved within the database - you can then modify them at some later date if you need to tidy up the layout, for example. Note that you can also export data to Word or Excel via **Office Links** in the **Tools** menu.

Access gives you the opportunity of designing your own reports from scratch (using *Design View*), however, unless you are an expert, don't even attempt this. It's much easier to use *AutoReport* or a *Report Wizard* and then modify the design if you really need to.

Using AutoReport

Begin by creating a report for the *HoR* table using *AutoReport*.

1. At the *Database* window, click on **[Reports]** in the *Objects* list and choose **[New]**
2. Use the list arrow to select the **HoR** table
3. Click on *AutoReport: Tabular* then press **<Enter>** or click on **[OK]**

A report is automatically produced for you. It looks fine, so there is no need to change the *design* unless you really want to.

4. Click on the report window's **[Close]** button, saving it as **HoR**

AutoReport gives you a very simple report. By using the *Report Wizard* instead, however, you can set various other options (as you found with the *Form Wizard*). You'll look at this next.

Using Report Wizards

To demonstrate the Report Wizard, you are going to produce a report listing the students by their hall of residence, with the hall address only appearing once for each group of students:

1. At the *Database* window, click on **[Reports]** in the *Objects* list
2. Double click on **[Create report by using wizard]** or use **[New]** and the *Report Wizard*
3. Use the *list arrow* to select the **Addresses** query
4. The Report Wizard now goes through six steps:



- a. Move across the fields you want on your report. Here, you want all the fields, so click on [>>] - press <Enter> or click on [Next>]
- b. Step two allows you to set grouping levels. You only need a list of names for each hall, so use the address fields for grouping (these then appear once for each list of names) - move across *Hall*, *Road* and *Town* (using [>]) then press <Enter> or click on [Next>]
- c. *Sort by*: **Surname** and then **FirstName** - press <Enter> or click on [Next>]
- d. Choose a *Layout*: **Align Left 1** is fine - press <Enter> or click on [Next>]
- e. Choose a *Style* for your report (eg **Formal**) - press <Enter> or click on [Next>]
- f. Call your report **Addresses** - press <Enter> or click on [Finish]

The resultant report may not be exactly what you want (in fact it looks terrible) but it's easier to modify a design than to create one from scratch. Here, for example, there is no need for the boxes round the headings (or indeed the headings themselves), the address for each hall needs to be in the same style and lined up properly, and the list of students should be on the left of the page.

5. Click on the [View] button to see the *Design View*
6. Open the **View** menu and select **Report Header/Footer** then click on [Yes] to delete these sections (they aren't needed here)
7. Click on the *Hall* label (the box on the left) in the *Hall Header* and <Delete> it
8. Click on the *Hall* text box in the *Hall Header* and, using the mouse or <arrow keys>, move it to the far left
9. Repeat steps 7 and 8 for the *Road* and the *Town* boxes
10. Using the mouse in the ruler on the left, drag down through the *Town Header* (very top to very bottom), then <Shift> click on the *Town* text box (to unselect it) and <Delete> everything else
11. Click on the *Hall* text box in the *Hall Header* then on the [Format Painter] button (the brush



to the right of **[Paste]**) and click on the *Road* text box to paint the format

12. *Right click* on the *Road* text box and choose **Size ...** then **To Fit**
13. Repeat steps **11** and **12** on the *Town* text box
14. Finally, click on the *FirstName* text box (to select it) then, using the mouse or **<arrow keys>**, move it to the far left - you may also need to move the *Surname* slightly to the right
15. Reduce the height of the *Detail* area slightly - position the mouse on the top of the *Page Footer* (it changes shape to a double-headed arrow), hold down the mouse button and drag the border up just a little

To force each hall onto a separate page:

16. *Right click* on the *Hall Header* and choose *Properties*
17. Set *Force New Page* to **Before Section** then **[Close]** the *Properties* window
18. Finally, click on the **[Print Preview]** button to see the changes you have made
19. Click on the window's **[Close]** button, saving the changes to the design of the report

Tip: For a multi-column layout, open the **File** menu and choose **Page Setup...** Then, on the *Columns* tab, set the *Number of Columns* and *Width* as appropriate (eg to columns to 2 and width to 7.9) and change the *Column Layout* to **Down then Across**.

Next, try using a special wizard to generate the address labels for the students.

1. At the *Database* window, click on the **[Reports]** tab and choose **[New]**
2. Use the list arrow to select the **Addresses** query
3. Click on the *Label Wizard* then press **<Enter>** or click on **[OK]**
4. The Label Wizard now goes through five steps:
 - a. Setup the size for your labels - check *Filter by manufacturer:* is set to **Avery**, change the *Units of Measure* to **English** and select the *Product number:* for your labels (eg **5160**) - press



<Enter> or click on [Next>]

- b. Setup the *Font name* and *Font size* etc which you require (here leave them as they are) - press <Enter> or click on [Next>]
- c. Move the fields across to a *Prototype Label* by clicking on the *arrow* provided:
 - move across *FirstName*, press the <spacebar>, then *Surname*
 - press <Enter>
 - move across *Hall* then press <spacebar> and type **Hall** - press <Enter>
 - move across *Road* - press <Enter>
 - move across *Town* - click on [Next>]
- d. *Sort by:* **Hall** and then **Surname** - press <Enter> or click on [Next>]
- e. Call your report **Labels Addresses** - press <Enter> or click on [Finish]

5. Press <Enter> (for [OK]) to cancel the warning message

6. View the report then click on its [Close] button to close the report

Tip: Getting Access reports looking exactly the way you want can be very time-consuming. It may be easier to do the formatting in Word - from the **Tools** menu choose **Office Links** then **Publish it with Microsoft Office**

Word. You can also send data to Excel if you want to carry out an analysis of the information.

Leaving Access

You should now be back at the *Database* window, where you could continue to work on the student's database, adding further tables and queries and producing more reports. When you have completely finished your work, open the **File** menu and issue a **Close** command. This closes any opened tables etc. and ensures that the database file is properly shut down.



You could now go on to use or create another database, but the course is now over so open the **File** menu and choose **Exit**. Finally, on the public machines, don't forget to **Log Off**.

5.5 CHECK YOUR PROGRESS

A. Fill in the blanks:

1. What is the program that enables you to create, access and manage a database called
2. When an Access file is saved, file format it takes.
3. In MS-Access, the rows in a table represent
4. A Strip of buttons across the top of the main window is called
5. tab consists of Spelling and grammar, thesaurus etc.

B. State whether the following statements are True or False:

1. Print Preview of Word does not allow you to do any editing.
2. The spelling and grammar check can only be done once the text is selected.
3. Graphics cannot be placed in headers and footers in MS-Word.
4. Clicking on any cell will highlight the selected print area.
5. You can only select cells that are adjacent to each other.

5.6 SUMMARY

Microsoft word is a widely used commercial word processor designed by Microsoft. It is a paid software that helps in preparing, editing, storing and printing documents quickly and with accuracy. A word processor lets a user change words or phrase, move whole sections of text from one place to another, store blocks of text, align margins. Use of MS word has changed the look and feel of official correspondence, reports and proposals etc. to a great extent. Microsoft excel is a software program developed by Microsoft corp. that allow users to organize, format and calculate data with formulas using a spread sheet system. This software has the same basic features as every other spread sheet, and uses a collection of cells arranged into rows and columns to organize data. An excel document is called a workbook. A workbook always has at least one worksheet. Worksheets are the grid where a user can store and calculate data. Microsoft access is used for data base management system. It stores data in form of tables.



5.7 KEYWORDS

Application Software: An application is any program, or group of programs, that is designed for the end user.

System Software: System software is a type of computer program that is designed to run a computer's hardware and application programs.

DBMS: Database Management System (DBMS) is a software for storing and retrieving users' data while considering appropriate security measures.

Spreadsheet: Spreadsheets present tables of values arranged in rows and columns that can be manipulated mathematically using both basic and complex arithmetic operations and functions.

MS-Word: Microsoft Word or MS-WORD (often called Word) is a Graphical word processing program that users can type with. Its purpose is to allow users to type and save documents.

5.8 SELF-ASSESSMENT TEST

1. What do you understand by Word processing? Give examples.
2. Describe the important features of Ms-Word.
3. Describe the various options available in the main menu bar of Ms-Word.
4. What are the different types of toolbar in MS word?
5. Define two methods to start Ms-Word.
6. What do you understand by Spread sheet?
7. Describe the important features of MS Excel.
8. What are the different types of toolbar in MS Excel?
9. Describe the important features of MS access.
10. What are the different types of toolbar in MS Access?



5.9 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress A:

1. Database Management System
2. .mdb
3. Record
4. Ribbon
5. Review

Check Your Progress B:

1. True
2. False
3. False
4. True
5. False

5.10 REFERENCES/SUGGESTED READINGS

1. Mridula Sharma, "Let Us Learn M S Office" Prabhat Prakashan, 2009.
2. By - Paul Mcfedries, "Formulas & Functions MS Office Excel 07" Pearson Education India, 1990.
3. Dinesh Maidasani, "Learning Computer Fundamentals, Ms Office and Internet & Web Tech." Firewall Media, 2005.
4. Dr. S.S. Srivastava, "MS-Office" Firewall Media, 2008.
5. <https://www.tutorialspoint.com/word/index.htm>
6. <https://www.guru99.com/excel-tutorials.html>
7. <https://www.excel-easy.com/>



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IT and Business: Concepts of Data, Information Technology and Effect of IT on Business

LESSON STRUCTURE

- 6.0 Learning Objective
- 6.1 Introduction
- 6.2 Meaning of Data and its Characteristics
- 6.3 Meaning of Information and its Characteristics
 - 6.3.1 Information Needs at Various Levels of Management
 - 6.3.2 Factors Affecting Information Needs
 - 6.3.3 Knowledge
 - 6.3.4 Information Technology
 - 6.3.5 Effect of IT on Business
- 6.4 Check Your Progress
- 6.5 Summary
- 6.6 Keywords
- 6.7 Self-Assessment Test
- 6.8 Answers to Check Your Progress
- 6.9 References/Suggested Readings

6.0 Learning Objectives

In this chapter you will learn about

- Definition of data and its characteristics
- Definition of information and its characteristics
- Types of information and features of information
- Need of information at various levels of management



- Definition of information technology
- Need of information technology
- Role of IT in business
- Benefits of information technology
- Issues and challenges in information technology
- Effect of IT on business

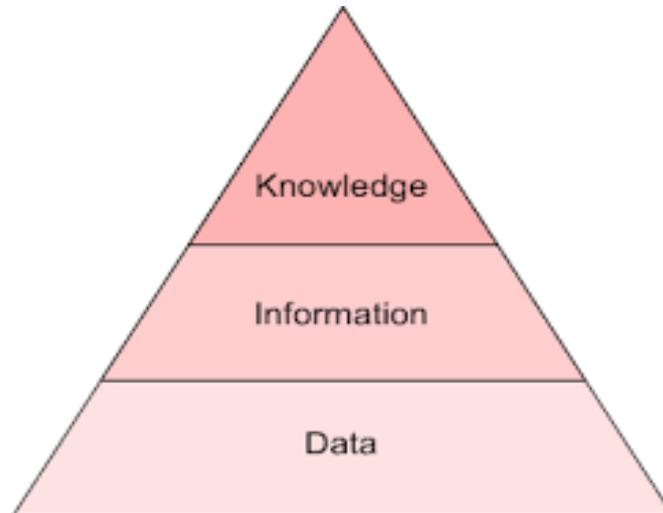
6.1 Introduction

We live in the information age. In the same way that the development of industry created the industrial age, the development of information technology systems, and especially the internet, has created the information age. It has been a long-held belief by many philosophers that knowledge is power and that knowledge stems from understanding of information; information, in turn, is the assigning of meaning to data. In the following sections data and information is defined according to three types of views:

- Objective view
- Subjective view
- Inter-subjective view

The objective view tends to assume that all data processing will be automated. The subjective view is very different in that it emphasises that if data are processed using a computer, the output is still only more highly structured or reformatted data. The inter-subjective view allows for the possibility that data may be processed either by computer or directly by a person.

To develop learners' understanding of information technology, we start by defining these three related concepts. The topics are hierarchical in that:



6.2 MEANING OF DATA AND ITS CHARACTERISTICS

6.2.1 Data in Noun form means

- Facts and figures collected together for reference or analysis.
- The quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of Information.

Example

- 3, 6, 9, 12
- cat, dog, gerbil, rabbit, cockatoo
- 161.2, 175.3, 166.4, 164.7, 169.3

These are meaningless sets of data. They could be the first four answers in the 3 x table, a list of household pets and the heights of 15-year-old students but without a context we don't know.

The concept of data as it is used in the syllabus is commonly referred to as 'raw' data – a collection of text, numbers and symbols with no meaning. Data therefore has to be processed, or provided with a context, before it can have meaning.



6.2.2 The objective point of view of data

The objective view makes the following assumptions about data.

- They are factual, resulting from recording of measurable events, or objects.
- They record particular instances of reality.
- Introna [1992: 2.42] takes a purely objective view of data, proclaiming them to be *“Aperspectual, ahistorical, acontextual”*.
- They are explicit as they are in a fixed, recorded form.
- Hence, they can be communicated digitally.
- Modern society generates enormous amounts of data that record details of individual events and objects.
- This objective point of view accepts that the data are validated in the sense that they must be measured and recorded accurately. Certain logic checks as to the reasonableness of the data can be done to try to determine whether the data capturing instruments or processes have failed. Data can be shown to be true if they correspond to reality.

The definitions that follow are examples of those that refer only to the objective characteristics of data:

“Data represent unstructured facts.” (Avison and Fitzgerald [1995: 12] quoted by Checkland and Holwell [1998])

“Data: Facts collected from observations or recordings about events, objects or people.” (Clare and Loucopoulos [1987: 2] quoted by Checkland and Holwell [1998])

“Data: The raw material of organizational life; it consists of disconnected numbers, words, symbols and syllables relating to the events and processes of the business.” (Martin and Powell [1992: 10] quoted by Checkland and Holwell [1998])

6.2.3 The subjective point of view of data

On the other hand the subjective view makes the following assumptions about data.

- The data are not necessarily true or accurate as not all errors can be detected automatically and not everyone will necessarily agree that they are a true representation of a particular fact.



- Some data record subjective opinion, not facts. If data can represent opinions and concepts, they are not truly objective.
- Data represent information and are the only way we can make information explicit.
- Nothing but data can be communicated digitally or in any other way. Only data are transmitted, be it by means of a telecommunications medium, in printed form, or directly without using any technology.
- Data have absolutely no meaning. They acquire meaning only when appropriated by a human recipient.

The definitions that follow are examples of those that include subjective aspects. These definitions include characteristics which have been highlighted as being objective or intersubjective as well.

“Data: Natural language: facts given, from which others may be deduced, inferred. Info. Processing and computer science: signs or symbols, especially for transmission in communication systems and for processing in computer systems, usually but not always representing information, agreed facts or assumed knowledge; and represented using agreed characters, codes, syntax and structure.” (Maddison [1989: 168] quoted by Checkland and Holwell [1998])

“By themselves, data are meaningless; they must be changed into a usable form and placed in a context to have value. Data becomes information when they are transformed to communicate meaning or knowledge, ideas or conclusions.” (Senn [1982: 62] quoted by Introna [1992])

6.2.4 The inter-subjective point of view

- The purpose of data is to permit communication.
- Information exists before data. Some version of that information can be retrieved from the data.
- Data must be recorded in a formalised structure and knowledge of this structure must be shared as prior shared meaning. They cannot be totally unstructured or no-one would ever be able to process them, but they can be reorganised into more complex structures during subsequent processing. The structure will result from language syntax and semantics if the data are in the form of text, or in the case of numeric or symbolic data, will depend on the predesigned layout of database records, forms or even the position of the data on a physical object. (We know something about what a number plate denotes from its position on a car even if the format is unfamiliar.)



- They are represented using agreed characters, codes, syntax and structure. A predetermined, agreed way of coding and decoding must be associated with this representation. A stream of bits is not data unless someone has the key by means of which it can be decoded.
- The fact that data are both recorded and have some structure makes them potentially useful - they are in a form suitable for subsequent interpretation and processing. Other information can be inferred and deduced from them and they can be associated with other data. They have potential meaning.
- They have an implied context and history. If the data have been captured or a procedure exists to capture them, a purpose has already been recognised.

Example definitions:

“Data: Facts, concepts or derivatives in a form that can be communicated and interpreted.” (Galland, [1982: 57] quoted by Checkland and Holwell [1998])

“Data are formalized representations of information, making it possible to process or communicate that information.” [Dahlbom & Mathiassen, 1995]

6.2.5 Data characteristics

- Data means Facts, statistics used for reference or analysis.
- Data comprises Numbers, characters, symbols, images etc., which can be processed by a computer.
- Data must be interpreted, by a human or machine, to derive meaning.
- Data is a representation of information.
- Data is derived from Latin word ‘datum’ which means “that which is given”.

6.3 MEANING OF INFORMATION AND ITS CHARACTERISTICS

It is important that students learn the concept of what ‘information’ is as used in information technology. Information is the result of processing data, usually by computer. This results in facts, which enables the processed data to be used in context and have meaning.

Information is Facts provided or learned about something or someone. It can be defined as data that:



- Has been verified to be accurate and timely
- Is specific and organized for a purpose
- Is presented within a context that gives it meaning and relevance, and
- That can lead to an increase in understanding and decrease in uncertainty.

In simple words it means processed data that has some meaning. Data alone are insufficient unless they are processed. Once converted in to information becomes directly applicable. The value of information lies solely in its ability to affect a behavior, decision, or outcome. A piece of information is considered valueless if, after receiving it, things remain unchanged.

The objective point of view

- Information is output from a computer program.
- The systems analyst decides what output will be useful. This output remains useful and meaningful regardless who the recipient is.
- The processing which produces the information includes summarising in order to reduce the volume of data.
- Data may be associated with other data, which may be obtained from different sources, to produce the information.
- The processing (classifying, linking, summarising, sorting, presentation) adds value in the form of potential meaning. The less structured data are less useful and less meaningful than the more structured information.

In the definition that follows “a meaning” seems to imply that the meaning is fixed and not open to interpretation and, therefore, this definition refers only to the objective characteristics of information:

“Information has a meaning ... (it) comes from selecting data, summarizing it and presenting it in such a way that it is useful to the recipient.” (Avison and Fitzgerald [1995] quoted by Checkland and Holwell [1998])

The subjective point of view

- Data become information only once they have been appropriated by the human recipient. Hence, the output from any computer program is still data.



- The added value of information (compared with data) results from the recipient appropriating the new data, interpreting them and placing them in context by combining them with existing personal information.
- Some authors consider data to be information only if they are used by the recipient in making a decision.
- Data become information only if they include something previously unknown to the recipient.
- Introna considers information to be historical, contextual and perspectual [Introna, 1992]. It is moulded by the life experience (erlebnis) to provide understanding.

The definitions that follow are examples of those that include subjective aspects. These definitions also include some characteristics which are considered to be objective or inter-subjective.

“Information usually implies data that is organized and meaningful to the person receiving it. Data is therefore raw material that is transformed into information by data processing. Information can be defined in terms of its surprise value. It tells the recipient something he did not know.” (Davis et al [1985] quoted by Introna [1992])

“Information: (1) Data that has been transformed into a meaningful and useful form for specific human beings. (2) The meaning that a human assigns to data by means of the known conventions used in its representations.” [Lay et al, 1993]

“Information is that which results when some human mental activity (observation, analysis) is successfully applied to data to reveal its meaning or significance.” (Galland [1982] quoted by Checkland and Holwell [1998])

“Information is the particular instances of reality as experience, perceived or understood by an individual in a specific context.” [Introna, 1992]

“... Information comes into being as the receiver appropriates the data and gives it meaning” [Introna, 1992]

The inter-subjective point of view

- Aspects of shared meaning and discourse (validity claims [Braaten, 1991]) are characteristic of this point of view.



- The recipient has participated in the systems analysis and hence has influenced the process and has said what output was likely to be meaningful to him and others using the system.
- More advanced, database-oriented, systems allow the user to formulate queries and interact directly with the data in the database. Hence, there is a more dynamic process where the user's judgement is combined with the power of the technology.
- Information “has meaning” which can be communicated versus “is meaning” in the objective point of view.

Information must be put into some context “... *in order to understand something, we already need a preliminary understanding of it*” [Dahlbom & Mathiassen, 1995]. This Preliminary understanding must be shared in order for a new shared understanding to result.

preconceptions plus information = interpretation => knowledge

“*To produce information we have to interpret what we experience and make explicit what we know.*” [Dahlbom & Mathiassen, 1995]

Characteristics of Information

- Information is the useful knowledge derived from the data
- Information is knowledge derived from study, experience (by the senses), or instruction.
- Information is any kind of knowledge that is exchangeable amongst people, about things, facts, concepts, etc.,
- In some context “Information is interpreted data”.

When does data become information?

Data on its own has no meaning. It only takes on meaning and becomes information when it is interpreted. Data consists of raw facts and figures. When that data is processed into sets according to context, it provides information.



Example

Looking at the examples given for data:

- 3, 6, 9, 12
- cat, dog, gerbil, rabbit, cockatoo
- 161.2, 175.3, 166.4, 164.7, 169.3

Only when we assign a context or meaning does the data become information. It all becomes meaningful when we are told:

- 3, 6, 9 and 12 are the first four answers in the 3 x table
- cat, dog, gerbil, rabbit, cockatoo is a list of household pets
- 161.2, 175.3, 166.4, 164.7, 169.3 are the heights of 15-year-old students.

Data refers to raw input that when processed or arranged makes meaningful output. Information is usually the processed outcome of data. When data is processed into information, it becomes interpretable and gains significance.

In IT, symbols, characters, images, or numbers are data. These are the inputs an IT system needs to process in order to produce a meaningful interpretation. In other words, data in a meaningful form becomes information. Information can be about facts, things, concepts, or anything relevant to the topic concerned. It may provide answers to questions like who, which, when, why, what, and how.

If we put Information into an equation it would look like this:

$$\text{Data} + \text{Meaning} = \text{Information}$$

Difference between Data and Information

	Data	Information
--	-------------	--------------------



Definition	In Latin ‘datum’ means “that which is given”.	Information is interpreted data. Data was the plural form of datum singular
Meaning	Data is raw, unorganized facts that need to be processed. Data can be something simple and seemingly random and useless until it is organized.	When data is processed, organized, structured or presented in a given context so as to make it useful, it is called Information.
Example	Each student’s test score is one piece of data	The class’ average score or the school’s average score is the information that can be concluded from the given data.

How does a computer process data into information?

A computer uses hardware and software in the following four functions to allow it to process data.

Input

Before a computer can process anything, data must receive input. For example, typing on a keyboard can enter input into the computer.

Process

After a computer has received input data, a program is used to process that information. A typical program may calculate, manipulate, or organize the data to create information that is understandable and presentable to the user.

Output



After the data is processed into information, it is displayed as output to the user. For example, the program displays the information on your monitor when you use the Windows Calculator.

Storage

Finally, the computer can store the created information for later use.

A real-life example of how data is processed

As a real-life example of data being processed into information, imagine the following scenario. You open a spread sheet program on your computer and enter the data "1.25" into the first cell. Initially, the computer understands this data only as the floating point number 1.25. But, using the spread sheet program, you can specify the data to be formatted as currency, so the computer understands it as "\$1.25" (one dollar and twenty-five cents).

You could input the data ".75" to another cell, and again format it as currency ("\$.75"). Then, you could input a formula in a third cell that adds the values of the information in the first two cells. This formula would return the new information "\$2.00." Or, the formula could convert the amount to another currency unit. For instance, if one dollar is worth .89 euros, the formula could convert "\$2.00" to the new information "€1.77."

After all of the data is processed, the spread sheet program can save (store) the file, allowing it to be opened again in the future to add additional data.

Features and qualities of information

1. Relevancy: The information so generated should be relevant to the context for which it is collated. Too much irrelevant information may confuse the intended user so it is necessary to generate only relevant information. No information should be generated only because it can be generated by Information System. A good way of ensuring relevance is to closely define the objectives of any information reports. Another way to improve relevance is to produce information that focuses on "exceptions" - e.g. problems, high or low values, where limits have been exceeded.

2. Up-to-date: Information needs to be timely if it is to be actioned upon. For example, a professional need updated information about applicable laws so that he may give relevant advice to his clients. To



improve the speed with which information is produced, businesses usually need to look at upgrading or replacing their information systems.

3. Accurate: As far as possible, information should be free from errors (e.g. the figures add up; data is allocated to the correct categories). The users of information should be informed whenever assumptions or estimates have been used.

4. Meet the needs of the User: Since different users have different information needs The managing director doesn't have time to trawl through thick printouts of each week's production or sales listings - he or she wants a summary of the key facts while the quality control supervisor will want detailed information about quality testing results rather than a brief one-line summary of how things are going. It is a good idea to encourage users to help develop the style and format of information reporting that they require.

5. Concise and User Friendly: Information should be clearly presented (e.g. use summaries, charts) and not too long. It also needs to be communicated using an appropriate medium (e.g. email, printed report, presentation). Businesses should also consider developing "templates" which are used consistently throughout the organization

- So that users get used to seeing information in a similar style.

6. worth the cost: Often forgotten. Information costs money. Data is costly to collect, analyse and report. Information takes time to read and assimilate. All users should question whether the information they receive/ have requested is worthwhile.

7. Reliable: Information should come from authoritative sources. It is good practice to quote the source used - whether it is internal or external sources. If estimates or assumptions have been applied, these should be clearly stated and explained.

Types of information

There may be different types of information classifications such as:

- Factual vs. Analytical
- Objective vs. Subjective



➤ Primary vs. Secondary

Factual Information: These are just the facts. This information is very objective and real. Something that actually exists, reality, truth is a factual information. Examples of factual information are like; Temperature in a city, winner of academy award etc.

Analytical Information: Interpretations, Analysis, Criticism constitute analytical information. To examine critically, so as to bring out the essential elements or give the essence of something, analysis is required. Examples include; Increase of drug use in the 2013, growth in crime rate etc.

Objective Information: Without Bias Non-judgmental “not influenced by personal feelings, interpretations, or prejudices; based on facts”. It is to the point, clear cut without any personal projection. Examples of objective information needs: Chronology of the Feminist movement, the eight stages of development according to Erik Erikson

Subjective Information: It includes opinions, personal viewpoints, and evaluations existing in the mind. Examples of subjective information needs include; Criticism of O’Neill’s play, Evaluation of a course based on class comments. Book review or movie reviews etc.

Primary Information: Information in its original form, not translated by anyone else, has not been published elsewhere, is termed as primary. Examples of primary information needs: Explanation or instructions from an employer or teacher, an eyewitness account of a house fire, etc.

Secondary Information: It is repackaged examination, restatement or interpretation of primary information already collected by someone. Examples of secondary information needs: Notes borrowed from a classmate for a missed class, a bibliography on the letters of Ernest Hemingway and so on.

Based on it is meant for information may be Personal Information, or Business Information. There can be other classifications as well like, formal vs informal, confirmed vs tentative etc.

Process of generating information

The goal of information generation is to generating information which is reliable, timely, user friendly and meeting the intended user objectives. If it fails to meet the stated objectives it is considered poor in quality. Therefore information generation requires careful steps so that it serves its purpose. The process basically involves the following steps.



- Understanding the user need in general
- Create framework for generating intended information
- Collecting the data.
- Process or analyze data.
- Collate the result from data, interpret, evaluate.
- Communicate the result of interpretation, evaluation of data in form of Information to intended user.

Value and cost of information

Information is of value to decision makers if it is accurate, timely, complete, and relevant. If it is poor on any of these criteria, it will be less useful hence may not have that value. These four criteria are used to distinguish valuable information from information that is of less value.

Accurate information provides a reliable and valid representation of reality. The cost of inaccurate or distorted information can be extremely high.

Consider the demise of the multimillion dollar Mars Climate Orbiter launched by NASA in 1998. The tragic outcome of this mission was blamed on the failure of one scientific team to recognize and correct an error in information from another team. Findings indicate that one team used English units (e.g., inches, feet and pounds) while the other used metric units for key spacecraft operations affecting navigation. This oversight caused the orbiter to burn up in Mars atmosphere before it could deploy to the surface. Oops.

Timely information is information that is available when it is needed. When information is needed almost always depends on the situation. In the fast-paced world of air travel, commercial airlines need virtually daily updates on what other commercial airlines are doing with their ticket prices. If one airline reduces its airfares from Mumbai Airport to New Delhi Airport, other airlines flying the same route would find out quickly about it and respond in a similar manner.

Complete information tends to be comprehensive in covering the issue or topic of interest. Complete information tells a complete story. Without complete information, a decision maker will get a distorted view of reality. Incomplete market information can lead businesses to introduce products and services that customers don't want.



Information is relevant if it has significance or can be applied to a specific situation, problem, or issue of interest. Here are some examples of relevant information. Human resource managers need information on hiring and employee turnover; operations managers need information on costs and productivity; marketing managers need information on sales projections and advertising rates; top executives need information on the strategic actions of their competitors. In contrast, product inventory information is not very relevant to a computer programmer.

Information as a corporate resource

Generally human, financial, physical and knowledge factors that provide a corporate the means to perform its business processes are considered as corporate resources.

Information can be considered as the raw material used in producing each and every decision taken in an organization. Organizations need to decide regularly on what objectives to be achieved, what actions to be taken to achieve these objectives, how and when these actions are to be taken, and the resources to be used for all these activities. These decisions are taken by all the people in the organization who work at different level of organizational hierarchy and handle different aspect of the organizational work.

The exact decision that in individual takes varies from person to person and from time to time, depending on nature of organizational tasks being performed. Also some people need to do more of decision making as compared to implementing the decisions. But everyone in the organization needs has to takes some decisions for which availability of adequate information is critical.

Information is also required to convey decisions taken to the people responsible for implementing the decisions taken, and for monitoring the actual results achieved as the work progresses. In want of information many decisions cannot be taken and in some cases it results into poor decisions. Therefore information is acting as a resource, which should be managed, so that needy people may get it in time when required. In this way information plays a role of corporate resource in every organization. Like any other resource it need to be formalized, must have some identified and systematize way of generation and dissemination.

6.3.1 INFORMATION NEEDS AT VARIOUS LEVELS OF MANAGEMENT



Information is needed for decision making at all levels of management. Managers at different organizational levels make different types of decisions, control different types of processes, and have different information needs.

Three classical levels of management include

- Top Management or Strategic Management
- Middle Management or tactical management
- Low Level Management or Operational Management

Strategic Management includes directors/owner that make decisions which affect the entire organization, or large parts of it, and leave an impact in the long run. The decision making at this level is highly unstructured. By this we mean, there may not be a proper format for decision making. It requires lot of inputs in terms of information, but there is no fixed way of mixing those inputs.

Middle, or tactical, management receive strategic decisions from strategic management as general directives. Using those directives as guidelines, they develop tactics to meet those strategic directives. The decision making at this level is semi structured. Some pieces of information can be mixed to get some conclusion but some amount of ambiguity is always there.

Operational managers are responsible for daily operations. They make decisions concerning a narrow time span about the deployment of small groups of clerical and/or shop floor workers. Generally the decisions at this level are structured in nature.

People in different management levels have different information needs. Most of the information that managers require is used to make decisions. The decision making process of middle managers and above is less structured than that of operational managers; In general, strategic decisions have no proven methods for selecting a course of action that guarantees a predicted outcome.

(a) Information needs of top or Strategic Management

Strategic management or TOP management of a company comprises the owners/managing director of a company. They are responsible for taking strategic decisions for a company which has long term bearing on company policies and perspectives. Strategic management is responsible for making strategic plan which is necessary to take the company on growth path. To prepare strategic Plan, Top



management is not concerned about day to day information of company operations. They do the macro analysis and their decisions are based on macro analysis. Generally the Strategic Management information needs comprises

- Information about market trend- Macro analysis.
- Information about Government Policies.
- Information about Competitors policies and tactics
- Information about Major exceptions in implementing the company policy at tactical/operation level.
- Analysis about major happening/event which may have a long term bearing on the strategic decisions of the company

The information need of TOP management is generally unstructured and it not easily defined.

(b) Information needs of Middle Level Management/Tactical Management

Tactical management/Middle Management comprises those who are responsible for preparing annual business plan to achieve the strategic Plan objectives of a company. Tactical Managers prepare Annual Business Plan on the basis of directs received from TOP management. The Information need of middle management comprises

- Information about Strategic Decisions/Plan of the organization for which they have been working.
- Information about Latest Technologies in the area they have been working.
- Information about problems faced by operational management in getting the things implemented.
- Information about best practices adopted by different organization in the same industries or different industries.

The information need of Middle level management is structured in comparison to TOP management and it can be developed in form of template in some cases.

(c) Information needs of Low Level or Operational Management

Operation management is responsible for implementing the policies framed by tactical management to achieve the business plan of the organization. They are generally responsible for the operational part of



the organization. The information need of Operational management is limited but very structured in nature. The information need of Operation management needs to be very accurate and it can be easily developed in the form of template

6.3.2 FACTORS AFFECTING INFORMATION NEEDS

There are various factors which affected the information need of him. Some of them are explained as below

- 1. Management Hierarchy:** Management Hierarchy plays an important role in deciding the information need of a user. Information need of TOP management will be entirely different from the information needs of Operational Management.
- 2. Purpose of seeking information:** The information needs will be depend on the purpose of seeking information. If a person wants to investment in a company, he/she will be interested about the financial statement of the company. He/she will have no interest in knowing about the past directors of the company.
- 3. Role in the Organization:** Information need of a person also depend on the role of the concerned user.

The information needs of different stakeholder in the organization will be different. For example, an employee of the organization will be interested in knowing about the company wage policy. They will have no interest in knowing company policy on market segmentation.

6.3.3 KNOWLEDGE

(a) What is knowledge?

When someone memorises information this is often referred to as 'rote-learning' or 'learning by heart'. We can then say that they have acquired some knowledge. Another form of knowledge is produced as a result of understanding information that has been given to us, and using that information to gain knowledge of how to solve problems.

Knowledge can therefore be:



- acquiring and remembering a set of facts, or
- The use of information to solve problems.

The first type is often called explicit knowledge. This is knowledge that can be easily passed on to others. Most forms of explicit knowledge can be stored in certain media. The information contained in encyclopaedias and textbooks are good examples of explicit knowledge.

Example

Looking at the examples given for data:

- 3, 6, 9, 12
- cat, dog, gerbil, rabbit, cockatoo
- 161.2, 175.3, 166.4, 164.7, 169.3

Only when we assign a context or meaning does the data become information. It all becomes meaningful when we are told:

- 3, 6, 9 and 12 are the first four answers in the 3 x table
- cat, dog, gerbil, rabbit, cockatoo is a list of household pets
- 161.2, 175.3, 166.4, 164.7, 169.3 are the heights of 15-year-old students.

If we now apply this information to gain further knowledge we could say that:

- 4, 8, 12 and 16 are the first four answers in the 4 x table (because the 3 x table starts at three and goes up in threes the 4 x table must start at four and go up in fours)
- A lion is not a household pet as it is not in the list and it lives in the wild.
- The tallest student is 175.3cm.

The second type is called tacit knowledge. It is the kind of knowledge that is difficult to pass on to another person just by writing it down. For example, saying that Paris is the capital of France is explicit knowledge that can be written down, passed on, and understood by someone else. However, the ability to speak a foreign language, bake bread, program a computer or use complicated machinery requires additional pieces of knowledge (such as that gained through experience) that are not always known explicitly and are difficult to pass on to other users.

**(b) How are data, information and knowledge linked?**

If we put Knowledge into an equation it would look like this:

Information + application or use = Knowledge

6.3.4 INFORMATION TECHNOLOGY

Information is a resource which has no value until it is extracted, processed and utilized. Information technology deals with information system, data storage, access, retrieval, analysis and intelligent decision making. Information technology refers to the creation, gathering, processing, storage, presentation and dissemination of information and also the processes and devices that enable all this to be done.

It can be extremely beneficial for all business owners to have some basic level of awareness about information technology. The advent of information technologies based on computers has enabled business models to understand that they may function as subsets of information technology. Information technology is a study of the design, implementation, development, management, and support of computer-based information systems that assist with supporting business operational needs within an industry.

(a) IT in the Past

The term information technology was first coined by Thomas L. Whisler and Harold J. Leavitt in a 1958 article published in the Harvard Business Review. At that time, the term IT was used only to describe the process of storing information.

At the time, there was no such thing as a degree or certificate in information technology and businesses had no need for large IT departments. There were no interconnected networks, server farms, or complex computer systems. Phone, fax, and regular mail were the main communication media.

(b) Modern Use of Information Systems



These days, the vast majority of businesses wouldn't survive without the use of information systems. They are sending internal emails, marketing via the web, managing e-commerce web sites, and storing and tracking data online. From the big conglomerates to the smallest home businesses, there's no doubt that companies all over the world rely heavily on information.

(c) The Necessity of Information Technology

Information technology is a broad field. It is concerned with all aspects of managing and processing electronic information, especially in the business world, where computers are vital for data management. In today's competitive environment, almost every company's business strategy relies on the use of information systems in order to succeed and grow into the future. For this reason, IT professionals are valued members of the organizations they're involved in, and the need for certified IT experts continues to increase.

(d) More Specifically Information Technology Means

- Managing a network of computers.
- Creating original web pages.
- Producing videos digitally.
- Designing computer systems as a consultant.
- Vendors selling products on the internet.
- Designing 3D artwork.
- Administering a company's database.
- Coding software.
- Providing technical support.
- Managing projects and budgets.
- Writing technical documentation.

(e) Examples of Information Technology Are

- Telephone and radio equipment and switches used for voice communications.



- Traditional computer applications that include data storage and programs to input process and output the data.
- Software and support for office automation systems such as word processing and spread sheets, as well as the computer to run them.
- User, PCs & software.
- Data networks and all associated communications equipment such as servers, bridges, routers, hubs & wiring.
- Peripherals directly connected to computer information systems used to collect or transmit audio, video or graphic information, such as scanners and digitizers.
- Voice response systems that interact with a computer database or application.
- Video conferencing equipment.
- The state radio communications network.
- Computers and network systems used by teachers, trainers and students for educational purpose.
- “Open” computer systems that monitor or automate mechanical or chemical processes and also store information used by computer applications for analysis and decision making.
- All operating costs, equipment and staff time associated with supporting the technology infrastructure of the agency, possibly including items excluded above, such as video equipment used for technology training that is included in the information systems costs center for the agency.

(f) Role of IT in businesses

Information technology covers many different areas, including software solutions and hardware that allow organizations and companies to organize, gather, and evaluate data. Ultimately, the analysis of this data helps companies achieve their goals. This also includes workflow processes that can expand an organization’s capacity to grow revenue. The bottom line for many business owners is that revenue growth and profit margins are key drivers for performance and efficiency. There are four primary elements for information technology as a whole: information security, database and network management, computer technical support, and business software development.

Some businesses may be under the impression that information technology is only a minor part of running the company and achieving goals. This can be a big mistake. The IT industry is always



evolving with new software and hardware applications. For many companies, information technology is most present in their concern for network security. Network security is vital for preventing system breaches. Many various data breaches for companies large and small have made headlines in recent years, and yet a surprising number of companies still have not adapted their own systems and procedures to prevent these attacks.

Another reason that today's business world must be aware of information technology has to do with data overloads. Many businesses are processing high volumes of data every single day, and without appropriate processing capability, this can overload a system easily. IT professionals play a key role in helping business owners address problems immediately in front of the company, as well as achieving goals down the road. Teamwork and clear communication skills are at the top of the list in a desirable information technology professional. The IT professional of the day helps to translate complicated concepts in the information technology world to meaningful results for those using the technology in their daily working lives. As such, businesses have to remain aware of the basics behind IT.

Reduce Operating Costs

Small business owners can use technology to reduce business costs. Basic enterprise software enables a firm to automate back office functions, such as record keeping, accounting and payroll. Mobile technology allows home offices to interact in real time.

Securing Sensitive Information

Business owners can also use technology to create secure environments for maintaining sensitive business or consumer information. Many types of business technology or software programs are user-friendly and allow business owners with only minor backgrounds in information technology to make the most of their tools and features.

Improved Communication Processes

Business technology helps small businesses improve their communication processes. Emails, texting, websites and apps, for example, facilitate improved communication with consumers. Using several types of information technology communication methods enable companies to saturate the economic market with their message. Companies may also receive more consumer feedback through these electronic communication methods.



Technology also improves inter-office communication as well. For example, social intranet software gives employees a centralized portal to access and update internal documents and contracts and relay relevant data to other departments instantly. These methods also help companies reach consumers through mobile devices in a real-time format.

Increased Employee Productivity

Small businesses can increase their employee's productivity through the use of technology. Computer programs and business software usually allow employees to process more information than manual methods. Business owners can also implement business technology to reduce the amount of human labor in business functions. This allows small businesses to avoid paying labor costs along with employee benefits.

Business owners may also choose to expand operations using technology rather than employees if the technology will provide better production output.

Broaden Customer Bases

Technology allows small businesses to reach new economic markets. Rather than just selling consumer goods or services in the local market, small businesses can reach regional, national and international markets. Retail websites are the most common way small businesses sell products in several different economic markets.

Collaboration and Outsourcing

Business technology allows companies to outsource business functions to other businesses in the national and international business environment. Outsourcing can help companies lower costs and focus on completing the business function they do best. Technical support and customer service are two common function companies outsource.

Small business owners may consider outsourcing some operations if they do not have the proper facilities or available manpower.



Issues and Challenges in Information Technology

- As computing systems and capabilities continue expanding worldwide, "data overload" has become an increasingly critical issue for many IT professionals. Efficiently processing huge amounts of data to produce useful business intelligence requires large amounts of processing power, sophisticated software, and human analytic skills.
- Teamwork and communication skills have also become essential for most businesses to manage the complexity of IT systems. Many IT professionals are responsible for providing service to business users who are not trained in computer networking or other information technologies but who are instead interested in simply using IT as a tool to get their work done efficiently.
- System and network security issues are a primary concern for many business executives, as any security incident can potentially damage a company's reputation and cost large sums of money.

6.3.5 EFFECT OF IT ON BUSINESS

The rise of information technology has paved the way for various innovations. With the digitization of information, more and more businesses are increasingly leveraging the benefits of digital tools to improve their prospects. Information technology has been crucial in turning this process into a complete success.

Information technology has dramatically transformed the lives of individuals. It provides businesses the scope to analyse data and plan business strategies accordingly. Utilizing information technology means that the data analysis is accurate, thus optimizing profits.

Information technology has had a major impact on various aspects of businesses. Let's take a look at some of these here.

1. Cloud Computing

The concept of cloud computing is immensely popular among businesses owing to the efficiency in business operations that it provides. Cloud computing utilizes information technology to capitalize on its ability to provide improved agility and time and resource management for businesses.



Increasingly, businesses are shifting to the cloud to leverage its many benefits. It has been predicted that more than \$1 trillion will be impacted in IT spending by the transition of businesses to cloud computing by 2020.

2. Automation of Business Processes

The movement towards increased automation of business processes improves efficiency and increases workflow considerably.

Information technology helps in developing automated processes for businesses. This not only helps in reducing the cost of operation but also saves time. The time saved can be utilized to focus on other tasks, thus speeding up business processes significantly.

Processes like billing, tracking metrics, collecting customer data, monitoring certain processes etc. can be automated easily. There are various automation software that can be utilized for this purpose.

3. Working Remotely

Implementation of information technology provides the ability to remotely access your company's network. As a result, it equips employees with the ability to get the work done even if they are not physically present at the workplace. Therefore, it has gained massive popularity.

4. Mobile Technology

Mobile technology takes business communication to a whole new level. A mobile team can improve the workplace productivity considerably. There are numerous ways to integrate mobile technology in the workplace.

5. Protecting Information

Every organization has database comprising various information related to business transactions, client details and so on. Such information is extremely valuable to a business and can cause a legal issue if it is lost. This is where information technology becomes relevant. It provides the right resources to store the information in a way that ensures maximum protection.



Therefore, information technology helps in upholding business integrity.

6. Providing Customer Satisfaction

Customer experience and satisfaction are crucial aspects of all businesses. The key to customer satisfaction is a strong customer support team and its availability to cater to the requirements of the customers. Information technology provides the best tools for communicating with customers and solving their problems in real time. It has unlocked the facilities like Email, social media and other messaging platforms for this purpose.

7. Management of Resources

A business has a variety of resources. These may include financial resources, human resources and so on. For large organizations, managing resources becomes quite difficult. Information technology plays a vital role in managing these resources effortlessly by introducing a wide range of feasible solutions.

For example, the integration of Enterprise Resource Planning (ERP) has improved the efficiency of various business processes. ERP is business management software that enables an organization to use a series of integrated applications that can manage and automate various business operations.

8. Open Source Software

Information technology has paved the way for various open source software that allow free usage of certain tools for various organizations. The primary benefit of open source software is its flexible license. This allows modifications to the source code. This means that you have the facility to customize its functions according to your requirements.

6.4 CHECK YOUR PROGRESS

1. The hardware, software and media used to store, organize, retrieve and communicate information is known as _____.
2. _____ is a generic term that refers to a variety of devices that allow people to access data and information from wherever they are.
3. _____ is the useful knowledge derived from the data



4. Information in its original form, not translated by anyone else, has not been published elsewhere, is termed as _____.
5. Data + _____ = Information

6.5 SUMMARY

Information is a resource which has no value until it is extracted, processed and utilized. Information technology deals with information system, data storage, access, retrieval, analysis and intelligent decision making. It can be extremely beneficial for all business owners to have some basic level of awareness about information technology. Information technology is a study of the design, implementation, development, management, and support of computer-based information systems that assist with supporting business operational needs within an industry. Information technology covers many different areas, including software solutions and hardware that allow organizations and companies to organize, gather, and evaluate data. Ultimately, the analysis of this data helps companies achieve their goals. This also includes workflow processes that can expand an organization's capacity to grow revenue. Utilizing information technology means that the data analysis is accurate, thus optimizing profits.

6.6 KEYWORDS

Data: The quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of Information.

Information: Information is the useful knowledge derived from the data.

Information Technology: The study or use of systems (especially computers and telecommunications) for storing, retrieving, and sending information.

Knowledge: Facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject.

Cloud Computing: The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

Mobile Computing: Mobile computing is a generic term that refers to a variety of devices that allow



people to access data and information from wherever they are. Mobile computing transports data, voice, and video over a network via a mobile device.

6.7 SELF-ASSESSMENT TEST

1. What is data and explain its characteristics.
2. What is information? What are the differences between Data and Information?
3. Explain the needs of information for different levels of managements, in detail.
4. Discuss the various factors affecting the information needs.
5. What is knowledge? How is knowledge different than information?
6. What is information technology (IT)? What are the various advantages of IT?
7. Discuss the effects of IT on Business.
8. Discuss the various challenges for IT in detail.
9. Explain the role of IT in business.
10. Discuss the factors affecting the information needs.

6.8 ANSWERS TO CHECK YOUR PROGRESS

1. Information technology
2. Mobile computing
3. Information
4. Primary
5. Meaning

6.9 REFERENCES/SUGGESTED READINGS

- Terry Lynn Crawford, *Managing a data information system (2000)*, Cornell University.
- <http://www.rebellionrider.com/data-definition-and-characteristics/> 01/11/2019.
- https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s10-data-characteristics-and-visua.html 01/11/2019
- James A. Senn, *Information Technology in Business: Principles, Practices, and Opportunities (1998)*, Prentice Hall.



- Stephen D. Tansey, Geoffrey Darnton, John Waterbridge, *Business, Information Technology and Society (2003)*, Psychology Press.
- Ulrich J. Gelinas, Steve G. Sutton, Jane Federowitz, *Business Processes and Information Technology (2010)*, University Press of Florida.
- Amir Manzoor, *Information Technology in Business (2012)*, Amir Manzoor.



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Information System and Its Types

LESSON STRUCTURE

- 7.0 Learning Objectives
- 7.1 Introduction
- 7.2 Information System
 - 7.2.1 Pyramid Diagram of Organizational Levels and Information Requirements
 - 7.2.2 Functions of Information System
 - 7.2.3 Types of Information System
 - 7.2.4 Why Businesses use Information System
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- 7.5 Summary
- 7.6 Keywords
- 7.7 Self-Assessment Test
- 7.8 Answers to Check Your Progress
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7.0 Learning Objectives

The value of information is directly linked to how it helps decision makers achieve the organization's goals. In this chapter you will learn about-

- Definition of information and types of information.
- Relation between information, knowledge and intelligence.
- Organizational levels and their required information.
- Functions of an information system



- Types of information system
- Use of information system in business
- Causes of information system failure
- Transaction Processing System
- Management Information System

7.1 Introduction

It is often observed that term information system and information technology are used interchangeably. In a literal sense, information technology is a subset of information systems. Information systems consist of people, processes, machines and information technology. The great advancement in information systems is due to development in information technology and introduction of computers. Section 7.2.1 explains some basic concepts of information system. This section defines information, various types of information, a variety of methods for collecting information (such as interview, focus group, observation, surveys) and system along with its components. Section 7.3 introduces information system with its needs. After that structure of an organization along with their corresponding information needs is represented by a pyramid diagram. Section 7.5 explains various functions of information system and section 7.6 describe types of information system i.e. Transaction Processing system, Management Information System, Decision Support System, Executive Support System, Office Automation System, Business Expert System. Section 7.7 explains use of information system and 7.8 describe cause of information system. Section 7.9 explains Transaction Processing System with its processing cycle and various types of transactions. Section 7.10 explains Management Information System and comparative study of manual information system and MIS, components of MIS, Characteristics of MIS, advantages and disadvantages.

7.1.1 Basic concepts

Information-Collection of facts organized in such a way that they have additional value beyond the value of the facts themselves.

According to Davis and Olson: "Information is a data that has been processed into a form that is meaningful to recipient and is of real or perceived value in the current or the prospective action or decision of recipient."

Information can only be considered to be 'real' Info if it meets certain criteria i.e.



1. It must be communicated to the recipient
2. It must be in a language that is understood
3. It must be in a suitable form
4. It must be relevant for achieving some purpose

7.1.2 Types of information- Information could be classified on the basis of the purpose for which it is utilized, into three main categories:

- **Strategic information**-it is required by the managers at the strategic level of management for the formulation of organizational strategies.
- **Tactical information**-information in this category is used in short term planning and is of use at management control level.
- **Operational information**-it applies to short periods which may vary from an hour to a few days.

7.1.3 Information Collection Techniques

In order to determine the requirements of a system, information must be gathered from the customer. Ideally, the information obtained will enable a well-defined, accurate, and complete description of how the business functions as well as the people, functions and data involved. However, this is not always the case, and information is often misinterpreted or omitted entirely. There are many techniques that can be employed when gathering information. The type of information you are trying to obtain, as well as the people providing the information, will determine which techniques you should use.

- ✓ **Focus group**
 - Used to explore a topic in depth with key stakeholders to learn what the common understanding is on various issues.
- ✓ **Case Studies**
 - A case study is a thorough description of a process, structure, or experience at one organization. Case studies use surveys, statistics about usage, and qualitative data collection techniques. While performing a research quantitative data is gathered first and then the qualitative strategies are used.
- ✓ **Observation**



- Observation is a data collection technique that is performed by monitoring or viewing the subject.
- Sometimes observations are performed continuously or in a set of time periods. There can be different types of observations like structured, unstructured, and semi-structured.
- The limitation of observations is that it consumes time and it affects the behavior of the participants.

✓ **Interviews**

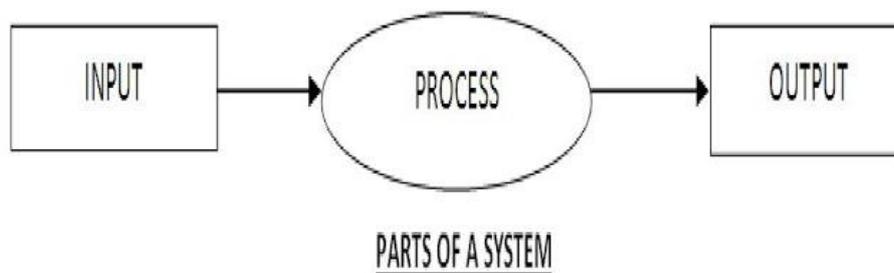
- An interview is another data collection technique.
- For collecting the data through this technique, interviews are performed in groups or on a one-on-one basis. During interviews, the data can be collected using stenography, video recordings, audio recordings, or written notes.

✓ **Surveys**

- Surveys are performed through questionnaires. A standard set of questions are used for performing the survey of any specific topic.

7.1.4 System

In a system, network of components work towards a single objective, if there is lack of co-ordination among components, it leads to counterproductive results.



A system may have following features:

- ✓ **Adaptability:** some systems are adaptive to the exterior environment, while some systems are non-adaptive to the external environment. For example, anti-lock braking system in car reacts



depending on the road conditions, whereas the music system in the car is independent of other happening with the car.

✓ **Limitation:** every system has pre-defined limits or boundaries within which it operates. This limits or boundaries can be defined by law or current state of technology.

7.2 INFORMATION SYSTEM

Information system is an integrated set of components for collecting, storing and processing data and for providing information, knowledge, and digital products. Business firms and other organizations rely on information systems to carry out and manage their operations, interact with their customers and suppliers, and compete in the marketplace.

(a) Need of information system

Information systems gain their importance by processing the data from company inputs to generate information that is useful for managing your operations. To increase the information system's effectiveness, you can either add more data to make the information more accurate or use the information in new ways.

Business Communication Systems

Part of management is gathering and distributing information, and information systems can make this process more efficient by allowing managers to communicate rapidly. Email is quick and effective, but managers can use information systems even more efficiently by storing documents in folders that they share with the employees who need the information. This type of communication lets employees collaborate in a systematic way.

Each employee can communicate additional information by making changes that the system tracks. The manager collects the inputs and sends the newly revised document to his target audience.

Business Operations Management

How you manage your company's operations depends on the information you have. Information systems can offer more complete and more recent information, allowing you to operate your company more efficiently. You can use information systems to gain a cost advantage over competitors or to differentiate yourself by offering better customer service. Sales data give you insights about what



customers are buying and let you stock or produce items that are selling well. With guidance from the information system, you can streamline your operations.

Company Decision-Making

The company information system can help you make better decisions by delivering all the information you need and by modeling the results of your decisions. A decision involves choosing a course of action from several alternatives and carrying out the corresponding tasks. When you have accurate, up-to-date information, you can make the choice with confidence.

If more than one choice looks appealing, you can use the information system to run different scenarios. For each possibility, the system can calculate key indicators such as sales, costs and profits to help you determine which alternative gives the most beneficial result.

Company Record-Keeping

Your company needs records of its activities for financial and regulatory purposes as well as for finding the causes of problems and taking corrective action. The information system stores documents and revision histories, communication records and operational data. The trick to exploiting this recording capability is organizing the data and using the system to process and present it as useful historical information. You can use such information to prepare cost estimates and forecasts and to analyze how your actions affected the key company indicators.

7.2.1 PYRAMID DIAGRAM OF ORGANIZATIONAL LEVELS AND INFORMATION REQUIREMENTS

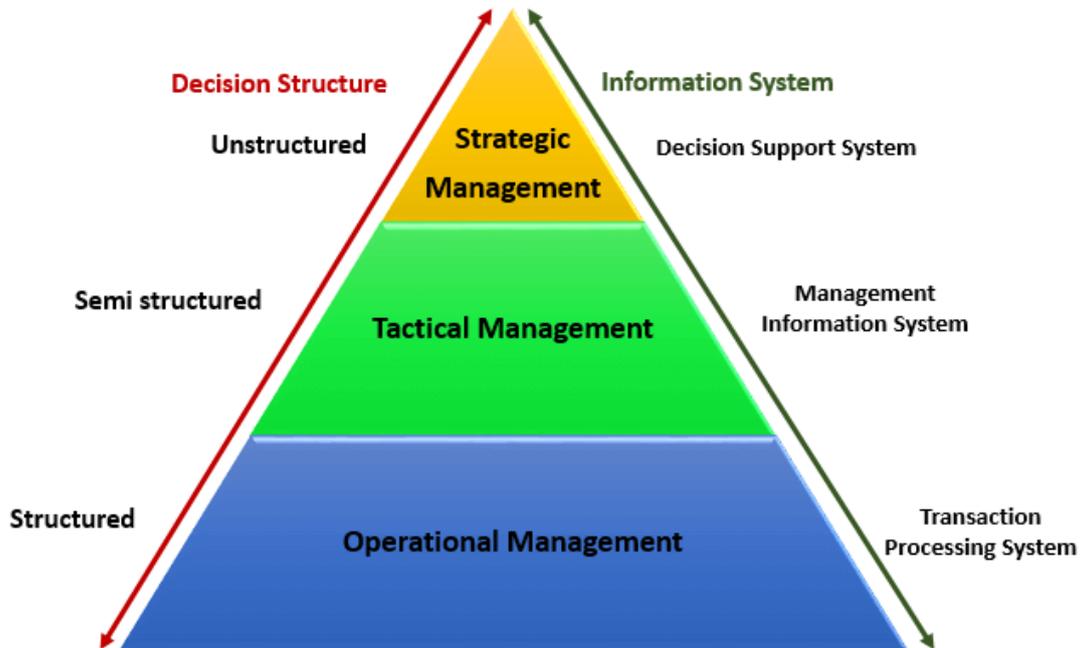
Understanding the various levels of an organization is essential to understand the information required by the users who operate at their respective levels.

(a) Operational management level

- The operational level is concerned with performing day to day business transactions of the organization.
- Examples of users at this level of management include cashiers at a point of sale, bank tellers, nurses in a hospital, customer care staff, etc.
- Users at this level use make structured decisions. This means that they have defined rules that guide them while making decisions.



The following diagram illustrates the various levels of a typical organization.



(b) Tactical Management Level

- This organization level is dominated by middle-level managers, heads of departments, supervisors, etc. The users at this level usually oversee the activities of the users at the operational management level.
- Tactical users make semi-structured decisions. The decisions are partly based on set guidelines and judgmental calls. As an example, a tactical manager can check the credit limit and payments history of a customer and decide to make an exception to raise the credit limit for a particular customer. The decision is partly structured in the sense that the tactical manager has to use existing information to identify a payments history that benefits the organization and an allowed increase percentage.

(c) Strategic Management Level

- This is the most senior level in an organization.
- The users at this level make unstructured decisions.
- Senior level managers are concerned with the long-term planning of the organization. They use information from tactical managers and external data to guide them when making unstructured decisions.



7.2.2 FUNCTIONS OF INFORMATION SYSTEM

One of the mostly widely used bases for organizing activities in almost every organization is the business function. Business activities are grouped around functions such as production, marketing, finance and personnel etc. resulting in the respective department or an area of the business organization. These departments or functional areas are commonly known as the functional areas of business.

There is no standard classification of such sub-system in an organization, but a typical set of functions in a manufacturing organization includes:

- Production
- Marketing
- Finance and accounting
- Materials and
- Personnel systems

Production:

- planning and control
- Engineering standards
- Quality control
- R & D etc

Marketing:

- Sales order
- Forecasting
- Sales analysis
- Billing
- Distribution
- Stock availability
- Sales quota control
- Pricing
- Product promotion.

Finance and accounting:

- Financial planning



- Budgeting
- Cost accounting
- Asset accounting
- Accounts receivable
- Payroll Accounts
- Payable, etc...

Materials:

- Material planning
- Bill of material
- Cost estimate
- Warehousing planning etc...

Personnel:

- Employee recruitment
- Employee selection
- Employee development
- Employee transfers
- Employee retirements etc.

7.2.3 TYPES OF INFORMATION SYSTEM

The classifications of information system are-

(a) Transaction processing system.

In manufacturing organization, there are several types of transaction across department. Typical organizational departments are Sales, Account, Finance, Plant, Engineering, Human Resource and Marketing. Across which following transaction may occur sales order, sales return, cash receipts, credit sales; credit slips, material accounting, inventory management, depreciation accounting, etc.

These transactions can be categorized into batch transaction processing, single transaction processing and real time transaction processing. Other details of TPS are given later in this chapter

(b) Management information system.



Managers require precise information in a specific format to undertake an organizational decision. A system which facilitates an efficient decision making process for managers is called management support system.

Management support systems are essentially categorized as management information system, decision support system, expert system and accounting information system.

Management information system provides information to manager facilitating the routine decision-making process. Decision support system provides information to manager facilitating specific issue related solution.

(c) Decision support system.

The Decision support system (DSS) is an information system application that assist decision making. Decision support systems tend to be designed primarily to serve management control level and strategic planning level managers. The data in the database typically is a combination of master files (internal corporate data) and from external sources.

Features of DSS

- **Adaptability and flexibility**
- **High levels of Interactivity** DSS are computer-based systems designed for interactive use by decision makers or staff users who control the sequence of interaction and the operations performed.
- **Ease of use**
- **Efficiency and effectiveness** DSS are intended to improve the accuracy, timeliness, quality and overall effectiveness of a specific decision or a set of related decisions. It provides a single platform that allows all users to access the same information and access the same version of truth, while providing autonomy to individual users and development groups to design reporting content locally. DSSs are intended to improve the accuracy, timeliness, quality and overall effectiveness of a specific decision or a set of related decisions.
- **Complete control by decision-makers** they are not intended to replace decision makers, instead a DSS can support decision makers at any level in an organization.
- **Ease of development** As a standalone, integrated, and Web-based systems, a DSS delivers an interactive, scalable platform for rapidly developing and deploying projects. Multiple projects can



be created within a single shared meta-data. Within each project, development teams create a wide variety of re-usable meta-data objects. Most DSSs will allow for extendibility, support for modeling and analysis and support for data access

Benefits of DSS

- Improves efficiency and speed of decision-making activities.
- Increases the control, competitiveness and capability of futuristic decision-making of the organization.
- Facilitates interpersonal communication.
- Encourages learning or training.
- Since it is mostly used in non-programmed decisions, it reveals new approaches and sets up new evidences for an unusual decision.
- Helps automate managerial processes.

Disadvantages of Decision Support Systems

- **Information Overload:** A computerized decision making system may sometimes result in information overload. Since it analyzes all aspects of a problem, it leaves a user in a dilemma what to consider and what not to consider. Not each bite of information is necessary in decision making. But when it's present, a decision maker finds it difficult to ignore information that is not a priority.
- **Too much Dependence on DSS:** It is true that decision support systems are integrated into businesses to make everyday decisions faster and more easily. Some decision makers develop a tendency to depend too much on computerized decision making and don't want to apply their own brains. Clearly, there is a shift in focus and decision makers may not hone their skills further because of excessive dependence on DSS.
- **Devaluation of Subjectivity:** A decision support system promotes rational decision making by suggesting alternatives basis the objectivity. While bounded rationality or restricted irrationality plays a critical role in decision making, subjectivity cannot and should not be rejected. A DSS promotes objectivity and relegates subjectivity, which can have serious impact on a business.
- **Overemphasis on Decision Making:** Clearly the focus of computerized decision making is on considering all aspects of a problem all the time, which may not be required in many of the situations. It is essentially important to train the users to ensure effective and optimal use of DSS.



- **Cost of Development:** The cost of decision making decreases once a decision support system is installed. But development and implementation of a DSS requires a huge monetary investment. Customization may attract higher cost. If you're on a tight budget, you might not get a customized DSS specific to your needs.

(d) Executive support system

Executive support system (ESS) is an extension of the management information system which is a special kind of DSS. An ESS is specially tailored for the use of chief executive of an organization to support his decision making. An ESS is designed to cater to the information needs of a chief executive keeping in view not only his requirements but also taking into account his personality and style of functioning etc.

Characteristics of ESS

❖ Informational characteristics

1. Flexibility and simple use.
2. Provides the timely info with the short reaction time and additionally with the short retrieval.
3. Produces the proper info.
4. Produces the relevant info.
5. Produces the valid info.

❖ User interface/orientation characteristics

1. Consists of the subtle self-facilitate.
2. Contains the user friendly interfaces consisting of the graphic user.
3. Will be used from several places.
4. Offers secure reliable, confidential access in conjunction with the access procedure.
5. Suites the management forms of the individual executives.

❖ Social control / Govt characteristics

1. Supports the overall vision, mission and also the strategy.
2. Provides the support for the strategic management.
3. Typically helps to manage the things that have a high degree of risk.
4. Is coupled to the worth accessorial business processes.
5. Supports the need/ access for/ to the external data/ databases.



Advantages of EIS

- Easy for upper-level executives to use, extensive computer experience is not required in operations
- Provides timely delivery of company summary information
- Information that is provided is better understood
- Filters data for management
- Improves to tracking information
- Offers efficiency to decision makers

Disadvantages of EIS

- System dependent
- Limited functionality, by design
- Information overload for some managers
- Benefits hard to quantify
- High implementation costs
- System may become slow, large, and hard to manage
- Need good internal processes for data management
- May lead to less reliable and less secure data

(e) Office automation system

Office automation refers to the application of computer and communication technology to office functions. Office automation systems are meant to improve the productivity of managers at various level of management by providing secretarial assistance and better communication facilities. Office automation systems are the combination of hardware, software and people in information systems, that process office transactions and support office activities at all levels of the organization. These systems include a wide range of support facilities, which include word processing, electronic filing, electronic mail, message switching, data storage, data and voice communication etc.

Characteristics

- Sophisticated process that consists of electronic equipment and communication systems.
- Involves and integrates people, procedure, and technology.



- Involves the use of computers, in conjunction with other electronic equipment.
- Consists of word processors and other essential documenting and presentation designing software connected to one another through means of a local area network or cloud drive.
- Designed as a multi-function information system to provide executives some decision support tools.
- Supports a large number of software packages working by integrating with each other.

Advantages and Disadvantages of Office Automation

Office automation today is much more than just document producing, storage and retrieval. Electronic and digital information is the crux of modern office automation. It may include strictly internal computers, high-end management software, a worldwide digital network through the internet or off-site cloud storage. Implementing the new office automation system in your office comes with its own set of advantages and disadvantages.

The Advantages are:

- **Values Time and Company Resources:** Your company's most valuable assets are time and its resources. The good performance of your company starts with using these two effects. Office automation allows you to communicate with people via emails, chats, fax, etc., and send text, image, audio, and video files digitally to anyone inside the office or outside in any part of the world. This way you can also save your resources that otherwise would have been spent on travel to meet people for information or file sharing.
- **Reduces Direct Involvement in Regular Works:** It reduces your workload on regular office tasks such as creating reports and organizing all sorts of data. Spread sheets allow you to enter, compile, and store bulk data for future reference. Spread sheets also help reduce the workload and keep your office in order.
- **Faster, and You Can Rely on Its Accuracy:** Everything from creation, editing, and sharing of documents and all sorts of data is way faster with office automation. Also, machines and software combined together give results that are highly accurate. For example, you can add up numbers in spread sheets and create budgets and it will always come up with accurate balance.
- **Reduces Cost of Operation with Lesser Workforce:** From ledger work to a more extensive task like managing company's facilities inside or outside the office, office automation allows you to hire only a selected number of people to manage all sorts of work through its digital dashboards. It helps



by lowering the cost of operation and increased dependency on manpower for even the pettiest of works.

Like any other system in the world, office automation system too has some issues however; they seem to be not-so-worrying to anyone who is using it. Let's have a look on the issues that exist with office automation.

- **Chances of System Failure, But No Data Loss:** Minor glitches are common, not in frequency but in the form of errors that are usually reported. A complete system failure is a rare phenomenon. Office automation technology isn't new. It has already been through the time and testing for so long. By keeping up with the updates, and software and hardware meltdowns, you can easily avoid a shutdown. Also, even if a shutdown couldn't be avoided, you still don't need to worry about your company data. If you have installed a cloud-based technology, your data will be safe which you can re-access right after the system restart.
- **First Time Installation Is Expensive:** Obviously, if you are installing everything afresh, it has to cost you dearly. A professional office suite and machines, their installation, training for use, and fixing of the initial issues, are the areas where you have to dig your pocket. You should think about the long-term benefits your company will be drawing out from automation after this one-time expense.

(f) Business expert system

Business expert system (BES) is a knowledge based information system that uses its knowledge about a specific, complex application area to act as an expert. This system is one of the knowledge based information system. Expert system provides decision support to managers in the form of advice from an expert in a specific problem area. Expert systems find application in diverse areas, ranging from medical, engineering and business.

Characteristics of an expert system:

- Human experts are perishable but an expert system is permanent.
- It helps to distribute the expertise of a human.
- One expert system may contain knowledge from more than one human experts thus making the solutions more efficient.



- It decreases the cost of consulting an expert for various domains such as medical diagnosis.
- They use a knowledge base and inference engine.
- Expert systems can solve complex problems by deducing new facts through existing facts of knowledge, represented mostly as if-then rules rather than through conventional procedural code.
- Expert systems were among the first truly successful forms of artificial intelligence (AI) software.

Limitations:

- Don't have human-like decision making power.
- Can't possess human capabilities.
- Can't produce correct result from less amount of knowledge.
- Requires excessive training.

Advantages:

- Low accessibility cost.
- Fast response.
- Not affected by emotions unlike humans.
- Low error rate.
- Capable of explaining how they reached a solution.

Disadvantages:

- Expert systems have no emotions.
- Common sense is the main issue of the expert system.
- It is developed for a specific domain.
- It needs to be updated manually. It does not learn itself.
- Not capable to explain the logic behind the decision.

7.2.4 WHY BUSINESSES USE INFORMATION SYSTEM

Many businesses today do not make use of internet which is very important in this day. Upgrading the computer information system is not an option in this technology-driven era, it is essential. The follow are reasons why businesses need to use information systems.

1. Operational excellence:



In order for a business to achieve high levels of profitability, they need to improve the efficiency of their operations. Information systems are a tool that is used in order to achieve high levels of efficiency and productivity in business operations.

2. New Products, Services and Business Models:

Information systems can be used to create new products and services and also an entirely new business model. A business model describes how a company produces, delivers and how they sell a product or service to create wealth.

3. Customer/Supplier Intimacy:

When a business provides a good product or service customers tend to return and purchase more frequently which raises revenue and profits. The more a business engages with its suppliers, the better the supplier can provide vital inputs which can lower costs.

4. Improved Decision-Making:

Many managers in an information bank may never have the right information at the right time to make an informed decision. This can raise costs and lose customers. However, information systems allow the managers to use real-time data from the marketplace when making decision.

5. Competitive Advantage:

When a firm achieved one or more of these business objectives (operational excellence, new products, services and business models, customer/supplier intimacy and improved decision-making), they may have a competitive advantage. By performing better than competitors, charging less for superior goods and responding to customers and suppliers, higher sales and profits can be made.

6. Day To Day Survival:

Businesses must invest in information systems and technology as they are essential to doing business. Information system enables companies to react, respond, cater, store, retrieve, disseminate and control their new valuable asset that is information. In the future, a good information system in a business will no longer be an option; it will become a compulsory in determining success.



7.2.5 CAUSE OF INFORMATION SYSTEM FAILURE

The British Computer Society defines information systems as “software that has been written to support human activity within an organization”. So at what point can we say that an information system has failed? Well an information system has failed when it:

- Goes way over budget
- Is not operational at a specific time
- Does not do what it was intended to do
- Does not fit in the organizational structure or work processes

Information system failure is not caused by just technological difficulties but also human resource issues and the functionality within a business.

Organizations need to be aware of the causes of information system failure because unfortunately failure rates are very high, much higher than success rate. The harsh reality is most projects are destined to fail before they even begin.

(a) Here are some causes of Information system failure in

- Requirements do not represent the actual needs of the customer.
- Improper planning
- Lack of and poor communication
- Requirements are incomplete or conflicting. have problems understanding and communicating with each other.
- Both a lack of proper leadership and poor leadership
- Unrealistic expectations
- Inability to keep within the budget

7.2.6 TRANSACTION PROCESSING SYSTEM

An information system that processes data arising from the occurrence of business transactions is known as transaction processing system.

- Transaction processing systems (TPS) are aimed at improving the routine business activities on which all organizations depend.



- A transaction is any event or activity that affects the organization which occur as part of doing business, such as sales, purchases, deposit, withdrawals, refunds and payments.
- Common transactions include placing orders, billing customers, hiring employees, and depositing cheques.
- The types of transactions that occur vary from organization to organization.
- Transaction processing, the set of procedures for handling the transactions, often includes the activities like calculation, storage and retrieval, classification, summarization, sorting.
- Transaction processing procedures are often called standard operating procedures.

When you purchase a book from an online bookstore, you exchange money (in the form of credit) for a book. If your credit is good, a series of related operations ensures that you get the book and the bookstore gets your money. However, if a single operation in the series fails during the exchange, the entire exchange fails. You do not get the book and the bookstore does not get your money.

The technology responsible for making the exchange balanced and predictable is called transaction processing. Transactions ensure that data-oriented resources are not permanently updated unless all operations within the transactional unit complete successfully. By combining a set of related operations into a unit that either completely succeeds or completely fails, you can simplify error recovery and make your application more reliable.

Transaction processing systems consist of computer hardware and software hosting a transaction-oriented application that performs the routine transactions necessary to conduct business. Examples include systems that manage sales order entry, airline reservations, payroll, employee records, manufacturing, and shipping.

(a) Types of Transactions

Note that the transactions can be internal or external. When a department orders office supplies from the purchasing department, an **internal transaction** occurs, when a customer places an order for a product, an **external transaction** occurs.

Internal Transactions: Those transactions, which are internal to the company and are related with the internal working of any organization. For example Recruitment Policy, promotion Policy, production policy etc.



External Transactions: Those transactions, which are external to the organization and are related with the external sources, are regarded as External Transaction. For example sales, purchase etc.

(b) Transaction Processing cycle

Transaction processing systems capture and process data describing business transactions. Then they update organizational files and databases and produce a variety of information products for internal and external use.

Transaction processing systems generally go through a five-stage cycle of

1. Data Entry: - The input activity in transaction processing systems involves a data entry process. In this process, data is captured, or collected by recording, coding, and editing activities. Then the data may be converted to a form that can be entered into a computer system. Data entry activities have always been a bottleneck in the use of computers for transaction processing.

2. Transaction Processing: - Transaction processing systems process data in two ways.

a) Batch processing - In a batch processing system, transaction data is accumulated over a period of time and processed periodically. For example paying by cheque.

Advantages of Batch Processing

- Control over time of processing
- Standardization
- Reduce setup and processing cost

Disadvantages of Batch Processing

- Time delay in gathering data , storing and bulk processing
- Operation cost may increase
- Only identical is processed in one batch
- Errors are corrected after processing the data

b) Real-time processing- real time processing is where all details of transactions are recorded and changed at the time as it occurs. For example- ATM.

Advantages of Real Time Processing

- Error correction can be immediate
- Data is processed as demand



- No time delay

Disadvantages of Real Time Processing

- Standardization may not exist or may be more difficult
- Processing needs make control difficult
- System hardware and software is expensive
- Security is critical

3. File and database processing-

An organizations database must be updated by its transaction processing system so that they are always correct and up-to-date. Therefore, Transaction processing system serve to assist in maintaining the corporate database of an organization to reflect changes resulting from day-to-day business transaction.

4. Document and report generation-

Transaction processing system generates a number of documents and reports. Eg of transaction documents are purchase order, sales receipt, customer statement.

Transaction reports might take the form of a transaction listing such as a payroll register, edit reports that describe errors detected during processing.

5. Enquiry Processing-

Many transaction processing system allow you to use internet, extranet, intranet and web browser or database management query languages to make enquiry and receive responses concerning the result of transaction processing activity. Typically responses are displayed in a variety of formats.

Examples of transaction processing systems include;

- **Point of Sale Systems** – records daily sales
- **Payroll systems** – processing employee's salary, loans management, etc.
- **Stock Control systems** – keeping track of inventory levels
- **Airline booking systems** – flights booking management

7.3 MANAGEMENT INFORMATION SYSTEM (MIS)

The MIS is an idea which is associated with man, machine, marketing and methods for collecting information's from the internal and external source and processing this information for the purpose of facilitating the process of decision-making of the business.



MIS is not new, only the computerization is new before computers MIS techniques existed to supply managers with the information that would permit them to plan and control business operations. The computer has added on more dimensions such as speed, accuracy and increased volume of data that permit the consideration of more alternatives in the decision-making process. The scope and purpose of MIS is better understood if each part of them is defined individually, thus

Management: Management has been defining in processor activities that describe what managers do in the operation for their organization plan, organize, initiate and control operations. They plan by setting strategies and goals and selecting the best course of action to achieve the goals. They organize the necessary tasks for the operational plan, set these tasks up into homogenous groups and assign authority delegation; they control the performance standards and avoiding deviation from the standard.

The decision-making is a fundamental prerequisite of each of the foregoing process, the job of MIS is facilitating decisions necessary for planning, organizing and controlling the work and functions of the business so that specified goals of the business are achieved.

Information: Data must be distinguished from information and the distinction is clear and important for the present purpose. Data are facts and figures that are not currently being used in a decision-making process and usually are taken from the historical records that are recorded and filled without immediate intent to retrieve for decision-making.

Information consists of data that have been retrieved, processed or otherwise used for information or interference purpose, argument or as a basis forecasting or decision-making regarding any business unit. Information is the knowledge that one derives from facts for the effective functioning of systems placed in the right context with the purpose of reducing uncertainty regarding the alternative courses of action as they are based on description and measurement of attributes of various entities associated with the enterprise.

System: The system can be described as a set of elements joined together for a common objective. A subsystem is a part of a larger system with which one is concerned. All systems for our purpose the organization is the system and the parts (divisions, departments, functions, unit, etc) are the subsystems. The system concept of MIS is, therefore one of optimizing the output of the organization by connecting the operating subsystems through the medium of information exchange. The Management information system (MIS) is a concept of the last two decade or two. It has been understood and described in a



number of ways. It is also known as the Information System, the Information and Decision System, the computer-based Decision System.

Information is the lifeblood of an organization, particularly in the case of system approach management. The MIS or Information system can be defined as the knowledge communicated by others or obtained from investigation or study. It is a system providing needed information to each manager at the right time in the right form and relevant one which aids understanding and stimulates the action. MIS is an organized method of providing past, present and projection information relating to internal operations and external intelligence. It supports the planning, control and operational functions of an organization by furnishing uniform information in the proper time frame to help the process of decision-making.

Management Information System is generally defined as an integrated user-machine system for providing information to support operations, management and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedure, models for analysis. Information is viewed as a resource much like land, labor, and capital. It must be obtained, processed, stored, manipulated and analyzed, distributed, etc. An organization with a well-defined information system will generally have a competitive advantage over an organization with poor MIS and no MIS.

The MIS has more than one definition, some of which are given below:

1. The MIS is defined as a system which provides information support for decision-making in the organization.
2. The MIS is defined as an integrated system of man and machine for providing the information to support the operations, the management and the decision-making function in the organization.
3. The MIS is defined as a system based on the database of the organization evolved for the purpose of providing information to the people in the organization.
4. The MIS is defined as a computer-based information system.

Though there are a number of definitions all of them converge on a single point, i.e. the MIS is a system that supports the decision-making function of the organization. The difference lies in defining the elements of MIS. However, in today's world, the MIS is a computerized business processing system generating information for the people in the organization to meet the information needs for decision-making to achieve the corporate objective of the organization.



- ✓ MIS is a computer-based system that provides flexible and speedy access to accurate data. The organizational information system which in general relates to the planning, operation and control of an enterprise is the most important among them. MIS refers primarily to such an organizational system which is generally large, sophisticated, structured and dynamically evolving and of immense commercial values. A large number of programs and system analysts are employed by many organizations to build a variety of MIS. Thus, the education of programmers and system analysts as well as general manager, the subject of MIS, has occupied a key position.
- ✓ Thus, MIS is a set of computer-based system and procedures implemented to help managers in their routine job of decision-making and planning, expansion and development.
- ✓ The objective of MIS is to provide information for a decision support process of management. It should help in such a way that the business goals are achieved in the most efficient manner. Since the decision-making is not restricted to a particular level, the MIS is expected to support all the levels of the management in conducting the business operations. Unless the MIS becomes a management aid, it is not useful to the organization.
- ✓ Modern management system relies on MIS, the complexity of business management and the competitive nature of business requires handling of business operations with skill and foresight to avert the crisis. The management process is executed through a variety of decisions taken at each step of planning, organizing, staffing, directing, coordinating and controlling. If the management is able to spell out the decision required to be taken, then the MIS is designed suitably.
- ✓ The actual MIS process relates to:
 - A. Collection
 - B. Organization
 - C. Distribution
 - D. Storage of wide information
 - E. Managerial control and analysis of data
- ✓ Management Information Systems (MIS) are used by tactical managers to monitor the organization's current performance status. The output from a transaction processing system is used as input to a management information system.

(a) Why MIS?



A manager has to take decisions with two main challenges:

First, a manager has to take quick decisions, or else there's a chance of the business being taken over by his competitors. The liberalization and globalization, in which organizations are required to compete globally, has further enhanced the necessity for such a system.

Second, information is doubling up every two or three years, a manager has to process a large voluminous data; failing which he may end up taking a strong decision that may prove to be very costly to the company.

Hence, Management Information System has proved to be the one of the most important in today's business environment.

(b) Manual Information Systems VS Computerized Information Systems (MIS)

Data is the bloodstream of any business entity. Everyone in an organization needs information to make decisions. An information system is an organized way of recording, storing data, and retrieving information.

In this section, we will look at manual information systems vs. computerized information systems.

Manual Information System

A manual information system does not use any computerized devices. The recording, storing and retrieving of data is done manually by the people, who are responsible for the information system.

The following are the major components of a manual information system

- **People** –people are the recipients of information system
- **Business Procedures** –these are measures put in place that define the rules for processing data, storing it, analyzing it and producing information
- **Data** –these are the recorded day to day transactions
- **Filing system** – this is an organized way of storing information
- **Reports** –the reports are generated after manually analyzing the data from the filing system and compiling it.

Advantages and Dis-advantages of a manual information system

Advantages:

The following are the advantages of manual information systems



- **Cost effective** – it is cheaper compared to a computerized system because there is no need to purchase expensive equipment such as servers, workstations, printers, etc.
- **Flexible** – evolving business requirements can easily be implemented into the business procedures and implemented immediately

Disadvantages:

The following are some of the disadvantages of a manual information system.

- **Time consuming** – all data entries need to be verified before filing, this is a time consuming task when done by humans. Retrieving data from the filing system also takes a considerable amount of time
- **Prone to error** – the accuracy of the data when verified and validated by human beings is more prone to errors compared to verification and validation done by computerized systems.
- **Lack of security** – the security of manual systems is implemented by restricting access to the file room. Experience shows unauthorized people can easily gain access to the filing room
- **Duplication of data** – most departments in an organization need to have access to the same data. In a manual system, it is common to duplicate this data to make it easy to accessible to all authorized users. The challenge comes in when the same data needs to be updated
- **Data inconsistency** – due to the duplication of data, it is very common to update data in one file and not update the other files. This leads to data inconsistency
- **Lack of backups** – if the file get lost or mishandled, the chances of recovering the data are almost zero.

Computerized information system

Computerized systems were developed to address the challenges of manual information systems. The major difference between a manual and computerized information system is a computerized system uses a combination of software and hardware to record, store, analyze and retrieve information.

(c) Examples of management information systems include;

- 1) **Sales management systems** – they get input from the point of sale system
- 2) **Budgeting systems** – gives an overview of how much money is spent within the organization for the short and long terms.
- 3) **Human resource management system** – overall welfare of the employees, staff turnover, etc.

**(d) Important roles of the MIS:**

- MIS satisfies the diverse needs through a variety of systems such as Query System, Analysis System, Modeling System and Decision Support System.
- It helps in strategic planning, management control, operational control and transaction processing.
- It helps in the clerical transaction processing.
- It answers the queries on the data pertaining to the transaction, the status of a particular record and reference on a variety of documents.
- MIS for Junior Management: Providing the operational data for planning, scheduling and control, and helps them further in decision-making at the operation level to correct an out of control situation.
- MIS for Middle Management: In short-term planning, target setting and controlling the business functions which is supported by the use of the management tools of planning and control.
- MIS for Top- Level Management: in goal setting, strategic planning and evolving the business plans and their implementation.
- It plays the role of information generation, communication, problem identification and helps in the process of decision-making.

In conclusion, organizations today just cannot survive and grow without properly planned, implemented and maintained MIS.

(e) Competitive advantage of information and MIS

Competitive advantage is a position that makes a business more profitable than its competitors. For example, producing products at a lower cost than your competitors makes you more profitable. Information systems have the capacity to help an organization into such a position. They do so in the following ways:

Operational excellence – operational excellence seeks to improve the operations of the business. Let's take an example of a retail store. A retail store can use information systems to automatically place an order with a supplier once the inventory level reaches the re-order limit. This ensures that the retail store never runs out of inventory and customers can always count on it to find what they need.

New business models, products, and services – let's continue with the example of a retail store. The retail store can develop a web based order system or smart phone application that clients can use to buy



items from the comfort of their homes or wherever they are. The order system can be linked to a delivery business and have support for online payments. This is a new business model compared to customers walking in to make purchases vs doing it from web based or smart phone apps.

Improved supplier and customer relations – historical data is used to understand the needs of the customers and suppliers. This data is then used to create services and products that address the needs. This leads to long-term relationships with customers and business which puts an organization in a more profitable position.

Improved decision making – information is critical when making decisions. Information systems if designed and operated efficiently then outputs information that has all the characteristic of good information that described in the above section. This enables an organization to make decisions that will profit the organizations.

(f) **Components of MIS and their relationship**

A management information system is made up of five major components namely people, business processes, data, hardware, and software. All of these components must work together to achieve business objects.

People – these are the users who use the information system to record the day to day business transactions. The users are usually qualified professionals such as accountants, human resource managers, etc. The ICT department usually has the support staff that ensures that the system is running properly.

Business Procedures – these are agreed upon best practices that guide the users and all other components on how to work efficiently. Business procedures are developed by the people i.e. users, consultants, etc.

Data – the recorded day to day business transactions. For a bank, data is collected from activities such as deposits, withdrawals, etc.

Hardware – hardware is made up of the computers, printers, networking devices, etc. The hardware provides the computing power for processing data. It also provides networking and printing capabilities. The hardware speeds up the processing of data into information.

Software – these are programs that run on the hardware. The software is broken down into two major categories namely system software and applications software. System software refers to the operating



system i.e. Windows, Mac OS, and Ubuntu, etc. Applications software refers to specialized software for accomplishing business tasks such as a Payroll program, banking system, point of sale system, etc.

(g) Following are the key characteristics of MIS:

1. **System approach:** MIS follows the system approach, which implies a step by step approach to the study of system and its performance in the light of the objective for which it has been constituted. It means taking an inclusive view at sub-systems to operate within an organization.
2. **Management-oriented:** The management-oriented characteristic of MIS implies that top-down approach needs to be followed for designing MIS. A top-down method says the initiation of system development determines management requirements as well as business goals. MIS implies the management dynamically to the system development towards the completion of management decision.
3. **As per requirements:** The design and development of MIS should be as per the information required by the managers. The required design and development information is at different levels, viz., strategic planning, management control and operational control. It means MIS should cater to the specific needs of managers in the hierarchy of an organization.
4. **Future-oriented:** The design and development of MIS should also be future purpose so that the system is not restricted to provide only the past information.
5. **Integrated:** A complete MIS is a combination of its multiple sub-components to provide the relevant information to take out a useful decision. An integrated system, which blends information from several operational areas, is a necessary characteristic of MIS.
6. **Common data flows:** This concept supports numerous basic views of system analysis such as avoiding duplication, combining similar functions and simplifying operations. The expansion of common data flow is a cost-effectively and logical concept.
7. **Long-term planning:** MIS should always develop as a long term planning because it involves logical planning to get success of an organization. While developing MIS, the analyst should keep future oriented analysis and needs of the company in mind.
8. **Relevant connection of sub-system planning:** The MIS development should be decomposing into its related sub-systems. These sub-systems must be meaningful with proper planning.



9. **Central database:** it contains data in tabular form. The data base is responsible to operations like insertion, deletion, updating of records. This database covers information related to inventory, personnel, vendors, customers, etc. the data stored in the database.

(h) Advantages:

The following are the advantages of computerized information systems

- **Fast data processing and information retrieval** – this is one of the biggest advantages of a computerized information system. It processes data and retrieves information at a faster rate. This leads to improved client/customer service
- **Improved data accuracy** – easy to implement data validation and verification checks in a computerized system compared to a manual system.
- **Improved security** – in addition to restricting access to the database server, the computerized information system can implement other security controls such as user's authentication, biometric authentication systems, access rights control, etc.
- **Reduced data duplication** – database systems are designed in such a way that minimized duplication of data. This means updating data in one department automatically makes it available to the other departments
- **Improved backup systems** – with modern day technology, backups can be stored in the cloud which makes it easy to recover the data if something happened to the hardware and software used to store the data
- **Easy access to information** – most business executives need to travel and still be able to make a decision based on the information. The web and [Mobile](#) technologies make accessing data from anywhere possible.

(i) Disadvantages:

- **It is expensive to set up and configure** – the organization has to buy hardware and the required software to run the information system. In addition to that, business procedures will need to be revised, and the staff will need to be trained on how to use the computerized information system.
- **Heavy reliance on technology** – if something happens to the hardware or software that makes it stop functioning, then the information cannot be accessed until the required hardware or software has been replaced.



- **Risk of fraud** – if proper controls and checks are not in place, an intruder can post unauthorized transactions such as an invoice for goods that were never delivered, etc.

7.4 CHECK YOUR PROGRESS

1. _____ is required by the managers at the strategic level of management for the formulation of organizational strategies.
2. An information system that processes data arising from the occurrence of business transactions is known as _____.
3. _____ are used by top level managers, and they help top level managers to make unstructured decisions.
4. _____ is a collection of people, procedures, data, and information technology that aids managers to make informed decisions.
5. _____ are by operational staff to record day to day business transactions, and they are used to make structured decisions.

7.5 SUMMARY

MIS is the acronym for Management Information System. It is a collection of people, procedures, data, and information technology that aids managers to make informed decisions. Computerized information systems are more efficient compared to manual information systems. Manual information systems are cheaper compared to computerized information systems. Transaction processing systems (TPS) are used by operational staff to record day to day business transactions, and they are used to make structured decisions. Management Information Systems (MIS) are used by middle-level managers to make semi-structured decisions. Decision Support Systems are used by top level managers, and they help top level managers to make unstructured decisions.

7.6 KEYWORDS

Information System: An information system is the information and communication technology (ICT) that an organization uses, and also the way in which people interact with this technology in support of business processes.



Transaction processing system: An information system that processes data arising from the occurrence of business transactions is known as transaction processing system.

Management information system: A management information system (MIS) is a computer system consisting of hardware and software that serves as the backbone of an organization's operations. An MIS gathers data from multiple online systems, analyses the information, and reports data to aid in management decision-making.

Decision support system: A decision support system (DSS) is a computerized program used to support determinations, judgments, and courses of action in an organization or a business.

7.7 Self-assessment Test

1. What do you mean by information system, explain in detail?
2. Explain the Transaction processing system.
3. Write short note on Management information system. Discuss various advantages and disadvantages of MIS.
4. Discuss the various features of decision support system.
5. What are the various characteristics of Executive support system?
6. What is Business expert system? Explain its characteristics.
7. Discuss “why do we require an information system for our business?”
8. Explain the various causes of information system failure.
9. Discuss the key characteristics of MIS.
10. Discuss the competitive advantages of information and MIS.

7.8 Answers to Check Your Progress

1. Strategic information
2. Transaction processing system
3. Decision Support Systems
4. Management information system
5. Transaction processing systems

7.9 References/Suggested Readings

- Ralph Stair, George Reynolds, *Fundamentals of Information Systems (2015)*, Cengage Learning.



- V.S.Bagad, *Management Information Systems (2008)*, Technical Publications.
- Nirmalya Bagchi, *Management Information Systems (2010)*, Vikas Publishing House.
- Singh, *Information System Management (2007)*, APH Publishing.
- libf, *Design, Development & Implementation of Information System (2007)*, Macmillan.
- <https://www.britannica.com/topic/information-system> 10/11/2019
- <https://bus206.pressbooks.com/chapter/chapter-1/> 10/11/2019
- <https://www.guru99.com/mis-types-information-system.html> 10/11/2019



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E-Commerce: Concept, WWW and Application Services

LESSON STRUCTURE

- 8.0 Learning Objectives
- 8.1 Introduction to E-Commerce
 - 8.1.1 Types of E-Commerce
 - 8.1.2 E-Commerce Architecture
 - 8.1.3 WWW
 - 8.1.4 Applications of E-Commerce
- 8.2 Advantages of E-Commerce
- 8.3 Disadvantages of E-Commerce
- 8.4 Check Your Progress
- 8.5 Summary
- 8.6 Keywords
- 8.7 Self-Assessment Test
- 8.8 Answers to Check Your Progress
- 8.9 References/Suggested Readings

8.0 Learning Objectives

- How the term E-commerce has been defined,
- What are the goals and scope of E-commerce
- What are the different methods to use E-commerce?
- About the scope of E-commerce.
- Application of www for E-commerce.
- About World Wide Web
- The benefits of getting your business into using e-commerce at one or more levels
- Which technical and economical challenges have to be faced when doing business electronically?



8.1 Introduction to E-Commerce

This chapter introduces you about the paperless exchange of business information- known as “E-Commerce”. The World Trade Organization defines e-commerce as, "e-commerce is the production, distribution, marketing, sales or delivery of goods and services by electronic means." E-Commerce is commonly referred as electronic commerce. It is also known as “Internet Commerce”. It refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions.

Michael Aldrich in 1979 invented online shopping to enable online transaction processing between consumers and businesses, or between one business and another, a technique known later as e-commerce.

In traditional commerce, communication/transactions are done in synchronous way. Manual intervention is required for each communication or transaction. Now with e-commerce, communication or transactions can be done in asynchronous way. The whole process is completely automated.

It takes place between companies, between companies and their customers, or between companies and public administrations. Section (a) states basic concepts about E-commerce. Section (b) states objectives of E-commerce in our daily life. In addition to usage of e-Commerce specified in section (c), there are some benefits provided to organization, society, and customers are also specified in section (d) of this chapter. Section 8.1.3 states about **WWW**. A broader definition comes from the World Wide Web Consortium (W3C): "The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge."

(a) E- Commerce

E-commerce is a business model or a larger business model that allows companies or individuals through the electronic network.

Electronic commerce is subdivided into three categories: business to business in B2B, business to consumer or B2C and consumer to consumer or C2C. What is B2B (Business To Business)? B2B is a type of between manufacturers and wholesalers or wholesalers and retailers. Business to business refers to the business between the company rather than the company and personal consumption. What is B2C (Business to Customer)? B2C is also the trading between consumers. What is C2C (Customer to



Customer)? C2C is the promotion and interaction between benefit and customer. Customer to customer is to provide location and talk to people, exchange and trading with other people.

(b) Goals of E-Commerce-

- Reduce cost
- Reduce product cycle time
- Faster customer response
- Improve service quality
- Attract more customer

(c) Usage of Electronic Commerce:

1. Send letters, documents, orders, or advertising material around the world, almost instantaneously and low cost;
2. Create a store-front on the Internet so that people around the world can find and access your business
· Buy or sell around the world via the Internet - do business with anyone, anywhere in the world at any time;
3. Provide better information and services to businesses and consumers;
4. Streamline your business processes and reduce costs.

It is also called a '**Virtual Market Place**'.

(d) Benefits of E-Commerce-

1. Benefits to Organization-

- E-Commerce decreases the cost of creating, Processing, distributing, storing and retrieving paper based information.
- E-Commerce reduces the time.
- Improved customer service.
- Improved image.

2. Benefits to Consumer-

- Customer can perform a transaction 24 hours per day.
- It provides customers with more choices
- It allows quick delivery



- Customer can communicate with each other through electronic communication
- It provides customer with less expensive products

3. Benefits to Society-

- It reduce the time of travelling for shopping
- Its facilitates people in rural areas to enjoy product and services
- It facilitates delivery of public services

(e) Methods of using of E-Commerce

E-commerce can be used in following ways

- **Electronic Data Interchange (EDI)**- Electronic data interchange (EDI) is the most commonly used B2B e-commerce technology today. It is the computer-to-computer exchange of business documents, such as purchase orders and invoices, in a standard electronic format between business partners.
- **Electronic Mail (e-mail)**- Electronic mail (also called email or e-mail) is the transmission of messages over communications networks. Most email systems include an editor for composing messages and then you send the message by specifying the recipient's email address.
- **Electronic Bulletin Boards**-Electronic bulletin boards (also known as message boards or as computer forums) are online communication systems where one can share, request, or discuss information on just about any subject.
- **Electronic Fund Transfer (EFT)**-*Electronic funds transfer (EFT) are electronic transfer of money from one bank account to another, either within a single financial institution or across multiple institutions, via computer-based systems, without the direct intervention of bank staff.*
- Other Network-based technologies

(f) Scope of E-commerce

- Marketing, sales and sales promotion.
- Pre-sales, subcontracts, supply.
- Financing and insurance.
- Commercial transactions – ordering, delivery, payment.
- Product service and maintenance.



- Co-operative product development.
- Distributed co-operative working.
- Use of public and private services.
- Business-to-administrations
- Transport and logistics.
- Public procurement.
- Automatic trading of digital goods like games, learning material, songs and music etc.
- Accounting and financial management.
- Legal advice

8.1.1 TYPES OF E-COMMERCE

Electronic commerce can be classified into following main categories. The basis for this simple classification is the parties that are involved in the transactions. So the six basic electronic commerce models are as follows,

- Business-to-Business (B2B)
- Business-to-Consumer (B2C)
- Consumer-to-Consumer (C2C)
- Consumer-to-Business (C2B)
- Business-to-Administration (B2A)
- Consumer-to-Administration (C2A)

Business-to-Business (B2B): This kind of E-commerce consists of all the electronic transactions and dealings related to the goods and services. These basically are conducted between companies and include conventional wholesalers and producers dealing with retailers.

Business-to-Consumer (B2C): The Business-to-Consumer E-commerce is related to the transactions and relationship between businesses and the end customers. This is mainly to do with the retail E-commerce trade that takes place online. With the inception of the internet, B2C E-commerce has



evolved to a great extent. Today, we find scores of electronic shopping sites and virtual stores on the web, that sell myriad products, ranging from computers, fashion items to even necessities.

In this case, the customer has more info about the products in the form of informative content and there is also a chance to buy products at cheaper rates. Most times, quick delivery of the order is also maintained.

Steps in B2C E-commerce

1. Customer uses a browser and locates vendor or he has vendor's webpage address
2. Sees Vendor's web page listing of items available, prices etc
3. Customer selects item and places order. Order may include credit card details or may be cash on delivery
4. Vendor checks with credit card company customer's credit
5. Credit card company OKs transaction
6. Vendor acknowledges Customer's order and gives details of delivery date, mode of transport, cost etc
7. Vendor orders with distributor who ships item to vendor's warehouse from where item supplied to customer
8. Customer's credit card company debits his account, credits vendor's account and sends bill to customer for payment.

Consumer-to-Consumer (C2C): This consists of electronic transactions of products and services between two customers. These are mainly conducted through a third party that provides an online platform for these transactions. Sites, where old items are bought and sold, are examples of C2C E-commerce.

Consumer-to-Business (C2B): In this, a complete reversal of the selling and buying process takes place. This is very relevant for crowd sourcing projects. In this case, individuals make their items or services and sell them to companies. Some examples are proposals for company site or logo, royalty free photographs, design elements and so on.



Business-to-Administration (B2A): In this kind of E-commerce transaction, there are dealings between companies and public administration. It encompasses different services, such as social security, fiscal measures, legal documents, employment and so on.

Consumer-to-Administration (C2A): In this E-commerce model, electronic transactions are carried between individuals and public administration. Some examples are distance learning, information sharing, electronic tax filing, and so on.

The main objective of both the B2A and C2A types of E-commerce is to increase flexibility, efficiency, and transparency in public administration.

8.1.2 E-COMMERCE ARCHITECTURE

- E-commerce is based on the client-server architecture.
- A client can be an application, which uses a Graphical User Interface (GUI) that sends request to a server for certain services.
- The server is the provider of the services requested by the client.
- In E-commerce, a client refers to a customer who requests for certain services and the server refers to the business application through which the services are provided.
- The business application that provides services is deployed on a Web' server.
- The E - Commerce Web server is a computer program that provides services to "other computer programs and serves requested Hyper Text Mark-up Language (HTML) pages or files.
- In client-server architecture, a machine can be both a client as well as a server.

There are two types of client server architecture that E-commerce follows: two-tier and three-tier.

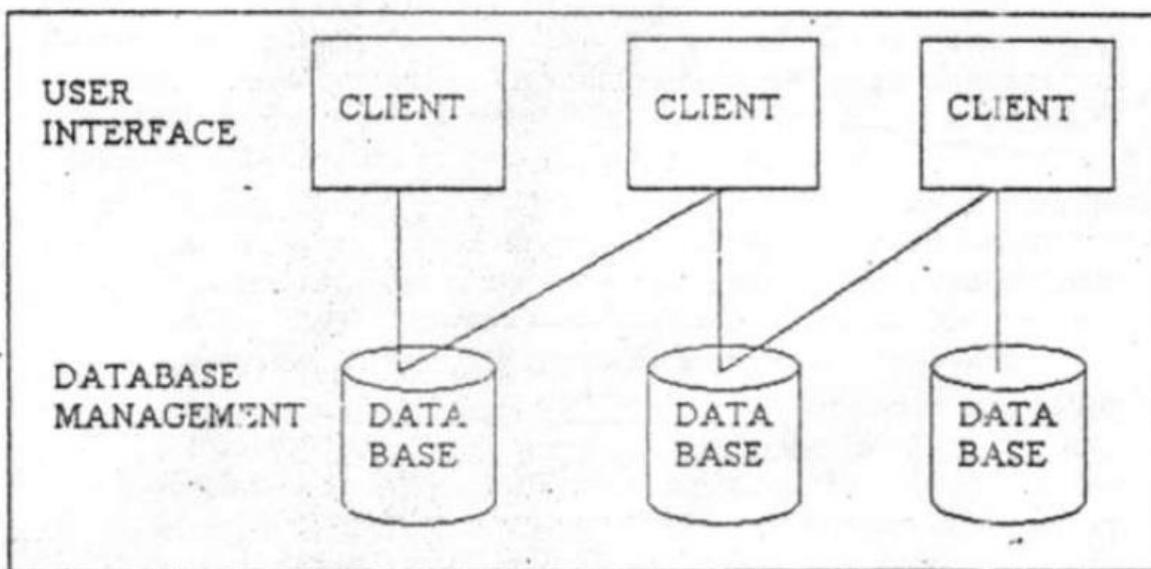
I. E- Commerce System Architecture: Two-tier architecture:

In two-tier client-server architecture the user interface runs on the client and the database is stored on the server. The business application logic can either run on the client or the server. The user application logic can either run on the client or the server. It allows the client processes to run separately from the server processes on different computers.



The client processes provide an interface for the customer that gather and present the data on the computer of the customer. This part of the application is known as presentation layer. The server processes provide an interface with the data store of the business.

This part of the application is known as data layer. The business logic, which validates data, monitors security and permissions and performs other business rules, can be kept either on the client or the server. The following Figure shows the e commerce system two-tier architecture diagram.



II. E-Commerce System Architecture: Three tier architecture

The three-tier architecture emerged in the 1990s to overcome the limitations of the two-tier architecture. In three-tier architecture, the user interface and the business application logic, also known as business rules and data storage and access, are developed and maintained as independent modules.

The three-tier architecture includes three tiers:

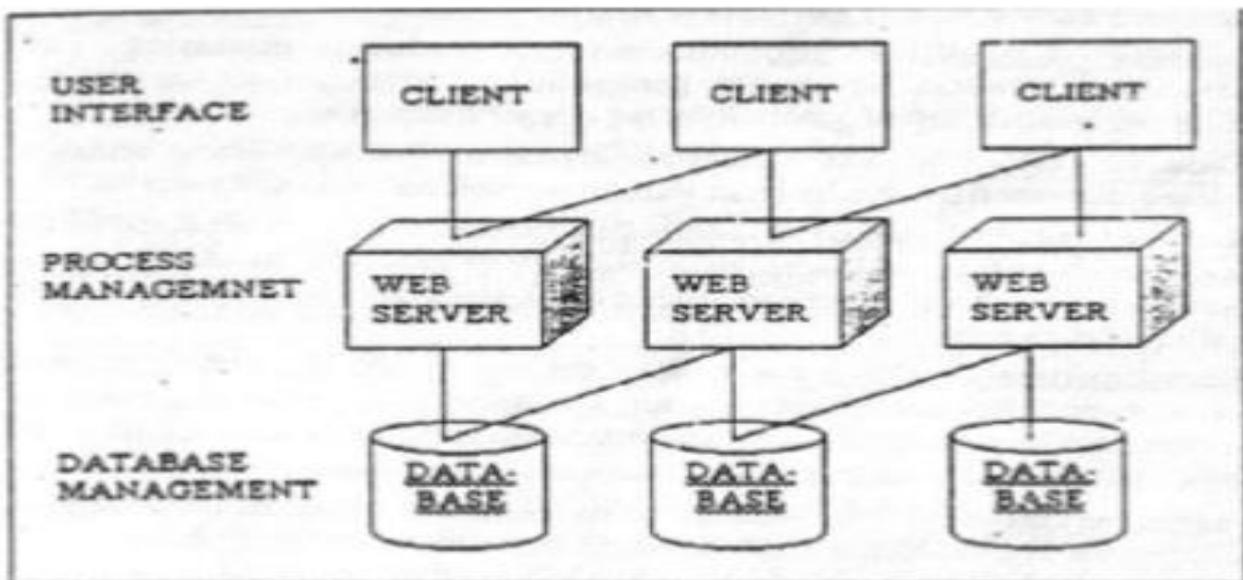
- ✓ Top tier,
- ✓ Middle tier and
- ✓ Third tier.

The **top tier** includes a user interface where user services such as session, text input, and dialog and display management reside.



The **middle tier** provides process management services such as process development, process monitoring and process resourcing that are shared by the multiple applications.

The **third tier** provides database management functionality. The data management component ensures that the data is consistent throughout the distributed environment, the centralized process logic in this architecture, which makes administration easier by localizing the system functionality, is placed on the middle tier.



The figure above shows the outline of the e commerce system three - tier architecture diagram.

III. Advantages of Client –Server model:

- The client-server architecture provides standardized, abstract interfaces to establish communication between multiple modules. When these modules are combined, they become an integrated business application. Each module is a shareable and reusable object that can be included in another business application.
- In the client-server architecture, the functions of a business application are isolated within the smaller business application objects and so application logic can be modified easily.
- In "the client-server architecture, each business application object works with its own encapsulated data structures that correspond to a specific database. When business application



objects communicate, they send the data parameters as specified in the abstract interface rather than the entire database records.

- This reduces the network traffic. In the client-server architecture, a programmer can develop presentation components without knowing the business application logic.
- This architecture also helps a database analyst in accessing the data from the database without being concerned how the data is presented to an end user.

8.1.3 WWW

The **World Wide Web** is the universe of network-accessible information. The development of the World Wide Web was begun in 1989 by Tim Berners-Lee and his colleagues at CERN, an international scientific organization based in Geneva, Switzerland. The Web gives users access to a vast array of documents that are connected to each other by means of hypertext or hypermedia links—i.e., hyperlinks, electronic connections that link related pieces of information in order to allow a user easy access to them. Hypertext allows the user to select a word or phrase from text and thereby access other documents that contain additional information pertaining to that word or phrase; hypermedia documents feature links to images, sounds, animations, and movies. Browser software allows users to view the retrieved documents. A hypertext document with its corresponding text and hyperlinks is written in Hyper Text Markup Language (HTML) and is assigned an online address called a Uniform Resource Locator (URL).

I. Difference between World Wide Web and Internet

Some people use the terms 'internet' and 'World Wide Web' interchangeably. They think they are the same thing, but it is not so. Internet is entirely different from WWW. It is a worldwide network of devices like computers, laptops, tablets, etc. It enables users to send emails to other users and chat with them online. For example, when you send an email or chatting with someone online, you are using the internet.

II. World Wide Web and E-Commerce

This invention became the launching point of the growth of the Internet as a way for businesses to share information about them. As web browsers and Internet connections became the norm, companies rushed



to grab domain names and create websites. The year 1994 saw the establishment of both eBay and Amazon.com, two true pioneers in the use of the new digital marketplace.

Companies are utilizing the WWW today for purposes of:

- (1) Promoting greater awareness of their companies and products;
- (2) Providing customer support for their products
- (3) Offering sales of products or services directly or indirectly either exclusively through the web or to supplement existing marketing channels
- (4) Selling advertising space on Web sites to other companies
- (5) Offering electronic information services.

Clearly, WWW applications for electronic commerce have accelerated so quickly in the past years that little attention has been paid to understanding WWW usage at a higher level.

8.1.4 APPLICATIONS OF E-COMMERCE

The applications of E-commerce are used in various business areas such as retail and wholesale and manufacturing. The most common E-commerce applications are as follows:

1. Online marketing and purchasing
2. Retail and wholesale
3. Finance
4. Manufacturing
5. Online Auction
6. E-Banking
7. Online publishing
8. Online booking
9. **Electronic Newspapers**
10. **Internet Bookshops**

I. Online marketing and purchasing

Data collection about customer behavior, preferences, needs and buying patterns is possible through Web and E-commerce. This helps marketing activities such as price fixation, negotiation, product feature enhancement and relationship with the customer.



II. Retail and wholesale

E-commerce has a number of applications in retail and wholesale. E-retailing or on-line retailing is the selling of goods from Business-to-Consumer through electronic stores that are designed using the electronic catalog and shopping cart model. Cybermall is a single Website that offers different products and services at one Internet location.

III. Finance

Financial companies are using E-commerce to a large extent. Customers can use E-commerce for following purposes-

- Check the balances of their savings and loan accounts
- Transfer money to their other account
- Pay their bill through on-line banking or E-banking.

Another application of E-commerce is on-line stock trading. Many Websites provide access to news, charts, information about company profile and analyst rating on the stocks.

IV. Manufacturing

E-commerce is also used in the supply chain operations of a company. Some companies form an electronic exchange by providing together buy and sell goods, trade market information and run back office information such as inventory control. This speeds up the flow of raw material and finished goods among the members of the business community. Various issues related to the strategic and competitive issues limit the implementation of the business models. Companies may not trust their competitors and may fear that they will lose trade secrets if they participate in mass electronic exchanges.

REPORT THIS AD

V. Auctions

Customer-to-Customer E-commerce is direct selling of goods and services among customers. It also includes electronic auctions that involve bidding. Bidding is a special type of auction that allows prospective buyers to bid for an item. For example, airline companies give the customer an opportunity to quote the price for a seat on a specific route on the specified date and time.

VI. E-Banking

Online banking or E- banking is an electronic payment system that enables customers of a financial institution to conduct financial transactions on a website operated by the institution, Online banking is



also referred as internet banking, e-banking, virtual banking and by other terms. Some sites related to Internet banking are as follows:

- www.indianbank.net.in
- www.icicibank.com

You cannot use the services provided by the online banks till you are not the customer.

VII. Online Publishing

Electronic publishing (also referred to as e-publishing or digital publishing) includes the digital publication of e-books, digital magazines, and the development of digital libraries and catalogs.

VIII. Online Booking

An Internet Booking Engine (IBE) is an application which helps the travel and tourism industry support reservation through the Internet. It helps consumers to book flights, hotels, holiday packages, insurance and other services online.

IX. Electronic Newspapers

One of the hot areas on the Internet is the electronic newspaper. Electronic newspaper has advantages over both, the printed newspapers and the broadcast news on radio and televisions. In comparison to printed newspaper, the e-newspaper can give up-to-date news similar to broadcast news. Further, the browser could be set to select the news of interest of the reader and to leave out the rest. This is not possible with the broadcast news.

Despite the said advantages, the electronic newspapers are not being very popular due to the following reasons:

- Radio and television news are often consumed while people are doing other things like eating their foods or driving a car.
- Printed newspapers may be read on the train or in the park and then may be shared with someone else.
- The printed newspapers give the reader the chance to be selective (the selection depends on the moods and time of the reader).

There are a number of online newspapers and most of them are web versions of existing newspapers.

For example:

- www.timesofindia.com



- www.dainikjagran.com

X. Internet Bookshops

It is one of the first applications of e-commerce on Internet. Books as an item have the following significant advantages:

- Books can be described well on the Internet. Moreover, it is not an item, which is required to be checked physically.
- Normally, the books have nominal prices and not too much risk is involved in the online payments.
- Books are small items and can be delivered in the customer's letterbox. The customer does not need to be at home.
- A large database of books. The details available for display include a picture of the cover, description of the book including page numbers, price of the book and reviews of other customers also if possible.
- The book can be searched with the help of search engines. The search can be made on the author's name, title of the book or the subject etc.
- There may be software on the site that may record the interest of the particular customer and can inform the customer on the new arrivals on that subject.

Some large online bookshop sites are:

- www.amazon.com
- www.infibeam.com
- books.rediff.com

8.2 ADVANTAGES

I. Speed up the buying process and save time for customers

It literally speeds up the buying process because when someone thinks of buying one specific product from the physical store, which is very far and not easily available. Here how the E-commerce helps the customer to avail the specific product easily and speedily.



For example – Sometimes customer are not able to find a particular product from the store and even by visiting other chained stores, this is where E-commerce come into a scene with a quick response over the requirement by even helping to purchase the particular product without wasting time.

E-commerce helps the one to choose from a wide range of online accessed products easily and get it delivered too; it helps you to access online global market standards.

Such type of buying process can help you to reduce the traveling time and helps you with choosing plenty of options which you might be looking forward to getting your own one.

II. Personalize the store as per the customer expectation

One of the online business benefit which will enhance your online shopping experience. It is because every purchase which is made online will be referred as per location and recommended as per customers advanced searches.

It is one kind of personalize store where every customer has a different front page because of their location and previous purchases. Even customers are eligible sometime to get extra services because of previous history and loyalty towards the services. Such kind of store helps the customer to fulfill their expectations.

III. Reduce recurring cost while hiring virtual support resources.

One of the factors which can benefit in E-commerce is that by hiring employees is affordable. It is like you can choose to outsource your task and work to your virtual assistants in different countries. It will make your presence of the company in a different location at the same time always. In this case, you will not need many employees in an E-commerce business as compared retail locations.

IV. Easily retarget your customers.

There are many ways to retarget the customer and sell the product nicely. Below are some of the techniques which you can use to retarget customers:-

- Share a coupon when customers leave the checkout page.
- Even by sending emails which are pitching upsell and cross-sell.
- Can be done through Google paid and organic search results.
- It can be done through the customer's number of visits to a specific page with a certain period of time.



V. Easier to encourage an impulse buy

Impulse buying is one of the techniques where it works as a common behavior of customer's perception towards a particular product. It is related to the control of human psychological behavior which is like some people possess personality traits that can be said as impulse buying tendencies.

This is what can be used on an E-commerce platform too by making the product more attractive with images, other color options and even by showing a video of the product. So the customer can get the same aura of buying the product from the store.

VI. Reviews Available

It has so many positive recommendations which can give more values to your E-commerce website and help customers to build more trust over a particular product. It can help you to be clear and more visible about the product that helps you with more product selection too.

All of the reviews are valuable to customers, which can really help a lot to built trust over the products and services

VII. Able to provide detailed information to the customer.

Every customer looks for more details over the products so that it can help them to take a wise decision over their purchases. It is one kind of description which really helps a lot and expresses about any particular product.

It is in short one kind of information which is been shared clearly on the description about the product, that helps the user to take a final decision on the requirements. The flow which is been shared below the product in detail makes the customer to understand it in more details and that makes them to put them on a cart for their final check out with making them aware of all the features and functions of the product.

VIII. Best Quality of services in reasonably low operation cost

It is one of the benefits which plays a very vital role over an E-commerce platform. In most of the case, physical retail stores have to pay a lot to maintain their presence in the market by paying rent or even if it's own. There are several upfront costs which affect the store which is physically owned.

E-commerce store will help you cut off more than 60% of the price which has been run through a physical store. When you talk about operation cost it is very high as compared to the online store. One has to pay their staff, location charges, inventory, store design etc, which affects a lot.



IX. Quick and affordable marketing

You will not have to spend many bucks to market your e-commerce biz. There are many ways to pull your E-commerce business into this online world through various ways of online marketing which are quick and affordable.

Here are some of the unique ways which can just make you understand and help you with improvising marketing techniques.

- Always go with great content this is what helps you to be more visible in the market through creative content marketing.
- You can even go for creative marketing video which expresses about the product and services.
- Social networking helps you to make your presence everywhere because there is no one who is currently not into socializing.
- Even there are DIY info graphics which helps you to express about presence, you can say contrary that it works as browser.
- It helps you to enlighten the life to old data too.
- Every customer can be reached through digital market just have to focus on the techniques to approach them.

This what makes all things affordable because when you try to same on offline marketing it is expensive and time consuming a lot.

X. Provide flexibility to the customer to buy product 24/7

It has more flexibility over the regular store because the services are available 24/7 and though helps to serve you the services at anytime and anyplace.

There is a lot of change in the online markets recently which are providing you services helping you with the recommendation, sales support, chat support and even helps you find similar products. E-commerce is one of the platform which available for consumers 24/7 and globally.

XI. less store setup cost and quick ROI (Return of investments)

When you talk about E-commerce it has less amount of investment as compared to the offline store, it takes a huge amount of investment to set up an offline store which affects your business a lot by lacking on the return of investments.



This happens all because all investment which is been done over maintaining the store, on the contrary, it takes less amount of investment to make an online one.

Even after investing a lot of money over stock, labor, services, maintenance, electricity bill, rent (if any) etc, these will never help you out to gain profits over your investments. **E-commerce stores** are affordable and though if you see nicely than you will find that there is not much of investment as compared to the offline store and has more benefits too.

XII. No Geographical limitation, tap the global market form the day one.

It is like the customer will have access to the online store from anywhere in the world, which can globally be accessed. This is what every customer is looking forward to having as their service because sometimes customers are not able to find a particular product which not available at the store location but though online store works like a magic to provide them with multiple options. So, they can avail the services easily.

That is the main reason why E-commerce store helps you to be visible over the global market, where you will be fully available to everyone across the globe from the day one itself.

XIII. Reduce Resource hiring and training cost

In E-commerce you will not have to hire many employees as compared to the store, it is because when you open an online store your half of the work is been done through approaching customers directly by providing detailed information and visibility of the products.

You will not have to hire a seller to express everything about the product or have to train them. This is what makes E-commerce more effective in cost deduction of hiring and training employees.

XIV. Avoid human error while dealing with customers.

In the path of e-commerce, you will never face the issue of human error because every product is updated with details on the site, so that makes easy for the customer to have more visibility over the products.

This is what makes the customer feel comfortable to buy online as compared to the store. The stores are way more difficult sometimes because due to lack of options, comparison and descriptions.

When you visit a store you will always find that the seller tries to express with things which are not much convincing but though still, you will have to hear it till the end. This is what makes the customer



more confusing to buy or not? It is like getting pitched again and again for the same on what you are not looking for to get checked out.

XV. Environment – Friendly

You can say the E-commerce is totally eco-friendly as compared to the store. It is because when we visit a store at a time of purchase, we receive a bill, receipts, coupons etc.

These harms our environment a lot and that is the reason why E-commerce bought such services which are much eco-friendly and easy to maintain.

XVI. Compare product and price

In the world of E-commerce, you can compare the products easily which shares a detailed description over it. The most beneficial part of E-commerce is that you can avail and understand the product clearly but though this happens totally opposite when you visit a store.

In store you might not be able to find the product and will not be able to compare it, even you might have to visit multiple shops to know the differences.

This is what saves time for the customers when we look into the world of E-commerce. Every service which are been provided through E-commerce are made to serve customers to have easy access with more details and less time-consuming.

8.3 DISADVANTAGES OF E-COMMERCE

Security

Online portals have been in the news a lot because of hacks by cybercriminals and hackers. It is a very serious issue as your account might be hacked because of negligence and wiped out clean of the existing cash.

This is a harsh reality of e-commerce sites and a website cannot give this assurance that the financial information cannot be compromised on its portal. The website owner needs to take important steps to change its password so as to stop any data breaches.

- Training and maintenance-
- Hardware and Software problems
- Online Security problem

**Legal issues**

Several cyber laws have been implemented to protect the rights of both seller and buyer. If you are looking to create a website it is important that you go through the local laws as well as cyber laws so that you do not have to face any problems later on. A serious disadvantage of e-commerce portals is that people either take care of local laws or cyber laws and fail to realize that you need to pay attention to both of them if you want to make a success of your business.

Huge technological cost

E-commerce requires advanced platforms to better their performance. If it faces disturbances in the form of software, network or domain issue it will not be able to offer seamless transactions.

The apt technical infrastructure is costly and needs huge investment. It also needs to be upgraded periodically to stay with changing times. Huge technological cost for a successful venture is a disadvantage of the e-commerce portal.

Fear

People fear the unknown. E-commerce transactions are mostly faceless and paperless without any due proof. Most of the organizations do not have a physical existence and customers are hesitant to make card payments beforehand.

They fear that if the desired product does not arrive then they will lose their money. If this happens then how are they going to trace the online outlet and recover their hard-earned money? One of the disadvantages of e-commerce is the absence of the physical existence of the store.

High labour cost

High labour cost is a serious disadvantage of the e-commerce platform. You need to hire technically sound, trained and qualified workforce for your website who are talented and capable of handling them in an efficient manner.

You need to shed a large chunk of money to hire and retain a talented pool of workers that will prove an immense help in handling all transactions.

Credit card fraud

Online transactions are mostly made by debit card, credit card, and internet banking and in very few cases with cash on delivery option. Yes, the website owners try to take every available precaution to protect the card details but what if the site is hacked by cybercriminals.



It is a growing concern as we hear news of data hacks regularly. The websites need to place proper blockers in place because the customers will lose faith and will stop making online payments. Stop it before it starts proving a serious disadvantage for e-commerce sites.

Dependency on the website

An e-commerce site is heavily dependent on its website. If it is not properly projected or the software is not implemented the site can face technology hiccups. It then comes under the serious radar.

Customers tend to lose faith very easily and shift their loyalties to other portals that they find convenient. The portal will suffer substantial loss because of this action.

Do not keep all the eggs in one basket as the dependency on the website can prove a disadvantage of e-commerce in times of crises.

Shipping problems

E-commerce stores run successfully because it can ship its products from anywhere to everywhere with ease. It has a strong network that helps it in its endeavor. In a physical store, a buyer chooses a product, purchases it and leaves the store with the item.

This is not so on an online store where the customer has to choose and buy and then wait for the product to arrive at his doorstep within the stipulated time frame. Shipping is an integral part of commerce and if you do not have appropriate infrastructure then it can cause serious issues and become a disadvantage of e-commerce.

Some products are difficult to buy online

If you think that you can buy everything online then it is your misconception. There are products for instance eatables like ice cream, spectacles, and metals like gold and silver that you do not want to buy online even if you have the option of doing so.

You cannot trust yourself to make a purchase without visibly touching, trying, testing them and this can prove a disadvantage for an e-commerce site. All the images and assurances cannot tempt you to buy some items, for example, you need to buy a gold and diamond bracelet.

Do you trust the online store to meet your expectations or will you make the effort and travel to a physical store to verify and then make a purchase.



late delivery

Late delivery is one of the common disadvantages of e-commerce platforms. While ordering a product the customer is assured that it will reach him in maximum seven days or a particular time period. In most cases that do not happen and you are kept waiting for it.

Ultimately when the information reaches you that the product will be delivered on this day the portal is not specific about the timings. There are several instances when a person who is going to collect the parcel had to wait for hours for the delivery.

His whole day is wasted and he could not go outside as per his original schedule. Such a situation makes the customer angry as he feels unnecessarily harassed.

8.4 CHECK YOUR PROGRESS

1. _____ is the electronic interchange of business information using a standardized format.
2. _____ refers to the buying and selling of goods or services using the internet.
3. The dimension of e-commerce that enables commerce across national boundaries is called _____.
4. A _____ is the set of planned activities designed to result in a profit in a marketplace.
5. The _____ is the universe of network-accessible information.

8.5 SUMMARY

E-commerce is the production, distribution, marketing, sales or delivery of goods and services by electronic means. E-Commerce is commonly referred as electronic commerce. It is also known as “Internet Commerce”. It refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions. E-Commerce creates a virtual market place for customer over internet. In traditional commerce, communication/transactions are done in synchronous way. Manual intervention is required for each communication or transaction. Now with e-commerce, communication or transactions can be done in asynchronous way. The whole process is completely automated. E-Commerce can be implemented in one of the following ways- EDI, E-mail, electronic bulletin board, electronic fund transfer.

8.6 KEYWORDS



VMP (Virtual Marketplace): A nonphysical and borderless spatial dimension that exists in the digital domain, in which exchange relations and transactions take place at different levels through digital interactions supported by communication technologies.

EDI: Electronic Data Interchange (EDI) is the electronic interchange of business information using a standardized format; a process which allows one company to send information to another company electronically rather than with paper. Business entities conducting business electronically are called trading partners.

EFT: Electronic funds transfer (EFT) are electronic transfer of money from one bank account to another, either within a single financial institution or across multiple institutions, via computer-based systems, without the direct intervention of bank staff.

E- Commerce: Ecommerce, also known as electronic commerce or internet commerce, refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions.

E-Banking: Electronic banking is a form of banking in which funds are transferred through an exchange of electronic signals rather than through an exchange of cash, checks, or other types of paper documents.

E-Newspaper: An electronic newspaper is a self-contained, reusable, and refreshable version of a traditional newspaper that acquires and holds information electronically.

8.7 Self-assessment Test

1. What is E-commerce and why it is needed?
2. How to use E-commerce in our daily life?
3. Explain how application of WWW plays a vital role in implementation of E-Commerce?
4. What kind of advantages does business gets using E-commerce?
5. Which technical and economical limitations are faced by a business using E-commerce?
6. Discuss the advantages of E-commerce.
7. Explain the various disadvantages of E-commerce.
8. Discuss the applications of E-Commerce.
9. Explain WWW and differentiate between WWW and Internet.



10. Discuss E-commerce system architecture.

8.8 Answers to Check Your Progress

1. Electronic Data Interchange
2. E-Commerce
3. Global reach
4. Business model
5. World Wide Web

8.9 References/Suggested Readings

- Brian C. Satterlee, *E-Commerce: A Knowledge Base (2001)*, iUniverse.
- Amir Manzoor, *E-Commerce: An Introduction (2010)*, Amir Manzoor.
- Janice Reynolds, *The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business (2004)*, CRC Press.
- Ritendra Goel, *E-Commerce (2007)*, New Age International.
- Mamta Bhusry, *E-Commerce (2005)*, Firewall Media.
- Parag Diwan, Sunil Sharma, *E-Commerce: A Manager's Guide to E-Business (2002)*, Excel Books India.
- <https://webfoundation.org/about/vision/history-of-the-web/> 03/11/2019
- <https://www.toppr.com/guides/business-economics-cs/money-and-banking/e-banking/> 03/11/2019
- <https://www.ipixtechnologies.com/what-is-ecommerce-and-its-applications.html> 03/11/2019



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Models of E-Commerce

LESSON STRUCTURE

- 9.0 Learning Objective
- 9.1 Introduction
- 9.2 Types of E-Commerce Business Models
 - 9.2.1 Business-to-Business (B2B)
 - 9.2.2 Business-to-Consumer (B2C)
 - 9.2.3 Consumer-to-Business (C2B)
 - 9.2.4 Consumer-to-Consumer (C2C)
 - 9.2.5 Business-to-Government (B2G)
 - 9.2.6 Consumer-to-Government (C2G)
- 9.3 Check Your Progress
- 9.4 Summary
- 9.5 Keywords
- 9.6 Self-Assessment Test
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- 9.8 References/Suggested Readings

9.0 Learning Objectives

The objective of this chapter is to get the students acquainted with the basic concepts of E-commerce business models. This chapter highlights the different types of E-commerce models.

After reading this chapter, you will be able to:

- ✓ Describe the various types of E-commerce models
- ✓ Give examples of different types of E-commerce models



- ✓ Define pros and cons of different types of E-commerce models

9.1 Introduction

In this chapter, we dive into the types of E-commerce business models and afterward, discuss the pros and cons of running an E-commerce venture using any of them. Before we get to that, let's define **what a business model is?**

A business model refers to a plan for the successful operation of a business and how it relates to existing products or services in the industry. It also encompasses the revenue sources as well as the potential customer base. A **business model** is a set of planned activities (sometimes referred to as *business processes*) designed to result in a profit in a marketplace. A business model is not always the same as a business strategy, although in some cases they are very close insofar as the business model explicitly takes into account the competitive environment. The business model is at the centre of the business plan. A **business plan** is a document that describes a firm's business model. A business plan always takes into account the competitive environment. An **e-commerce business model** aims to use and leverage the unique qualities of the Internet, the Web, and the mobile platform.

9.2 TYPES OF E-COMMERCE BUSINESS MODELS

There are primarily six e-Commerce business models:

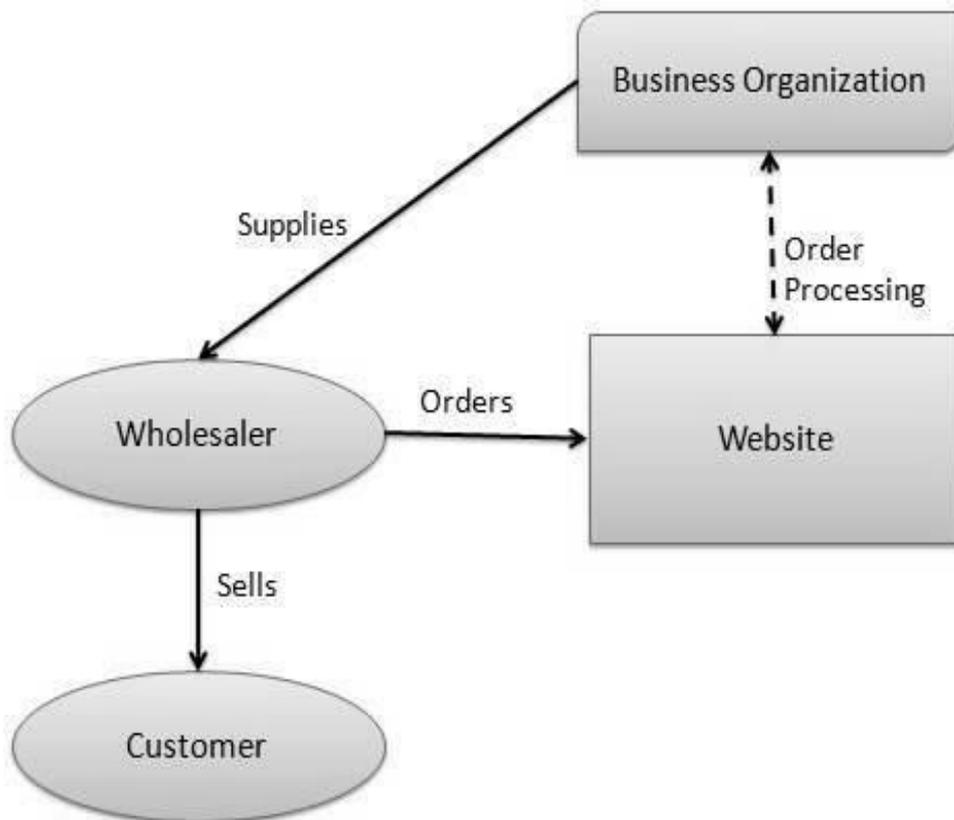
- Business-to-Business (B2B)
- Business-to-Consumer (B2C)
- Consumer-to-Business (C2B)
- Consumer-to-Consumer (C2C)
- Business-to-Government (B2G)
- Consumer-to-Government (C2G)

9.2.1 BUSINESS-TO-BUSINESS (B2B)

Business to business, known as B2B model, is the largest e-commerce model that is based on revenue which involves trillions of dollars. In this both the buyers and sellers are business entities. B2B describes commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer. The volume of B2B transactions is much higher than the volume



of B2C transactions and any other transaction. The primary reason for this is that in a typical supply chain there will be many B2B transactions involving sub components or raw materials, and only one B2C transaction, specifically sale of the finished product to the end customer.



A website following the B2B business model sells its products to an intermediate buyer who then sells the product to the final customer. As an example, a wholesaler places an order from a company's website and after receiving the consignment, sells the end product to the final customer who comes to buy the product at one of its retail outlets.

I. B2B EXAMPLES

Do you want to know the details about such companies in India? Followings are the some examples:

- AmazonBusiness.in



Amazon, the US-based ecommerce giant started its B2B online platform in 2015 to fulfill the demand of business customers who were looking for the seamless ‘Amazon buying experience’ while procuring supplies for their work.

Currently available in two cities, Bangalore and Mangalore with plans to expand in other cities, you can become a part of this members-only site if you have a valid business license.

Payments can be made through NEFT/RTGS transfer, Credit/Debit Card and Net-banking and cash-on-delivery service is available for Bangalore-based buyers. The marketplace also offers free credit service (up to 48 days) in association with HDFC Bank and ICICI Bank.

Its main USPs are the brand name ‘Amazon’ and ease of buying.

Primary Categories: Health & Personal Care, Home Medical Supplies, Beauty, Food & Beverages, Cleaning & Laundry, Mobile & Accessories, Office & IT Peripherals, Home, Kitchen & Dining products at wholesale prices and in bulk quantities.

- Power2SME.com

Founded by R. Narayanan in 2012, Power2SME calls itself the first ‘Buying Club’ for SMEs. The company was formed with an aim to empower SMEs by making it easy & affordable for them to procure raw materials.

In 2014, the company raised Rs. 42 crores in Series C round of funding from Accel Partners, Inventus Capital and Kalaari Capital. In January 2016, Chairman of UIDAI Nandan Nilekani along with the existing three investors poured more capital into Power2SME during Series D round of funding.

In April 2016, the B2B firm’s revenue was \$10 million and the average order value was Rs.25 lakh! This is why the company is confident about breaking even by next year.

Register for free or fill up the Request for Quote (RFQ) form with your business requirement. The company’s sales representative then gets in touch with buyers with proposed rates. SMEs can avail loan facility on request.

Its main USPs are strong investors and high-quality suppliers like LG, Essar, and Indian Oil.

Primary Categories: Abrasives, Adhesives, Safety, Power tools, Plumbing, Handtools, Power Transmission, Security, Machining, Office Supplies, Motors & Pumps, Medical Supplies, Electricals, Hardware and a lot more.

- IndustryBuying.com



Established in 2013 by Swati Gupta and Rahul Gupta, Industry Buying is a B2B marketplace for industrial good and supplies. Regular buyers are offered credit and the purchasing process is quite straightforward.

The startup has grown tremendously with its seller base increasing from 1000 in 2015 to 4,500 in May 2016. Buyer base increased from 40 enterprises and 25,000 SMEs in 2015 to 150 enterprises and 75,000 SMEs in May 2016. Customer visits too multiplied by four times.

The company has raised Rs 87 crores from investors such as Kalaari Capital, Saif Partners and BEENext so far.

Its main USPs are impressive growth & traction and innovative product solutions like ProcMan.

Primary Categories: Lab supplies, LED & lights, Electronics & Robotics, Cleaning, Dimension Measurement, Industrial Automation, Furniture & Hospitality, Lubricants & Oils, Powder & Coatings, and Welding are just 10 of the 40+ categories.

- Bizongo.in

This B2B marketplace focuses on bulk buying and selling of 'Packaging' materials. Started by Aniket Deb, Sachin Agrawal and Ankit Tomar (IIT Bombay and IIT Delhi graduates) in 2014, the startup found an investor in Accel Partners.

It initially started as a platform for plastic and chemical product categories, but as of now, there are only packaging products listed on the website.

Last heard news about Bizongo's funding was in October 2015, when Accel invested an undisclosed amount in the startup.

Its main USPs are knowledgeable team and ability to adapt with changing business environment.

Primary Categories: Food packaging, Bottles, rigid and protective packaging, Crates, Pallets, Drums, Dustbins, Packaging Bags & Boxes, Flexible films, Pouches and Bubblewraps.

- Tolexo.com

It's an IndiaMart subsidiary launched in June 2014 for SMEs. With more than 1,000,000+ products from over 28 categories, 7000 sellers, and 8000 brands, Tolexo's product portfolio, seller & buyer base is probably the widest and biggest out of all players.

The B2B marketplace offers last mile deliveries with guaranteed dispatch within 24 hours, which is a great service for business clients.



IndiaMart had invested Rs. 100 crores in Tolexo in FY15-16.

Its main USP is its association with IndiaMart, which is one of the biggest players in the Indian B2B industry.

Primary Categories: Safety, Plumbing, Adhesives, Fasteners, Electricals, Abrasives, Car & Bike Accessories, Lubrication, Handtools, Hardware, Office Supplies, Lab supplies, and much more.

- JustByLive.com

The newest one on the block, Just By Live is already creating waves by multiplying its network and raising funds in less than a year. The startup is an app-based e-distributor that connects traditional manufacturers to retailers. Thus, by eliminating regular distributors, manufacturers get better margins and retailers get a wide range of products at one glance.

The firm raised around Rs 136 crore (\$20 million) in Series A funding from Alpha Capital in January 2016. Just by Live aims to restructure the age-old retail distribution system by modernizing it to fit the current fast-paced ecommerce industry.

Buyers/retailers can access the listed products through Just Buy Live's app, talk to brand teams and get order delivered at doorstep after downloading the app and registering their business. Buyers can also make use of credit facility 'Udhaar by Just Pay' by uploading required documents. If you are a brand owner, then write to brands@justbuylive.com to list your label on the B2B platform.

Its main USPs are unique concept and focussed approach backed by thorough research and experienced team.

Primary Categories: Grocery, Ayurveda, Dairy, Water, Chocolates & Sweets, Home care, Personal care, Fashion & Beauty, Auto, Appliances and many more.

The B2B ecommerce space comes with its own set of complex challenges that has forced startups like Omnikart to shut shop.

But such startups with the help of technology, new-age thinking, compassion and ecommerce have empowered SMEs to a great extent. Many business buyers have stopped haggling with local distributors and now prefer to buy from B2B ecommerce portals like the ones mentioned above.

Faster delivery, wide range of products, competitive prices, organised buying process, professional service, secure payment process, legal credit facility, low commission rates and buying assistance are few of the many reasons why industry buyers rely on such companies.



Investors too are keen on investing/buying stake in B2B start-ups as the business model doesn't allow or demand to spend funds on mindless-discounting, year-round deals, marketing & promotional activities and heavy returns like it is the case in B2C ecommerce space.

Sellers, have you tried any of these B2B marketplaces? Do you buy or sell from any such platform? Any feedback or recommendations you would like to share? Please do leave your valuable comments and help the seller community.

II. PROS

- The B2B market is predictable as well as stable.
- There is greater customer loyalty than in other models of e-Commerce
- B2B features lower operating costs after the initial setup since most processes are automated and valid for a long time.
- You can generate a sustainable and reasonably high-profit margin from repeat clients.

III. CONS

- B2B e-Commerce often requires substantial capital to set up. Costs include business registration, branding and setting up a physical or virtual office.
- There is a smaller pool of customers when compared to other models.
- Since B2B marketing targets businesses, sales are a little hard to come by because firms take a longer time to make decisions. Where firms ask for huge discounts because of their bulk purchase, it could eat into the profit of the seller.

9.2.2 BUSINESS-TO-CONSUMER (B2C)

Business-to-consumer (B2C) is among the most popular and widely known of sales models. The idea of B2C was first utilized by Michael Aldrich in 1979, who used television as the primary medium to reach out to consumers.

B2C traditionally referred to mall shopping, eating out at restaurants, pay-per-view movies, and infomercials. However, the rise of the Internet created a whole new B2C business channel in the form of e-commerce or selling of goods and services over the Internet.

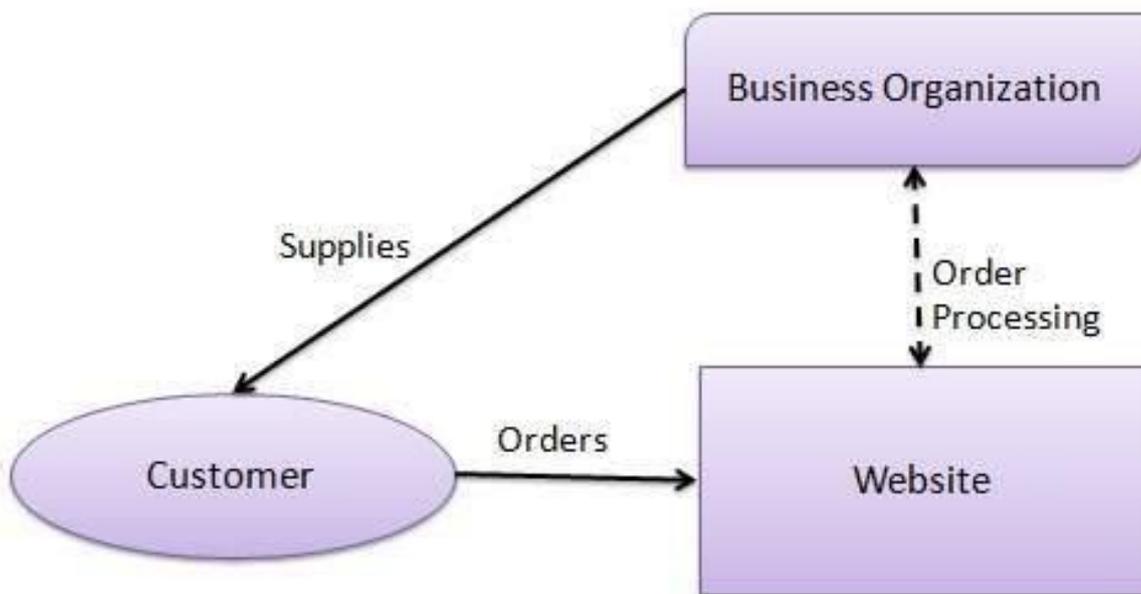
B2C, the acronym for "business-to-consumer", is a business model based on transactions between a company, that sells products or services, and individual customers who are the end-users of these



products. B2C ecommerce definition suggests the commerce transaction through a company website featured with online catalog.

Most Internet users are familiar with the B2C ecommerce model. Consumers appreciate the convenience of online shopping where they now can purchase clothes, electronics, media subscriptions and services via Internet.

Any business that relies on B2C sales must maintain good relations with their customers to ensure they return. Unlike business-to-business (B2B), whose marketing campaigns are geared to demonstrate the value of a product or service, companies that rely on B2C must elicit an emotional response to their marketing in their customers.



Following are the key features of the B2C model

- Heavy advertising required to attract customers.
- High investments in terms of hardware/software.
- Support or good customer care service.

Consumer Shopping Procedure

Following are the steps used in B2C e-commerce:



A consumer –

- Determines the requirement.
- Searches available items on the website meeting the requirement.
- Compares similar items for price, delivery date or any other terms.
- Places the order.
- Pays the bill.
- Receives the delivered item and review/inspect them.
- Consults the vendor to get after service support or returns the product if not satisfied with the delivered product.

I. B2C Business Models in the Digital World

There are typically five types of online B2C business models that most companies use online to target consumers.

1. Direct sellers. This is the most common model, in which people buy goods from online retailers. These may include manufacturers or small businesses, or simply online versions of department stores that sell products from different manufacturers.

2. Online intermediaries. These are liaisons or go-betweens who don't actually own products or services that put buyers and sellers together. Sites like Expedia, Trivago, and Etsy fall into this category.

3. Advertising-based B2C. This model uses free content to get visitors to a website. Those visitors, in turn, come across digital or online ads. Basically, large volumes of web traffic are used to sell advertising, which sells goods and services. Media sites like the Huffington Post, a high-traffic site that mixes in advertising with its native content is one example.

4. Community-based. Sites like Facebook, which builds online communities based on shared interests, help marketers and advertisers promote their products directly to consumers. Websites will target ads based on users' demographics and geographical location.

5. Fee-based. Direct-to-consumer sites like Netflix charge a fee so consumers can access their content. The site may also offer free, but limited, content while charging for most of it. The New York Times and other large newspapers often use a fee-based B2C business model.

II. B2C Examples



- All major online retail stores like Amazon and payment processors like PayPal.
- A traveling agency that provides ticket and travel insurance policies to clients.
- A digital education website such as Code Academy that lets users learn basic computer programming for free.

III. PROS

- It requires a reasonably low startup capital when compared to other e-Commerce models. For instance, drop shipping allows selling products without you having to manage an inventory or delivery.
- Anyone with a basic knowledge of the internet can set up and manage a B2C e-Commerce store under little supervision.
- It is also easy to scale a B2C e-Commerce venture.
- It involves selling to a wide range of audience with already known purchase patterns and behavior.
- It allows for flexibility since the platform is the channel for efficiently collating market demand in real-time.
- It is easier to encourage B2C e-Commerce shoppers to practice impulse buying since you can run ads targeted towards customers that are not even searching for what to buy.
- The retailer is in charge of discounts and giveaways as opposed to the B2B model.

IV. CONS

- The B2C space is highly competitive with most firms already boasting a majority of the market share.
- Shipping products across borders can be a massive challenge if you mistakenly land the wrong shipping company.
- Many buyers still prefer making purchases in-store rather than online.
- There is little difficulty in sourcing for hot and cheap products to list on your e-Commerce store throughout the year.
- The market is continually evolving and requires upgrades more frequently than in other models.

V. DIFFERENCE BETWEEN B2B AND B2C

The point given below clarifies the difference between B2B and B2C:



1. B2B is a business model where business is done between companies. B2C is another business model, where a company sells goods directly to the final consumer.
2. In B2B, the customer is business entities while in B2C, the customer is a consumer.
3. B2B focus on the relationship with the business entities, but B2C’s primary focus is on the product.
4. In B2B, the buying and selling cycle is very lengthy as compared to B2C.
5. In B2B the business relationships last for long periods but in B2C, the relationship between buyer and seller lasts for a short duration.
6. In B2B, the decision making is fully planned and logical whereas in B2C the decision making is emotional.
7. The volume of merchandise sold in B2B is large. Conversely, in B2C small quantities of merchandise are sold.
8. Brand value is created on the basis of trust and personal relationship of business entities. In contrast to, B2C where advertising and promotion create brand value.

BASIS FOR COMPARISON	B2B	B2C
Meaning	The selling of goods and services between two business entities is known as Business to Business or B2B.	The transaction in which business sells the goods and services to the consumer is called Business to Consumer or B2C.
Customer	Company	End user
Focus on	Relationship	Product
Quantity of merchandise	Large	Small
Relationship	Supplier - Manufacturer Manufacturer - Wholesaler Wholesaler - Retailer	Retailer - Consumer
Relationship horizon	Long term	Short term
Buying and Selling cycle	Lengthy	Short
Buying Decision	Planned and Logical, based on needs.	Emotional, based on want and desire.
Creation of Brand	Trust and Mutual Relationship	Advertising and Promotion



Value		
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9.2.3 CONSUMER-TO-BUSINESS (C2B)

C2B is a business model in which consumers (individuals) offer products and services to companies and the companies pay them. This business model is a complete reversal of traditional business model where companies offer goods and services to consumers.

This kind of economic relationship is qualified as an inverted business model. The advent of the C2B scheme is due to major changes:

- Connecting a large group of people to a bidirectional network has made this sort of commercial relationship possible. The large traditional media outlets are one direction relationship whereas the internet is bidirectional one.
- Decreased cost of technology : Individuals now have access to technologies that were once only available to large companies (digital printing and acquisition technology, high performance computer, powerful software)

Consumer-to-Business model is based on 3 players: a consumer acting as seller, a business acting as buyer and an intermediary dealing with the connection between sellers and buyers.

Consumer

A consumer in the C2B business model can be any individual who has something to offer either a service or a good. The individual is paid for the work provided to the companies. Depending on the model, the "consumer" can be:

- A webmaster/ blogger offering advertising service (through Google Adsense program for example or amazon.com affiliation program)
- A photographer or a designer offering stock images to companies by selling his artwork through Fotolia or istockphoto for example
- Any individual answering a poll through a survey site
- Any individual with connections offering job hiring service by referring someone through referral hiring sites like jobster.com or h3.com

Business



Business in the C2B business model represents any companies buying goods or services to individual through intermediaries. Here are some examples of potential companies which can be such clients:

- Any company which wants to fill a job (through referral hiring sites)
- Any company needing to advertise online (through Google Adwords program for example)
- Any advertising agency which needs to buy a stock photo (through microstock sites)

Intermediary

The Intermediary is the crucial element since it creates the connection between business which needs a service or a good and a mass of individuals. Intermediary is usually a portal both for buyers (businesses) and seller (individuals).

The intermediary plays two roles:

- It promotes goods and services offered by individuals by proposing a distribution channel. It offers what individuals can't do themselves : large promotion, logistic and financial support, technical expertise
- It offers buyers a contact to a mass of individuals and takes care of money transactions and legal aspects

We can notice that some intermediaries prefer creating two different accesses one for buyers and one for sellers (Google Adwords for advertiser - Google Adsense for web publisher) whereas other companies like Fotolia have only one access because buyers and sellers can be the same.

We can differentiate two kinds of intermediaries:

- Extern intermediary : they act as a extern agent within the relation between companies and individual (ex : referral hiring site)
- Intern intermediary: they play the role both of business and intermediary. For example, it is the case of amazon.com through its affiliation program. Amazon pays individual to promote its own products.

PROS

- C2B provides a channel for companies to source and hire a variety of service talents and products from around the globe.
- It also provides an opportunity for companies to prioritize hiring from regions where the standard of living is low, thus, reducing what figure goes on the paycheck.



- It also allows service providers to gain work experience across multiple projects and get paid well for doing so.
- Freelancers also enjoy relative freedom and flexibility in terms of working hours.

CONS

- A high level of communication skills is required to convey project ideas.
- Companies that hire freelancers could face a challenge in sending payment to freelancers in some parts of the world.

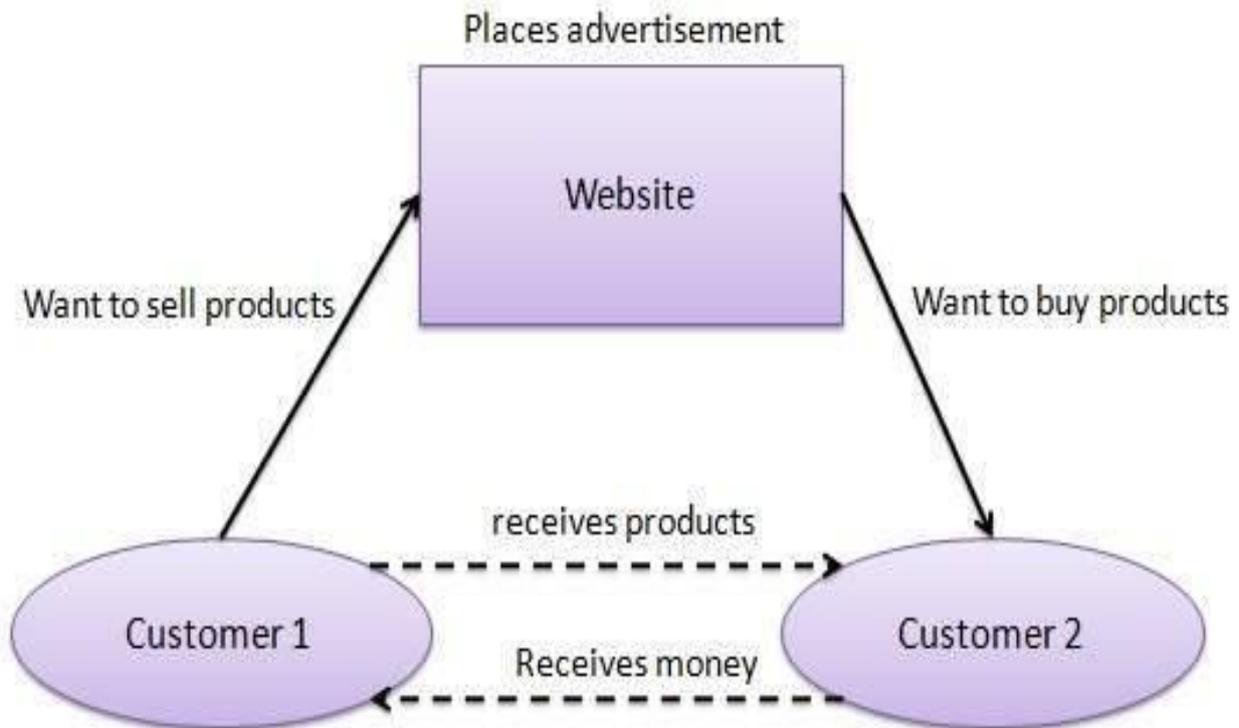
The possibility of outsourcing means the freelancer paid for the job may not even be the one doing it.

This situation could put the

- Employer at a disadvantage as he gets a substandard service than what he originally paid.

9.2.4 CONSUMER-TO-CONSUMER (C2C)

A website following the C2C business model helps consumers to sell their assets like residential property, cars, motorcycles, etc., or rent a room by publishing their information on the website. Website may or may not charge the consumer for its services. Another consumer may opt to buy the product of the first customer by viewing the post/advertisement on the website.



C2C Examples

- The foremost example of C2C via a third-party website would be an auction platform like eBay which brings seller and buyers together. eBay charges a fee for facilitating each sale while the other parties to the transaction are responsible for settling other matters such as product quality, packaging, shipping, and refunds.
- Cryptocurrency exchanges that offer over-the-counter trades to users. Under such circumstance, the exchange charges a fee for the transaction while it allows the users to transact cryptocurrencies with one another.
- It is important to note that most businesses operate the B2C and C2C models simultaneously even though they may decide to start up with one. In most cases, though, the B2C comes first while the C2C follows shortly as an extension and additional revenue source.
- If you plan to go down this path, you may need to do more extensive research to find out what buyer behavior is prevalent in the market before deciding which model to employ first.

PROS

- There are usually no upfront costs to get product listed on a third-party C2C website.



- With C2C, the products gallery is unlimited since different customers are on board and selling various items scattered across different niches.
- C2C facilitates the sale of used items as opposed to B2C where a majority of the products are new.
- C2C often serves as a black market for businesses to purchase items without going through the primary market.
- Any online platform that allows interaction between two or more people can facilitate a C2C trade.

CONS

- The cost charged for each sale using the C2C ecommerce model on a third-party site like eBay may eat into the profit of the merchant.
- C2C poses a high level of risk in terms of product quality than other ecommerce business models. Under C2C, most transactions require that both parties trust it each other.
- For auction sites, users may end up buying goods at inflated prices which is not a good economic decision.

9.2.5 BUSINESS-TO-GOVERNMENT (B2G)

It is the exchange of information, services and products between business organisations and government agencies on-line. It refers to the use of the Internet for public procurement, licensing procedures, and other government-related operations. In most case, businesses under this umbrella have these government or public administrative offices as their only clients and receive contracts on a long-term basis. Such a situation makes it possible for them to easily calculate profits and manage funds effectively while delivering their solution to a wide audience. Sadly, though, their business could also be negatively affected if there is a change in government and the new authority refuses to honor the already existing contract.

Consider this scenario:

An online marketing agency or influencer is contracted by a sitting government to manage its political campaign by broadcasting promotional material to the masses across social media and other digital channels.



If by any chance, the ruling government fails to win at the election, the new authority may likely opt for another online marketing agency or influencer to do the job of previously held by a different entity. In this situation, one B2G firm gains while the other loses out.

Other Examples of B2G

- A government using virtual workspace software designed by a creative agency.
- The situation in Ohio where the State's tax department hired the service of a third-party to collect and convert tax payments in crypto currencies to fiat.

PROS

- It features a high-profit margin and longevity than most other ecommerce business models.
- B2G businesses can enjoy tax benefits not common to other ecommerce merchants.
- It increases flexibility and efficiency in public administration.

CONS

- A change in government could adversely affect a B2G product or service provider
- It often requires huge capital to set up.
- It could also confine a business to operate within a specific geographical location, thus removing the primary purpose of ecommerce transactions which is borderless product and service delivery.

9.2.6 CONSUMER-TO-GOVERNMENT (C2G)

C2G is just the opposite of the last ecommerce business model albeit a little difference; this time it is the consumers or members of the public that offer value to the government or public administrative agencies.

However, it is still the public administration or government that initiates the transactions, often as a way to ease its operations and relieve the citizenry of some burdens.

The public does not bear any responsibility whatsoever if the platform conducting the C2G transactions goes offline or fails to deliver.

Examples of C2G

- A State's tax agency deciding to ditch paper tax filing and instead introduce an electronic tax filing portal.
- A State creating an information sharing platform to allow citizens to get the latest information possibly because of a suspected natural disaster.



- An electronic voting app for citizens to participate in an election without having to visit the polling unit or filing paperwork.
- Other forms of transactions between citizens and the government either facilitated by the government directly or via a third-party

Note that the government could decide to terminate C2G transactions if it doesn't realize its purpose of creating such a platform or wants to try a new approach.

PROS

- It makes public administration more flexible and efficient.
- It encourages public knowledge of internet-based technology.
- There is enormous profit potential for third parties contracted to handle C2G transactions.

CONS

- A lack of internet service in some regions could restrict the performance of C2G ecommerce.
- Public awareness and education programmes may be needed to introduce the populace to such systems.

9.3 Check Your Progress

1. _____ type of e-commerce focuses on consumers dealing with each other.
2. _____ refers to business that is conducted between companies.
3. All major online retail stores like Amazon belongs to _____ model.
4. A _____ is a document that describes a firm's business model.
5. _____ is a business model that refers to businesses selling products, services or information to governments or government agencies.

9.4 Summary

A business model refers to a plan for the successful operation of a business and how it relates to existing products or services in the industry. It also encompasses the revenue sources as well as the potential customer base. The business model is at the center of the business plan. A **business plan** is a document that describes a firm's business model. A business plan always takes into account the competitive environment. An **e-commerce business model** aims to use and leverage the unique qualities of the



Internet, the Web, and the mobile platform. We discussed six types of business models in this chapter. Each model has its own pros and cons.

9.5 KEYWORDS

B2B: Business to business refers to business that is conducted between companies, rather than between a company and individual consumers

B2C: The term business-to-consumer (B2C) refers to the process of selling products and services directly between consumers who are the end-users of its products or services.

C2B: Consumer-to-business (C2B) is a business model where an end user or consumer makes a product or service that an organization uses to complete a business process or gain competitive advantage.

C2C: Consumer to consumer, or C2C, is the business model that facilitates commerce between private individuals. Whether it's for goods or services, this category of e-commerce connects people to do business with one another.

B2G: Business-to-government (B2G) is a business model that refers to businesses selling products, services or information to governments or government agencies.

9.6 Self-assessment Test

1. What are the different E-commerce business models?
2. Explain the B2C business model briefly?
3. Explain the B2B business model briefly?
4. Explain the C2B business model briefly?
5. Explain the C2C business model briefly?
6. Explain the B2G business model briefly?
7. Explain the C2G business model briefly?
8. Discuss the various advantages and disadvantages of different E-commerce models.
9. Differentiate between B2B and B2C model.
10. Differentiate between C2B and C2C model.

9.7 Answers to Check Your Progress



1. C2C
2. Business to business
3. B2C
4. Business plan
5. Business-to-government

9.8 References/Suggested Readings

- Mamta Bhusry, *E-Commerce(2005)*, Firewall Media.
- Janice Reynolds, *The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business(2004)*, CRC Press.
- Brian C. Satterlee, *E-Commerce: A Knowledge Base (2001)*, iUniverse.
- Amir Manzoor, *E-Commerce: An Introduction (2010)*, Amir Manzoor.
- Paul May, Paul Richard May, *The Business of Ecommerce: From Corporate Strategy to Technology (2000)*, Cambridge University Press.
- <https://www.bigcommerce.com/blog/types-of-ecommerce-business-models/10/11/2019>.
- [https://www.practicalecommerce.com/6-leading-ecommerce-business-models-explained 10/11/2019](https://www.practicalecommerce.com/6-leading-ecommerce-business-models-explained-10/11/2019).
- [https://www.rapportrix.com/6-types-of-e-commerce-business-models 10/11/2019](https://www.rapportrix.com/6-types-of-e-commerce-business-models-10/11/2019).



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Electronic Data Interchange: Benefits, Components and Security Issues in E-Commerce

LESSON STRUCTURE

- 10.0 Learning Objectives
- 10.1 Introduction to EDI
 - 10.1.1 Components of EDI
 - 10.1.2 EDI Documents
 - 10.1.3 Member's Involved in EDI Implementation
 - 10.1.4 EDI Implementation Steps
 - 10.1.5 Steps in an EDI System
 - 10.1.6 Applications of EDI
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 - 10.1.8 Limitations of EDI
- 10.2 E-Commerce Security System
- 10.3 Check Your Progress
- 10.4 Summary
- 10.5 Keywords
- 10.6 Self-Assessment Test
- 10.7 Answers to Check Your Progress
- 10.8 References/Suggested Readings

10.0 Learning Objectives

In this chapter you will learn about

- EDI Basics
- The definition of EDI.
- Comparative study of traditional document exchange and EDI.



- What elements are necessary to implement an EDI in a system?
- How many types of documents exchanged via EDI.
- How the EDI process works for sending and receiving documents.
- What are the benefits provided by EDI?
- In which application area EDI is used as an efficient tool.
- What kind of security issues are faced when you use EDI in an organization.

10.1 Introduction to EDI

This chapter introduces EDI acronym for **Electronic Data Interchange**. EDI is an electronic way of transferring business documents in an organization internally, between its various departments or externally with suppliers, customers, or any subsidiaries.

Electronic data interchange (EDI) is the use of computer and telecommunication technology to move data between or within organizations in a structured, computer retrievable data format that permits information to be transferred from a computer program in one location to a computer program in another location, without manual intervention. An example is the transmission of an electronic invoice from a supplier's invoicing software to a customer's accounts receivable software. Other electronic commerce transactions are also paperless but involve manual intervention. Examples are **Internet** transactions requiring one party to enter data manually. **Electronic mail** is another example of paperless but manual electronic commerce.

In EDI, paper documents are replaced with electronic documents such as word documents, spreadsheets, etc. Business entities conducting business electronically are called **trading partners**.

EDI has two important subsets:

- ✓ **Electronic Funds Transfer** (EFT) is EDI between financial institutions. The result of an EFT transaction is the transfer of monetary value from one account to another.
- ✓ **Financial EDI** (FEDI) is EDI between banks and their customers or between banks when there is not a value transfer. For example, a firm may receive electronic reports from its bank listing all checks received the previous day. A bank may also send its monthly statement to a firm using FEDI.

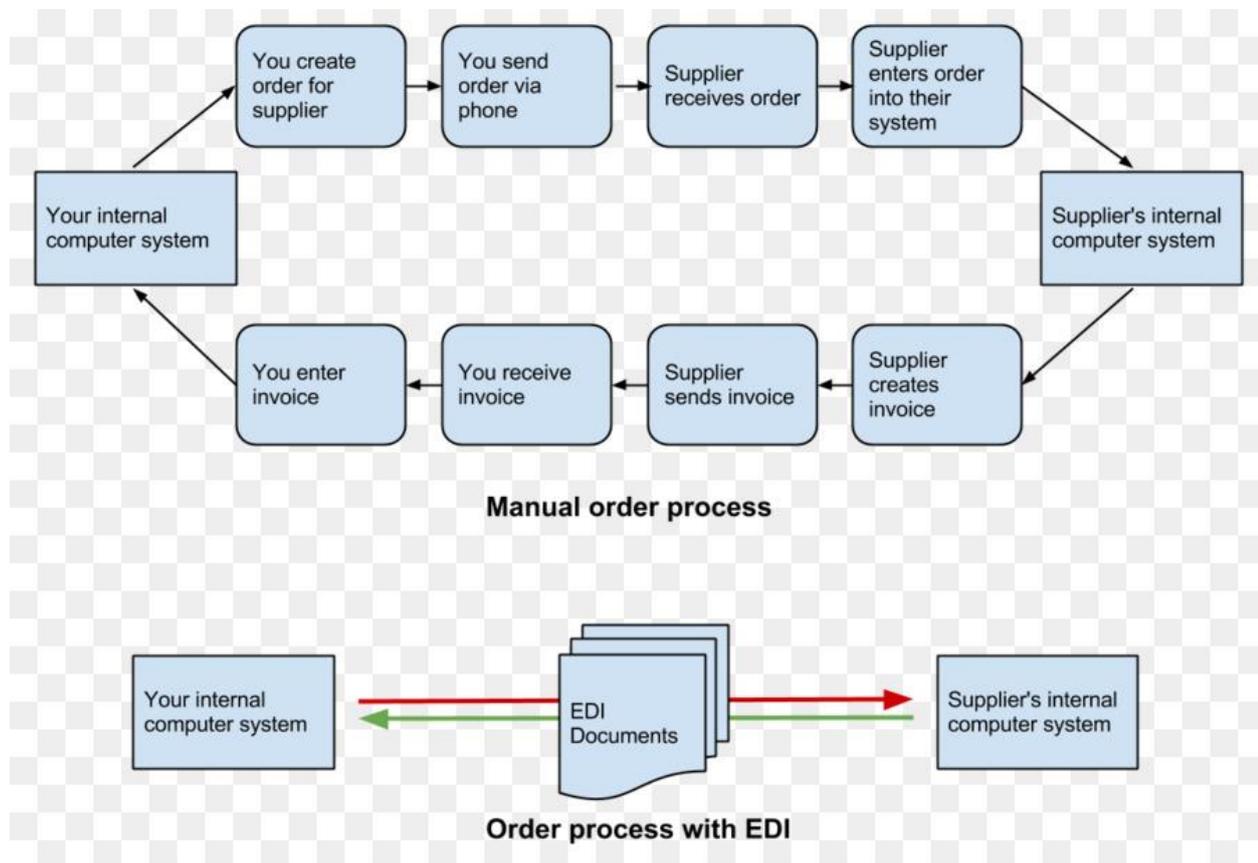


The entire process is nothing more than the transfer of information from the seller's computer to the customer's computer. EDI makes it possible to minimize or even eliminate the manual steps involved in this transfer.

Traditional document exchange v/s Electronic data exchange

The process improvements that EDI offers are significant and can be dramatic. For example, consider the difference between the traditional paper purchase order and its electronic counterpart:

Traditional document exchange of purchase order	EDI document exchange of purchase order
This process normally takes three to five days.	This process normally takes less than an hour.
Here buyer makes a buying decision, creates the purchase order and prints it.	Here buyer makes a buying decision, creates the purchase order but does not print it.
Buyer mails the purchase order to the supplier.	EDI software creates an electronic version of the purchase order and transmits it automatically to the supplier.
Supplier receives the purchase order and enters it into the order entry system.	Supplier's order entry system receives the purchase order and updates the system immediately on receipt.
Buyer calls supplier to determine if purchase order has been received, or supplier mails buyer an acknowledgment of the order.	Supplier's order entry system creates an acknowledgment and transmits it back to confirm receipt.



10.1.1 COMPONENTS OF EDI

To perform electronic data interchange, four elements must exist:

Format Standards

They are required to facilitate automated processing by all users. To permit the efficient use of computers, information must be highly organized into a consistent data format. A format defines how information in a message is organized: what data goes where, what data is mandatory, what is optional, how many characters are permitted for each data field, how data fields are ordered, and what codes or abbreviations are permitted.

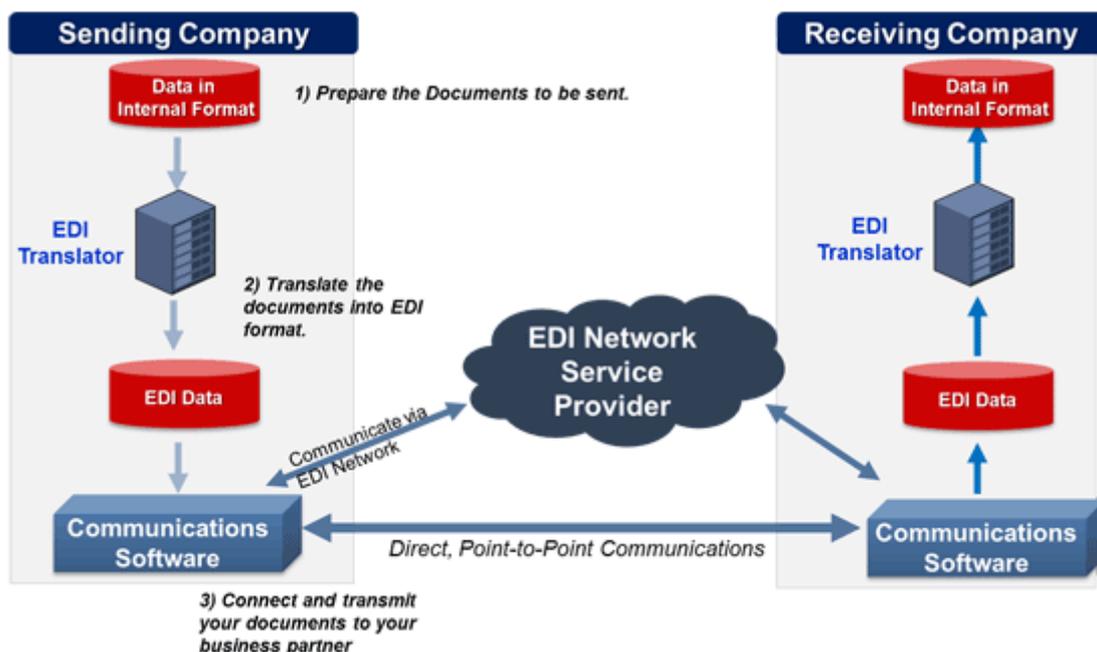
To facilitate the widespread use of EDI, standard formats were developed so that an electronic message sent by one party could be understood by any receiver that subscribes to that format standard.



There are many different formats in use, such as EDIFACT, ANSI, X12, TRADACOMS, XML, JSON, IMP, CSV, ODETTE, VDA, VICS, HIPAA, EANCOM, ebXML, UBL ja RosettaNet.

Translation Software

Translation software makes EDI work by translating data from the sending firm's internal format into a generic EDI format. Translation software also receives a sender's EDI message and translates it from the generic standard into the receiver's internal format. There are currently translation software packages for almost all types of computers and operating systems.



Communication Networks

They are very helpful in solving the technical problems of sending information between computers. When firms first began using EDI, most communications of EDI documents were directly between trading partners. Unfortunately, direct computer to-computer communications requires that both firms

- ✓ use similar communication protocols
- ✓ have the same transmission speed
- ✓ have phone lines available at the same time, and



- ✓ Have compatible computer hardware. If these conditions are not met, then communication becomes difficult.
- **Modem**- It is a hardware device which transmits data from one computer to another.
- **VAN**- A value-added network (VAN) can solve these problems by providing an electronic mailbox service. By using a VAN, an EDI sender need only learn to send and receive messages to/from one party: the VAN. VANs also provide a secure interface between trading partners. Since trading partners send EDI messages only through the VAN, there is no fear that a trading partner may dip into sensitive information stored on the computer system
- **Point- to- Point link**- Direct communication link between computers.

Microcomputers- are required to bring all potential users into the market.

10.1.2 EDI DOCUMENTS

The real power of EDI is that it standardizes the information communicated in business documents, which makes possible a "paperless" exchange. Many business documents can be exchanged using EDI, but the two most common are purchase orders and invoices. Following are the few important documents used in EDI:

- Invoice
- Purchase Order
- Purchase Order Acknowledgement
- Advance Shipping Notice
- Payment Order/Remittance Advice
- Shipping Schedule
- Order Status Inquiry
- Order Status Report
- Warehouse Shipping Order
- Load Tender Response

➤ INVOICE

An invoice notifies a customer that their order is complete and that you are ready to bill them. An EDI invoice can include information about products and services rendered, the payment terms, and shipping



information. Companies often send this EDI document at the same time as shipping the customer's products.

➤ **PURCHASE ORDER**

A customer sends a purchase order to their supplier to place an order. The EDI purchase order lists the items they want to order, the total quantity of each item, the agreed pricing, and shipping information. Since purchase orders are often subject to change, it's much more convenient to use this EDI transaction than sending paper purchase orders back and forth.

➤ **PURCHASE ORDER ACKNOWLEDGEMENT**

When a supplier receives a purchase order, they will send a purchase order acknowledgment back to the customer to accept or reject the order. When accepting the order, the purchase order acknowledgment will summarize the order in full and confirm that processing of the order is starting. When rejecting the order, the supplier can indicate what information about the order needs to be changed, such as shipping dates or product that is out of stock.

➤ **ADVANCE SHIPPING NOTICE**

An advance shipping notice informs your customer that their order is shipping to them. This EDI document contains the specific details of their order, such as a list of the items shipped with descriptions and quantities, packaging information, the estimated delivery date, carrier information, and tracking numbers.

➤ **PAYMENT ORDER/REMITTANCE ADVICE**

A payment order/remittance advice EDI document accompanies an invoice payment. This EDI transaction includes the invoice number, total paid amounts, and banking information when necessary. In most cases, sending a payment order/remittance advice transaction effectively closes out the order lifecycle.

➤ **SHIPPING SCHEDULE**

A shipping schedule transaction set outlines the specific requirements for a particular shipment from a supplier. This information includes the target shipping schedule, order details, shipping carrier information, and other details regarding the shipment of an order. This EDI document is crucial for just-in-time manufacturing, which relies on real-time data to accurately manage inventory levels.



➤ ORDER STATUS INQUIRY

Customers will send an order status inquiry to get updated information about a purchase order or select portions of a purchase order. An order status inquiry might request an update about the shipping of an order, the status of a product in manufacturing, the quantity of a set of items that are already shipping, or other related details.

➤ ORDER STATUS REPORT

An order status report is the responding EDI transaction to an order status inquiry, providing the information requested. This EDI document can also confirm the completion of an order or the completion of a portion of the order and might include updated shipping information as well.

➤ WAREHOUSE SHIPPING ORDER

A warehouse shipping order provides instructions to a remote warehouse for the shipment of an order, including which items to ship, item quantities, the target delivery date, shipping information, billing information, and the shipping method. In most cases, the seller uses a warehouse shipping order to instruct the warehouse to ship an order to the buyer.

➤ LOAD TENDER RESPONSE

Motor carriers send a load tender response to confirm or decline the pickup of a shipment outlined in a previously received offer. In addition to accepting or declining the load tender, this EDI document can accept the load tender with specific conditions, or accept and deny a spot bid request.

In addition to the EDI documents listed above, there are hundreds of other EDI transaction sets exchanged electronically between businesses in a matter of minutes. Without EDI, supply chains wouldn't be able to meet the fast pace of modern business and consumer demand.

10.1.3 MEMBER'S INVOLVED IN EDI IMPLEMENTATION

Functional business managers- they are responsible to perform EDI feasibility studies in their own departments purchasing, sales, accounting, inventory etc.

System and communication managers- They assist technical system specification and choice of VAN and EDI software.

Auditing and legal representations- They acts as monitors. All the situations arise during implementation should be reported and resolved.



Business managers- They perform input-output testing, information exchange, transaction set.

10.1.4 EDI IMPLEMENTATION STEPS

The following is a quick reference check of the steps you should follow when implementing an EDI system.

1. Identify the type of document transmission you wish to use.

In this primary investigation step, you need to decide if you wish to use EDI transmission for your documents. If you decide to use EDI, you need to choose between the following EDI options:

- Receive EDI documents from your trading partners, and then enter them into your system manually. In this case, you do not need transmit documents.
- Receive and transmit documents using EDI. This is considered a complete electronic information flow. Both your inbound and outbound documents are transmitting via EDI.

2. Identify the type of EDI transactions you wish to perform.

Once you choose to use EDI, you must decide which documents to transmit. MAC-PAC can transmit and receive seven different EDI documents. See the EDI within MAC-PAC portion of this key concept for details on each.

3. Identify trading partners.

Choose your customers, vendors, and warehouses carefully, because they will have a significant impact on the successful use of EDI in your business.

4. Negotiate requirements with trading partners.

You must develop EDI requirements with each of your trading partners. Decide which documents you intend to transmit/receive, the format of these documents, and what EDI standards will be used. Identify the segments, elements, and qualifiers for every EDI document. Don't forget to set up proper legal guidelines for the documents as well.

5. Select a value added network (VAN).

Be sure to consider the following:

- Cost (include installation, training, and maintenance costs)
- Technical support (consider on-site as well as hot line support)



- Features (be sure it is easy to use and maintain)
- Interfacing (should interface with the translation software that you and your trading partners use)
- Install base (identify successful installations within your industry and among your trading partners)

6. Select your translation software.

Remember this software is used for both transmitting as well as receiving EDI documents. Be sure your choice works well in both modes. When selecting a translation software package, examine the following:

- Platform
- Cost (include installation, training, and maintenance costs)
- Technical support (consider on-site as well as hot line support)
- Features (be sure it is easy to use and maintain)
- Install base (identify successful installations within your industry and among your trading partners)

7. Conduct training.

Select a training program that fits your individual company's needs. You will probably need training for both your value added network (VAN) and your translation software. You may wish to obtain an EDI expert to monitor your system if your EDI transactions will have a high level of impact on your business.

8. Set up your telecommunications network.

Your telecommunications network will include modems, communications lines, and transmission software. Depending on the impact level to your business, you may wish to choose low speed transmission equipment to decrease costs. If your business requires high communication integrity, you may choose leased lines rather than standard communications lines. Your EDI expert can help you select your telecommunications equipment.

9. Configure your translation software and telecommunications network.

You must define your documents and the mapping of your data. The data map consists of field maps as well as conversion tables. This map is the guide to converting your data into the EDI standard files. You must also configure your communications network. Be sure your trading partners have also configured their translation software correctly. Remember, successful transmission of your EDI transactions depends on both parties.



10. Host system design and configuration.

If you intend to use a host system to store your data once it has been translated to the EDI standard files, you will need to design and configure that system. Be sure to integrate the necessary file mapping for the translation software and the interface between your existing system and the host system. Also, make architectural modifications if necessary.

11. Test the entire system.

Test every aspect of your EDI system including:

Your MAC-PAC setup: Remember you may be transmitting in both asynchronous and batch modes. Be sure to test both.

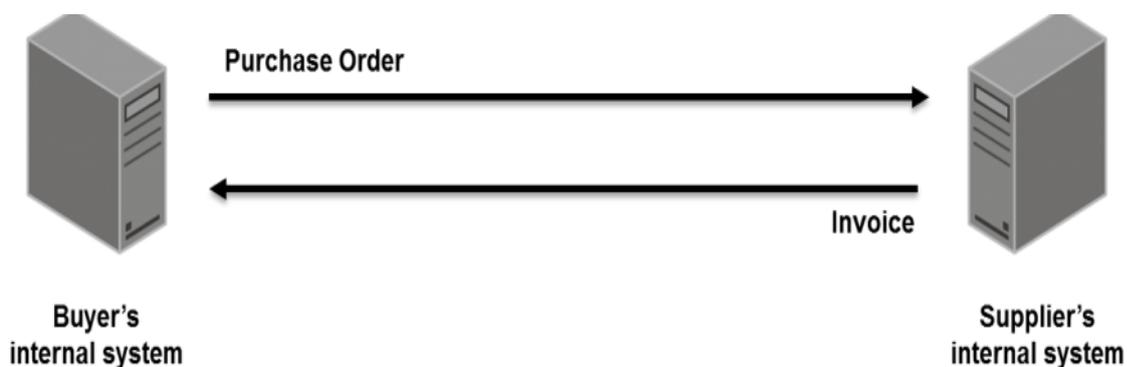
The translation software: This includes your host system if you are implementing one. Be sure every EDI document has the correct data map and is correctly translated in the EDI standard files. Test both transmitting and receiving EDI documents.

The value added network (VAN): This network needs to be able to transmit all of your inbound and outbound transactions. Be sure the connections to and from trading partners are correct.

Your trading partners will need to test everything that starts at their end. Be sure to test every EDI transaction from its start in MAC-PAC to the final destination at your trading partner's business.

10.1.5 STEPS IN AN EDI SYSTEM

Let's now look at how the EDI process works.



Today, all types of business documents for industries such as retail, automotive, high tech, logistics, and banking can be exchanged using EDI. These documents can flow from the sender's computer straight through to the appropriate application on the receiver's computer.

**(a) Sending EDI Documents**

To send an EDI document, you need to identify the data, create an EDI document, and transmit it.

- **Step 1: Identify the data-** The first step is to identify the data you want to include in the purchase order, invoice, advance ship notice, etc. The sources of data and the methods available to generate the electronic document can include:
 1. computer programs that extract data from system databases, such as from a retailer's purchasing system or a shipping company's logistics system;
 2. computer programs that extract data from spreadsheets; and
 3. People keying in the data via web form data entry screens.
- **Step 2: Create the EDI document-** In this step software converts your internal data into the EDI standard format. This requires specialized translation software that defines how your internal data is to be mapped (i.e. correlated) to the EDI format. Translation software is available to suit just about any computing environment and budget, from large systems that handle thousands of transactions daily to PC-based software that need only process a few hundred or fewer transactions per week.
- **Step 3: Transmit the EDI document-** There are two basic ways to transmit an EDI document. The first option is to send it directly to your business partner, usually via the internet. The other option is to use the services of an EDI Network Services Provider, in which case you send the EDI document to the Provider, who then makes it available to your business partner. Using a Provider is often the easiest and best approach when you have many business partners, each using a different communications protocol (rules) that you would otherwise need to accommodate.

(b) Receiving EDI Documents

Receiving an EDI document is basically the reverse of the sending process:

1. You receive the transmitted EDI document;
 2. Your system converts the EDI data for your internal system; and
 3. The data is fed into your internal system for processing, such as into a bank's payment origination system or a supplier's order management system.
- **Step 1: Receive the transmitted EDI document-** As with sending a document, there are two basic options. You can receive the EDI document directly from your business partner or you can use the

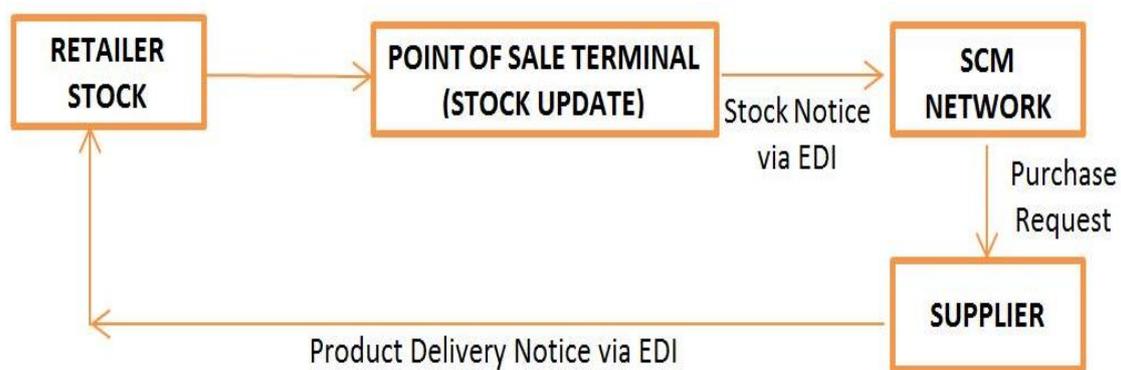


services of an EDI Network Services Provider, in which case your Provider receives the EDI document from the sender and then makes it available to your internal system.

- **Step 2: Convert the EDI document-** for your internal system Software now converts the data from the incoming EDI document into the format used by your internal system. This requires specialized translation software that defines how the EDI data is to be mapped (i.e. correlated) to your internal data format. The same specialized translation software that is used to create EDI documents for sending is used in the receiving process.
- **Step 3: Feed data into your internal system-** for processing your computer application can now automatically feed the translated data into your system, such as your order management system, for immediate processing. Or, often for smaller companies that haven't fully integrated EDI with their internal systems, the incoming data is made available either as a report or on the computer screen.

10.1.6 APPLICATIONS OF EDI

(a) Retail Sector



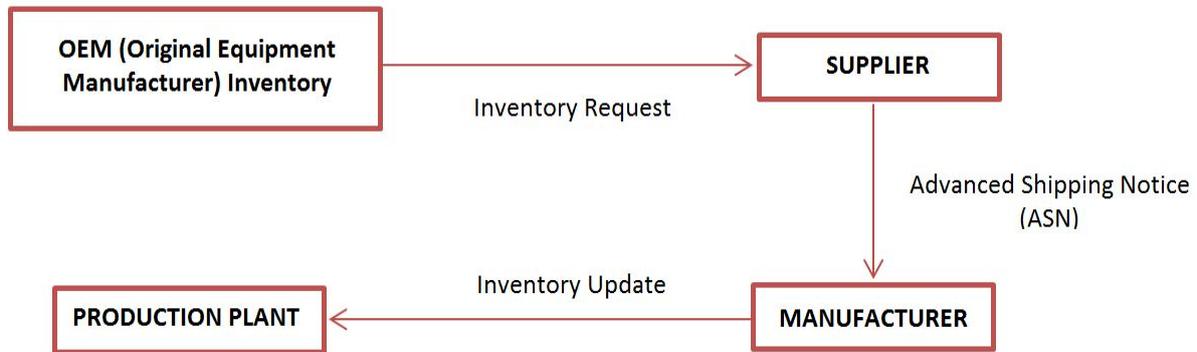
EDI in RETAIL INDUSTRY

In retail sector profit margins usually depend upon efficient inventory management. EDI provides a structured way to maintain goods stocked at a retail outlet. Retailers use a common model stock for each shop location and the point of sale stock position is updated automatically via EDI enabled SCM (Supply chain Management) network.

(b) Manufacturing Sector



EDI ensures effective and efficient management of materials required for production. In manufacturing sector EDI facilitate material requirement planning and just in time manufacturing.



EDI in MANUFACTURING INDUSTRY

(c) Automobile Sector

In automobile sector EDI is used

- To provide updated information about product and pricing information to the customer during purchase cycle.
- To transmit an advance shipping notice to customer to ensure proper receipt of product
- To enable the customer to make payments on receipt of goods via EDI to speed up the payment process.

(d) Financial sector

In this sector EDI replaces the manual activities of collecting, processing and distributing payments with in electronic system.

- It facilitates flow of payment between bank account of trading partners without any human intervention.
- Using EDI a payee's account is electronically credited and payer's account is electronically debited, such an exchange is referred as EFT (Electronic Fund Transfer).

10.1.7 BENEFITS OF AN EDI SYSTEM

EDI was developed to solve the problems inherent in paper-based transaction processing and in other forms of electronic communication. In solving these problems, EDI is a tool that enables organizations



to reengineer information flows and business processes. Problems with the paper-based transaction system are:

- **Time delays.** Delays are caused primarily by two factors. Paper documents may take days to transport from one location to another. In addition, manual processing delays are caused by the need to key, file, retrieve, and compare data.
- **Labor costs.** In non-EDI systems, manual processing is required for data keying, document storing and retrieving, sorting, matching, reconciling, envelope stuffing, stamping, signing, etc. While automated equipment can help with some of these processes, most managers will agree that labor costs for document processing represents a significant proportion of their overhead.
- **Errors.** Because information is keyed multiple times and documents are transported, stored, and retrieved by people, non-EDI systems tend to be error prone.
- **Uncertainty.** Uncertainty exists in two areas. First, paper transportation and other manual processing delays mean that the time the document is received is uncertain. Once a transaction is sent, the sender does not know when the transaction will be received or when it will be processed. Second, the sender does not even know whether the transaction has not been received at all nor whether the receiver agrees with what was sent in the transaction.
- **High Inventories.** Because of time delays and uncertainties in non EDI processing, inventories are often higher than necessary. Lead times with paper processing are long. In a manufacturing firm, it may be virtually impossible to achieve a just-in-time inventory system with the time delays inherent in non-EDI processing systems.
- **Information Access.** EDI permits user access to a vast amount of detailed transaction data—in a non-EDI environment this is possible only with great effort and time delay. Because EDI data is already in computer-retrievable form, it is subject to automated processing and analysis. Such information helps one retailer, for example, monitor sales of toys by model, color, and customer zip code. This enables the retailer to respond very quickly to changes in consumer taste.

By implementing EDI, many companies add value to their organization by automatically processing information, reducing clerical tasks and eliminating data entry errors.



By using EDI throughout the business cycle results in significant savings of time and resources. Current trading partners benefit from the seamless flow of information and availability of the technology opens doors for new business opportunities.

OTHER BENEFITS INCLUDE

(a) Minimal paper usage

EDI reduces associated expenses of storage, printing, postage, and mailing.

(b) Enhanced quality of data

EDI minimizes data entry errors, improves accounts payable/receivable times and can be used for forecasting. When bad data makes its way into your internal systems, such as your accounts payable or transportation management systems, the results have a negative impact on your business. This includes overpayments, late or underpayments resulting in additional fees, lost revenue due to delays, and poor customer service. The root of most data errors is the keying in of data from a paper document into your internal system. First, if the paper document is handwritten rather than computer-generated, it may be difficult to read, leading to input errors or phone tag to obtain clarification, both of which can cause delays in the business cycle. Even when the document is typed or computer generated and thus legible, keying errors can still occur. In the order entry process, these errors can result in shipping the wrong product, in the wrong quantity, at the wrong price, to the wrong address. The electronic capture of business documents enables critical business data to be fed directly into your internal systems without relying on error prone, manual re-keying, which is required when you use paper-based or email-based processes. Having more accurate data means that the entire supply chain is more efficient.

(c) Improved turnaround times

We have just discussed how manual data entry can greatly slow the business cycle. In addition, when using postal mail, your documents will take days to arrive. Sometimes, it may be weeks before you discover that the mail has been lost. Delivery services such as UPS and FedEx are very reliable but quite costly. And even with faxes, documents can remain at the fax machine or sit on someone's desk before any action is taken. In contrast, EDI transactions can be exchanged in minutes instead of the days or weeks associated with postal mail. Furthermore, there is significant time saved by the elimination of data re-keying and its high error rate, which results in time-consuming corrective actions. For many



companies that use EDI, transactions that used to take five days using paper can be completed in under an hour. This reduced cycle time leads to faster payments and thus improved cash flow. Cash is no longer tied up in inventory or goods in transit and, therefore, can be applied to other areas of the business.

(d) Improved timelines

EDI transfer ensures real-time processing and eliminates times associated with manually sending, receiving and entering orders.

(e) Costs saving in operational efficiency

EDI reduces the time it takes your staff to manually create invoices and process purchase orders. EDI reduces the costs of personnel, supplies, and office and storage space. Since paper documents are replaced by EDI transactions, expenses associated with paper—printing, reproduction, storage, filing, postage, and document retrieval— are all reduced or eliminated. Moving from a manual to an EDI process frees up personnel to concentrate on other aspects of the business.

(f) Improved data security and ease of auditing

In this highly competitive, international world of business, data security is paramount to the success of a company. Documents that circulate in an office or that can be changed by several people may not be secure. With fully integrated EDI, in which data flows directly from computer to computer, data can be exchanged in a highly secure environment. In addition to keys and passwords to protect the data, encryption and decryption programs are used, so that even during the few seconds it takes to transmit the data from sender to receiver the data is secure. Even when an EDI Network Services Provider is used to perform translation, there can be “encryption at rest” programs, so no one at the Provider’s data center can see or violate the data. Of course, in today’s environment, it is necessary for companies to install firewalls in their own data centers to prevent hackers from stealing data. But this is true of internal systems, whether you use EDI or not. Corporate auditing is made easier and faster since the EDI process eliminates many of the discrepancies and problems that can creep into a paper-based system. Moreover, all the EDI transactions can be made easily available to the auditor in reports, thereby improving accuracy and reducing productivity loss during the auditing process.

(g) Strategic business benefits



Beyond the direct cost and time-saving benefits of EDI described above, it provides the foundational technology that, when combined with other collaborative commerce capabilities available today, enables dramatic strategic benefits. For example, in today's fast-paced business environment, electronic transactions enable real-time visibility into transaction status. This, in turn, enables faster decision-making and improved responsiveness to changing customer and market demands. In some industries, EDI enables businesses to adopt a demand-driven business model rather than a supply driven one, because it shortens the lead times for product enhancements and new product delivery, streamlines the ability to enter new territories and markets, and provides a common business language that facilitates the communication and collaboration of businesses throughout the world. Moreover, EDI promotes corporate social responsibility and sustainability by eliminating paper from the supply chain and replacing paper-based processes with "green" electronic alternatives. This will both save you money and make your company part of the solution to our overall "carbon footprint." As we have seen, the benefits of using EDI are many and have a far-reaching effect throughout the company. Later, we will examine how EDI brings benefits to specific business processes, such as ordering, invoicing, receiving, and payments.

10.1.8 LIMITATIONS OF EDI

While countless businesses enjoy the benefits of EDI, some companies are still cautious to try it out due to the following limitations of EDI.

- **Cost of Implementation**

It is true that EDI provides massive cost savings benefits but for small businesses re-designing and implementing software applications to fit in EDI into current applications can be quite costly. Such limitations of EDI must be considered if you plan on implementing such system.

- **Electronic System Safety**

EDI also necessitates substantial investment in computer networks and security systems for maximum security. Any EDI system installed would require protection from hacking, malware, viruses, and other cyber security threats.

- **Preliminary Setup Consumes Time**



Not only is the implementation of EDI system expensive to install, but it also consumes a considerable amount of time to set up the essential parts. Thus, such limitations of EDI can hinder fast-tracking of services if urgently required.

- **Several Standards to Maintain**

Numerous businesses looking to implement EDI also consider the several standards involved. These limitations of EDI do not allow small businesses to exchange data with larger establishments that make use of latest edition of a document standard. Some known measures include ANSI ASC X12, GS1 EDI, HL7, TRADACOMS, and UN/EDIFACT.

- **Suitable Backup System**

EDI implementation also requires regular maintenance as the business functionality is highly dependent on it. Some robust data backup system is needed in case of system crash or for statistical purpose. Such limitations of EDI can cost some substantial amount to implement.

10.2 E-COMMERCE SECURITY SYSTEM

Security is an essential part of any transaction that takes place over the internet. Customers will lose his/her faith in e-business if its security is compromised. Following are the essential requirements for safe e-payments/transactions –

- **Confidentiality** – Information should not be accessible to an unauthorized person. It should not be intercepted during the transmission.
- **Integrity** – Information should not be altered during its transmission over the network.
- **Availability** – Information should be available wherever and whenever required within a time limit specified.
- **Authenticity** – There should be a mechanism to authenticate a user before giving him/her an access to the required information.
- **Non-Reputability** – It is the protection against the denial of order or denial of payment. Once a sender sends a message, the sender should not be able to deny sending the message. Similarly, the recipient of message should not be able to deny the receipt.
- **Encryption** – Information should be encrypted and decrypted only by an authorized user.
- **Auditability** – Data should be recorded in such a way that it can be audited for integrity requirements.

I. Measures to ensure Security



Major security measures are following –

- **Encryption** – It is a very effective and practical way to safeguard the data being transmitted over the network. Sender of the information encrypts the data using a secret code and only the specified receiver can decrypt the data using the same or a different secret code.
- **Digital Signature** – Digital signature ensures the authenticity of the information. A digital signature is an e-signature authenticated through encryption and password.
- **Security Certificates** – Security certificate is a unique digital id used to verify the identity of an individual website or user.

II. Security Protocols in Internet

We will discuss here some of the popular protocols used over the internet to ensure secured online transactions.

Secure Socket Layer (SSL): It is the most commonly used protocol and is widely used across the industry. It meets following security requirements –

- Authentication
- Encryption
- Integrity
- Non-reputability

"https://" is to be used for HTTP URL's with SSL, whereas "http://" is to be used for HTTP URL's without SSL.

Secure Hypertext Transfer Protocol (SHTTP)

SHTTP extends the HTTP internet protocol with public key encryption, authentication, and digital signature over the internet. Secure HTTP supports multiple security mechanism, providing security to the end-users. SHTTP works by negotiating encryption scheme types used between the client and the server.

Secure Electronic Transaction

It is a secure protocol developed by MasterCard and Visa in collaboration. Theoretically, it is the best security protocol. It has the following components –

- **Card Holder's Digital Wallet Software** – Digital Wallet allows the card holder to make secure purchases online via point and click interface.
- **Merchant Software** – this software helps merchants to communicate with potential customers and financial institutions in a secure manner.
- **Payment Gateway Server Software** – Payment gateway provides automatic and standard payment process. It supports the process for merchant's certificate request.



- **Certificate Authority Software** – this software is used by financial institutions to issue digital certificates to card holders and merchants, and to enable them to register their account agreements for secure electronic commerce.

III. Common Ecommerce Security Threats & Issues

There are quite a few threats you need to protect your online store from. Let's touch on a few common ones that often plague online businesses.

➤ *Financial Frauds*

Financial fraud has afflicted online businesses since their inception. Hackers make unauthorized transactions and wipe out the trail costing businesses significant amounts of losses. Some fraudsters also file requests for fake refunds or returns. Refund fraud is a common financial fraud where businesses refund illegally acquired products or damaged goods. For instance, Jimmy likes to capitalize on fraudulent activities. He knows that friendly fraud is an easy medium where he can purchase an item, use it, and then refund it in order to get his money back, so he does it!

➤ *Spam*

Where emails are known as a strong medium for higher sales, it also remains one of the highly used medium for spamming. Nonetheless, comments on your blog or contact forms are also an open invitation for online spammers where they leave infected links in order to harm you. They often send them via social media inbox and wait for you to click on such messages. Moreover, spamming not only affects your website's security, but it also damages your website speed too.

➤ *Phishing*

It is one of the common security threats of ecommerce where hackers masquerade as legitimate businesses and send emails to your clients to trick them into revealing their sensitive information by simply presenting them with a fake copy of your legitimate website or anything that allows the customer to believe the request is coming from the business.

Common phishing techniques include emailing your customers or your team with fake "you must take this action" messages. This technique only works your customers follow through with the action and provide them access to their login information or other personal data which the hacker can exploit as per his benefit.



➤ ***Bots***

You may recognize bots from your good books such as those that crawl the web and help you rank your website in Search Engine Result Pages. However, there are exclusive bots developed to scrape websites for their pricing and inventory information. The hackers use such information to change the pricing of your online store, or to garner the best-selling inventory in shopping carts, resulting in a decline in sales and revenue.

➤ ***DDoS Attacks***

Distributed Denial of Service (DDoS) attacks and DOS (Denial of Service) attacks aim to disrupt your website and affect overall sales. These attacks flood your servers with numerous requests until they succumb to them and your website crashes.

➤ ***Brute Force Attacks***

These attacks target your online store's admin panel in an attempt to figure out your password by brute-force. It uses programs that establish a connection to your website and use every possible combination to crack your password. You can protect yourself against such attacks by using a strong, complex password. Do remember to change it regularly.

➤ ***SQL Injections***

SQL injections are cyber-attacks intended to access your database by targeting your query submission forms. They inject malicious code in your database, collect the data and then delete it later on.

➤ ***XSS***

Hackers target your website visitors by infecting your online store with malign code. You can safeguard yourself against it by implementing Content Security Policy.

➤ ***Trojan Horses***

Admins and customers might have Trojan Horses downloaded on their systems. It is one amongst the worst network security threats where attackers use these programs to swipe sensitive information from their computers with ease.

IV. Ecommerce Security Solutions

Security issues in ecommerce are not something online businesses can neglect. In fact it should be a priority for most online stores so their customers are able to enjoy a smooth and safe shopping



experience. Your ecommerce security lets your customers protect themselves from cyber-attacks and fraud. The better your security protocols are, the better your brand will uphold its reputation and earn the trust of the customers. Ecommerce stores with ideal security have some features in common. They don't economize on robust hardware; they don't rely too heavily on third-party apps or plugins like adobe flash. Let's further breakdown these features so that you do not have to face any security issues in ecommerce.

✓ *Switch to HTTPS*

Using outdated HTTP protocols makes you vulnerable to attacks. I strongly recommend that you switch to HTTPS which displays the trustee green lock sign that says "secured" next to the URL bar on your customer's computer. HTTPS protocols not only protect the sensitive information users submit, but their user data as well.

Since HTTP protocols are mostly defunct now, most modern browsers display a message warning the user from proceeding further because the website is insecure. Not just that, some browsers outrightly blocks the user from accessing the site.

Another benefit you get from upgrading to HTTPS is higher ranking on Google's search page since Google considers HTTPS as a ranking factor.

Before you make that switch, you must purchase an SSL certification from your hosting company. Having an up-to-date SSL certificate and HTTPS protocol has become the standard, so it's crucial that you obtain them if you wish to get any considerable traffic.

✓ *Secure Your Servers and Admin Panels*

Most ecommerce platforms come with default passwords that are ridiculously easy to guess. And if you don't change them you are exposing yourself to preventable hacks. Use complex password(s) and usernames and change them frequently.

You can go one step further and make the panel notify you every time an unknown IP attempts to log in. These simple steps can significantly improve your web store's security.

✓ *Payment Gateway Security*

While it may make processing payments more convenient, having credit card numbers stored on your database is a liability. It's nothing less than an open invitation for hackers where you put your brand's reputation and your customer's sensitive information on the line.



If you fall victim to a security breach, and hackers get their hands on credit card data, all you can do is to say goodbye to your business because the heavy fines will force you into bankruptcy.

In order to save your business from this terrible fate, you should never store credit card information on your servers and ensure your payment gateways security is not at risk. Additionally, you can use third-party payment processing systems to carry out the process off-site. Popular options include PayPal, Stripe, and Wordplay.

When it comes to ecommerce recommendations, you must obtain a Payment Card Industry Data Security Standard (PCI DSS) accreditation.

✓ *Antivirus and Anti-Malware Software*

Hackers can use stolen credit card information to place orders from anywhere in the world. Antivirus or anti-fraud software can help you with this serious ecommerce issue. They use sophisticated algorithms to flag any malicious transactions to help you can take further action. They provide a fraud risk score which can help proprietors determine if a certain transaction is legitimate.

✓ *Use Firewalls*

Another effective ecommerce recommendation is to use firewall software and plugins that are pocket-friendly yet effective. They keep untrusted networks at bay and regulate traffic that enters and leaves your site. It offers selective permeability and only allows trusted traffic in. They also protect against cyber threats such as SQL injections and cross-site scripting.

✓ *Secure your website with SSL certificates*

Secure sockets layer (SSL) certificates are files that link a key to transactions on different paths on a network. These certificates are associated with credit card details and transactions to regular queries. SSL certificates encrypt data to protect it from interception in between different destinations. The information you send from your end to the server is secure.

If you want to conduct any type of business on your site, you require SSL certificates, so that every process that takes place on your site is secure. Besides, it provides you with a certificate of ownership so hackers can't use your site as a counterfeit for phishing.

✓ *Employ Multi-Layer Security*



You can fortify your security by using various layers of security. You can use a wide-spread Content Delivery Network or CDN to protect your site against DDoS attacks and malevolent incoming traffic. They do so by utilizing machine learning to filter out the malicious traffic from regular traffic.

You can also use two-factor authentication to squeeze in an additional layer of security. Two-factor authorization requires a standard username and password combination as well as an extra code that is sent as an email to the user or as an SMS to their provided phone number. This ensures that only the user can access the service even if their username and password are at risk.

✓ *Ecommerce Security Plugins*

Security plugins are a simple way to enforce security protection on your website. They provide protection against bad bots, SQLi, XSS, code injections and hundreds of other severe attacks. One of the most secure, easy to implement, feature rich security plugin is Astra. It helps automatically secure your site and virtually patch software by preventing malicious requests from ever reaching your website.

✓ *Backup Your Data*

Data loss due to hardware malfunction or cyber-attacks is not uncommon. And if you don't backup your data regularly, you are at the risk of losing it for good. You should do it yourself and not trust anyone else to do it for you. Employ automatic backup service so that even if you forget to do it manually, all your data will be backed up automatically.

You can go one step further and make a copy of the backup, so you will have a contingency plan available if you lose your original backup. Another option is to choose a managed ecommerce web hosting service that automatically creates backups for you, like Cloudways.

✓ *Stay Updated*

The importance of regularly updating WordPress core, security tools, and plugins can be stressful, however, install security updates and patches as soon as they release because hackers can use bots that identify which websites use outdated software. That makes outdated software a serious liability.

✓ *Opt for a Solid Ecommerce Platform*

It is important that you choose a secure ecommerce platform that regularly updates itself and offers top-notch security. Ecommerce platform tools safeguard you against common threats and frequently provide you with updates. PrestaShop, Magento and WooCommerce are some popular choices.



✓ *Train Your Staff Better*

Your staff should be aware of laws and policies pertaining to the protection of user information. They should not share login credentials, and you should review the personnel who have access to sensitive customer information.

Once your employee tenders their resignation, expunge their details and revoke all their access to keep them from committing a cybercrime against your business.

✓ *Keep an Eye out for Malicious Activity*

If you don't want any malicious attack to go under the red carpet, you should keep your eyes open for any suspicious activity. This can save you a lot of trouble – not to mention revenue – since you can potentially catch a fraudulent transaction before it can take place. You can utilize special monitoring software that tracks the activity in real time and notifies you of any questionable transaction.

✓ *Educate Your Clients*

Some lapses in security don't happen at your end but your client's. They might be using weak passwords or they might deliver sensitive information on phishing sites and in the hands of hackers.

You can solve these ecommerce security threats by educating your customers. Educate them about the risks associated with unsafe security practices. You can demand strong passwords and introduce them to how phishing works.

Strong passwords require a good combination of characters, symbols, and numbers that are near-impossible to brute-force or guess. You can also keep users away from creating profiles with weak passwords. You can also adopt the two-factor authentication system in case they are using weak passwords. Or if the user submitted information is sensitive and susceptible to hacking.

Give these approaches due consideration because some customers might consider them a hassle and might just leave your website altogether. Do ensure that you aren't making your customers jump through unnecessary hoops.

Or you can bypass this whole process and simply let them sign up via Facebook or Google which offer world-class cyber security.

10.3 CHECK YOUR PROGRESS



1. _____ is an extension to the Hypertext Transfer Protocol (HTTP) that allows the secure exchange of files on the World Wide Web.
2. _____ is standard security technologies for establishing an encrypted links between a server and a client.
3. _____ a process which allows one company to send information to another company electronically rather than with paper.
4. _____ attack flood your servers with numerous requests until they succumb to them and your website crashes.
5. The security threat in which hackers masquerade as legitimate businesses and send emails to your clients to trick them into revealing their sensitive information by simply presenting them with a fake copy of your legitimate website is known as _____.

10.4 SUMMARY

Electronic data interchange (EDI) is the use of computer and telecommunication technology to move data between or within organizations in a structured, computer retrievable data format that permits information to be transferred from a computer program in one location to a computer program in another location, without manual intervention. In EDI, paper documents are replaced with electronic documents such as word documents, spreadsheets, etc. Business entities conducting business electronically are called **trading partners**. The entire process is nothing more than the transfer of information from the seller's computer to the customer's computer. EDI makes it possible to minimize or even eliminate the manual steps involved in this transfer.

10.5 KEYWORDS

EDI: Electronic Data Interchange (EDI) is the electronic interchange of business information using a standardized format; a process which allows one company to send information to another company electronically rather than with paper.

EFT: Electronic funds transfer (EFT) are electronic transfer of money from one bank account to another, either within a single financial institution or across multiple institutions, via computer-based systems, without the direct intervention of bank staff.



FEDI: Financial EDI (FEDI) is the computer-to-computer exchange of payment and payment-related information between companies using a standard format.

VAN: A value-added network (VAN) is a hosted service offering that acts as an intermediary between business partners sharing standards based or proprietary data via shared business processes. The offered service is referred to as "value-added network services".

E-commerce: Ecommerce, also known as electronic commerce or internet commerce, refers to the buying and selling of goods or services using the internet, and the transfer of money and data to execute these transactions.

SSL: Secure Sockets Layer (SSL) is standard security technologies for establishing an encrypted links between a server and a client—typically a web server (website) and a browser, or a mail server and a mail client (e.g., Outlook).

SHTTP: S-HTTP (Secure HTTP) is an extension to the Hypertext Transfer Protocol (HTTP) that allows the secure exchange of files on the World Wide Web.

10.6 SELF-ASSESSMENT TEST

- Q1. Describe Electronic data Interchange with a suitable example.
- Q2. Why do we need EDI and how to implement EDI?
- Q3. What are the basic components required to implement an EDI?
- Q4. Describe various kinds of document exchanged during EDI.
- Q5. Describe the various application areas of EDI.
- Q6. What are the advantages and disadvantages of EDI?
- Q7. Discuss the common Ecommerce security threats & issues.
- Q8. Discuss the Ecommerce Security Solutions.
- Q9. Discuss about Security Protocols in Internet.
- Q10. Explain e-commerce security system

10.7 ANSWERS TO CHECK YOUR PROGRESS

1. S-HTTP
2. Secure Sockets Layer



3. Electronic Data Interchange
4. Denial of Service
5. Phishing

10.8 REFERENCES/SUGGESTED READINGS

- Brian C. Satterlee, *E-Commerce: A Knowledge Base (2001)*, iUniverse.
- Amir Manzoor, *E-Commerce: An Introduction (2010)*, Amir Manzoor.
- Janice Reynolds, *The Complete E-Commerce Book: Design, Build & Maintain a Successful Web-based Business (2004)*, CRC Press.
- Ritendra Goel, *E-Commerce (2007)*, New Age International.
- Mamta Bhusry, *E-Commerce (2005)*, Firewall Media.
- Parag Diwan, Sunil Sharma, *E-Commerce: A Manager's Guide to E-Business (2002)*, Excel Books India.
- <https://digitalstrategy.ie/security-issues-in-e-commerce/> 02/11/2019
- <https://www.cloudways.com/blog/ecommerce-security-tips/> 02/11/2019
- <https://losspreventionmedia.com/awareness-of-e-commerce-security-issues-is-the-first-step/> 02/11/2019



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M-Commerce and E-Governance

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11.0 Learning Objectives

In this chapter you will learn about

- M-Commerce and Wireless communication technology



- Scope of mobile--commerce
- Principles of mobile commerce
- Benefits of mobile commerce
- Limitations of mobile commerce
- Mobile commerce framework
- Mobile commerce business models
- M-commerce applications
- E-government and E-governance
- Stages of E-governance
- Importance of E-government
- National E-governance Plan
- Need of E-governance
- E-governance experiences in India

11.1 Introduction

This chapter introduces the M-commerce and E-governance. Mobile Commerce, also known as m-commerce, is defined as the process of performing business transactions using handheld mobile devices which are connected through wireless networks. E-Governance is defined as the use of information and communication technologies, and particularly the internet, as a tool to achieve better government. Section 11.3 to 11.12 discusses about the M-commerce and section 11.13 to 11.21 discusses about E-governance.

11.2 M-COMMERCE

Mobile Commerce, also known as m-commerce, is defined as the process of performing business transactions using handheld mobile devices which are connected through wireless networks. The business transactions may range from buying and selling goods, making mobile payments, downloading audio/video contents, playing online games, using numerous software applications or getting mobile tickets. The mobile devices include cellular phones, handheld computers such as palmtops or laptops, pagers, smartphones and Personal Digital Assistants (PDA). The mobile users can access internet through these devices without any wired connection or a computer. Powered with the



emerging technology based on Wireless Application Protocol (WAP), m-commerce employs web ready micro browsers in these mobile devices to surf through the internet anytime, anywhere on earth. WAP-enabled smartphones equipped with Bluetooth technology offer fax, e-mail and phone capabilities to the user to facilitate business transactions while in transit. Such smartphones are becoming so popular that most business houses have adopted m-commerce as the more efficient method of reaching to the customers or communicating with other business partners. The content delivery over wireless mobile devices has become much faster, safer as well as cheaper. The reservation of air/rail/bus tickets through mobile devices saves time and offers peace of mind to numerous passengers. Such services are gradually making m-commerce as the method of choice for performing digital business transactions. For these reasons, m-commerce is sometimes referred to as next generation e-commerce.

11.2.1 WIRELESS COMMUNICATION TECHNOLOGY

Mobile commerce is based on wireless communication technology. The wireless communication technology has emerged as the new choice of modern corporate world. The wireless networking has some distinct advantages over traditional wired networking that employs co-axial, twisted pair or fibre optic cables for physical connection between two or more computing devices. In wireless networking, the data transfer between computers is facilitated by microwaves, radio waves or infrared waves. It eliminates the cumbersome cabling process involving bulky cables with a significant reduction in labour and material cost as well as development time. The wireless networking technology together with wireless application protocol provides the backbone of mobile commerce applications. In various vertical markets, such as retail, health care, manufacturing and warehousing, mobile commerce gained acceptance and provided increased productivity through the usage of mobile devices. The mobile handheld devices are used to transmit data in real time to centralized hosts through wireless networks.

The mobile commerce that employs wireless technology, offers some extra advantage over the internet based e-commerce. In e-commerce, the internet provides information anytime of the day, while in m-commerce; the information is available anytime, anywhere. In e-commerce, the information is available as long as the user is connected with the internet, i.e. connected with the wired network. If the user is



involved with some other activities, i.e. travelling or doing some offline job, which forces him/her to become disconnected from the internet, the information becomes unavailable. M-commerce removes such uncertainties. Wireless networking allows the user to be connected with the wireless internet even if he/she is on the move. Thus, in m-commerce, it is possible to stay online anywhere on earth and anytime of the day. The user can access information instantly even if he/she is engaged in some other activities, such as travelling or shopping, with the help of the mobile device and the wireless network or internet. This helps the employees to make spot decisions, the customers to ask questions spontaneously and business owners to perform transactions anytime regardless of their geo-graphical positions.

11.2.2 SCOPE OF MOBILE COMMERCE

Mobile commerce provides instant connectivity between mobile users irrespective of their geographical location and time of the day. With enormous growth of wireless and mobile technology and rapid penetration of mobile phones in developing countries worldwide, the scope of m-commerce has increased manifold. With the advent of super-fast 3G access technology that ensures high speed data transfer rates of the order of 20 Mbps, m-commerce is opening up new vistas of digital media applications. 3G technology, equipped with WiMax and UMTS standards for high speed mobile broadband internet connectivity, supports mobile multimedia application delivery at far greater bandwidths. So, it is now possible for mobile users to watch their favourite TV programmes or download and view famous movies in their mobile devices while travelling.

The scope of mobile commerce is all pervasive, and is gradually engulfing all aspects of lives of modern day citizens. Ranging from mobile banking, mobile browsing and mobile ticketing up to mobile marketing, mobile advertising and mobile computing, mobile commerce is gradually becoming an integral part of both corporate world and common people. With the prices of mobile phone decreasing exponentially and the number of different mobile applications increasing enormously, more and more people will indulge in m-commerce applications and soon it will become the preferred choice of the digital business world.

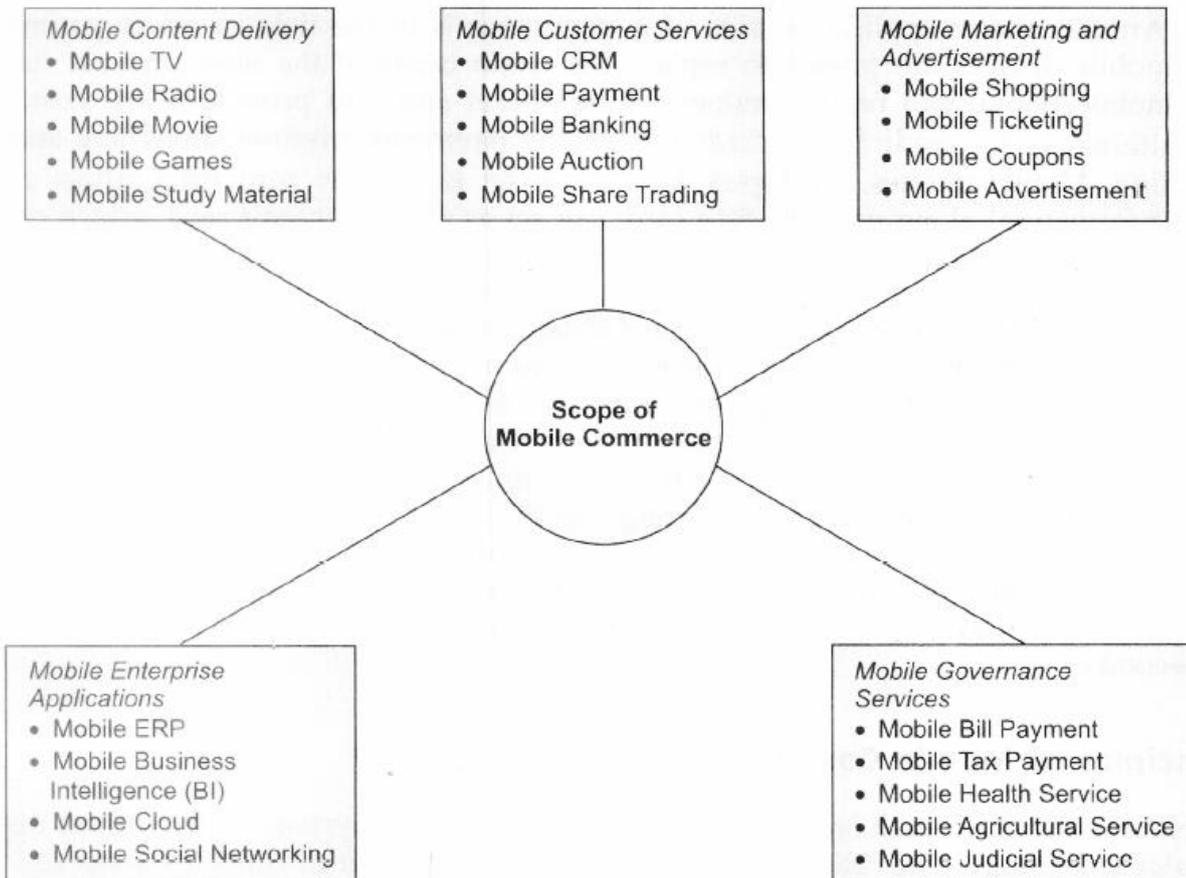


Fig.1 : Scope of Mobile Commerce.

11.2.3 PRINCIPLES OF MOBILE COMMERCE

Mobile commerce is based on wireless mobile communication system, which utilizes digital cellular technology. The cellular network consists of a number of cell sites. Each cell site consists of a stationary base station (a radio frequency transceiver), an adjacent tower antenna (for transmission and reception of signals) and a surrounding cell (a hexagonal shaped geographical area). Each cell is allotted a band of radio frequencies and provides coverage to any portable mobile device that comes within the geographical range of the cell. Whenever a mobile device such as a mobile phone or a pager, etc., comes inside a cell, it starts communicating with the base station using one of the cell frequencies. The base station receives the signal from the mobile device and transmits using the tower antenna to a distant base station for call delivery. To distinguish signals received from different mobile devices at the same base station, different access technologies such as Frequency Division



Multiple Access (FDMA), Code Division Multiple Access (COMA) or Time Division Multiple Access (TDMA) are used. Whenever a mobile user tends to move away from one cell to another adjacent cell, the cell frequency switching occurs, whereby the old cell frequency is dropped and the mobile device is automatically allotted a new frequency corresponding to the adjacent base station. The mobile device switches from previous base station frequency to current base station frequency and the communication with the new base station continues without interruption. This is known as cell handover. There are a number of different digital cellular technologies which are used in various mobile phone networks worldwide. These are: Global System for Mobile (GSM) Communication, General Packet Radio Service (GPRS), and Enhanced Data Rates for GSM Evolution (EDGE), Digital Enhanced Cordless Telecommunications (DECT), etc.

The geographical location of a base station is fixed, i.e. stationary and the frequency band and location of each base station are registered in the database of a centralized Mobile Telecommunication Switching Office (MTSO). So, whenever a mobile device changes position from one cell site to another, its geographical location can be easily tracked from MTSO. Utilizing this fact, mobile commerce offers a number of location-based services, such as tracking and monitoring of people/vehicles, identifying or discovering nearest ATM machines/banks/hospitals/restaurants and local weather/traffic reports. People tracking can help in criminal investigation where the mobile phone used by a criminal can be tracked and its location is identified. The vehicle tracking is utilized in finding out the actual position of the goods to be delivered and helps in supply chain operation management. The local traffic and weather report can be generated in a local office and delivered to the mobile phone of a user on request. The local bank/ ATM/ hospital/restaurant info can also be delivered to a mobile user at a minimal cost.

11.2.4 BENEFITS OF MOBILE COMMERCE

The main advantage of mobile commerce is that it provides instant connectivity to the mobile user, irrespective of his/her geographical location and time of the day. The mobile user can stay connected with his/her business network and gather information even if he/she is in transit and remotely located away from the business installation. The same light weight mobile device can be used for making business transactions or making online payments round-the-clock in a cost-effective way. Highly personalized information can be delivered in the mobile device in an efficient manner to satisfy



numerous needs of a large number of customers. The major benefits of mobile commerce are as follows:

Anytime Anywhere

Mobile commerce together with wireless communication technology and wireless broadband internet access, keeps the mobile user connected with the internet while travelling across the globe. The business information is available to the mobile user any time of the day and anywhere around the globe. This anytime/anywhere internet access makes business transactions more flexible and customer communications more efficient, which in turn improves the productivity of the company and increases customer satisfaction. The valuable market information, stock/share prices, inventory position, delivery schedule, etc. are instantly available at the fingertips. Handheld devices, such as Blackberry, etc. work on internet mode and allow users to continuously send/receive electronic mail, download news alerts, stock prices and receive weather updates. The round the clock (24 x 7) internet availability benefits many users to conduct business transactions from their homes or from any other place while on the move and at any convenient time. Thus m-commerce offers greater mobility and flexibility to mobile users in performing business transactions using their handheld mobile devices.

Cost-effective

The costs of transactions using mobile devices are relatively low. The time-critical business data, such as reports, photographs, etc. can be captured and transmitted easily from the mobile devices without involving any bulky expensive equipment. The customer queries can be attended and support provided instantly from the mobile device, thus making customer support more comprehensive. The SMS-based micro payments facilitate bank account transfer within a few seconds and at the cost of an SMS. Contact less smartcard based mobile payments provide a low cost alternative for toll tax payments in mass transit systems. In case of mobile billing, users can pay for electricity bills, telephone bills, petrol, grocery, etc. through their mobile phones. The payments made in the mobile phones for such items will appear as part of their mobile phone bills, thus eliminating the need' for a third party payment mechanism such as, credit cards. This reduces the cost of payment to a large extent.

Personalized Service

Mobile commerce offers a number of personalized services to the mobile users depending on their various requirements and purposes. The digital cellular technology can monitor the location of user



performing mobile transactions. Knowledge of the user's location may be used to deliver timely and useful contents such as product availability and discount information to the potential customer. Timely information, such as flight schedules and flight availability can be delivered to the user at the last minute. Delivery of time critical as well as emergency information, SMS- based notifications and alerts can be easily made if the location of the user is tracked. The location tracking is also utilized in offering customized services to the user, such as delivery of discount coupons that can be cashed in and around of the location of the customer. Delivery of regional maps, driving directions and online directories are also possible if the location of the mobile user is known. Another major advantage-of location tracking is that, in criminal investigation, the location of the mobile user can be monitored and recorded as part of the investigation process.

11.2.5 LIMITATIONS OF MOBILE COMMERCE

Although mobile commerce has some distinctive advantages, such as instant connectivity and location and time independence over electronic commerce and offers low cost personalized services to the mobile users, it suffers from some serious limitations which restrict its use in mainstream business world. The mobile device limitations, such as small screen size, small memory capacity and lower processor speed makes it unsuitable for high quality internet graphics applications. The limited availability of bandwidth to various mobile operators imposes a limitation on the speed of operation of different mobile commerce applications. The wireless networks used in mobile commerce are more vulnerable to external hacker attacks compared to wired networks and stringent security arrangements in the form of encryption and authentication should be adopted to prevent unwanted intrusions. The main disadvantages of mobile commerce are explained in detail below.

(1) Mobile Device Limitations

1. Small screen size: Mobile devices have smaller screen size (of the order of 2 by 3 inches) and poor resolution which makes them inconvenient for browsing applications. Data entry can be quite difficult using small combinational keypad that comes with most of the mobile handheld devices. The wide and high resolution screens in conventional desktops or laptops used in e- commerce applications offer ease of use in data entry operations as well as viewing web pages. These larger screens support 1920 x 1080 resolution and 3D graphics display. Although mobile devices offer greater mobility and flexibility in accessing information, the smaller screen size restricts the amount of information that could be



presented and offers a less convenient user interface in the form of menu-based scroll-and-click mode of data entry.

2. Low speed processor: Most mobile devices come with low-powered processors with much lower processing speed compared to sophisticated processors (i.e. core 2 duo or i-core series) used in desktops or laptops. Such low speed processors restrict the download speed in most mobile commerce applications. The applications requiring too much processing power should be avoided as they may become irritably slow due to low speed processors. Also, keeping the low processor speed in mind, the mobile websites must be optimized to ensure customer satisfaction. Unnecessary plug-ins, flash images and animations should be removed to ensure speed of delivery.

3. Small memory capacity: The mobile devices do not have large storage space. The memory capacity in mobile devices is in the order of 5 GB to 10 GB compared to 2 TB or higher used in desktops/laptops. So, it is difficult to store large video files in mobile devices for future use. The mobile application developers must be concerned about the size of their applications during the development phase.

4. Low power backup: Mobile devices use batteries as their power supply. Normally, power for a mobile device lasts up to 2-3 days, depending on the size of the device. After this period, the battery should be recharged again, and it adds an additional burden to the user who has to remember every now and then to recharge it.

(2) Wireless Network Limitations

Mobile commerce depends on wireless networks which are usually of lower speed compared to wired networks. In many cases, wireless networks offer one-fourth speed of standard wired network. Also, most wireless networks are more common in urban areas and some of the rural areas might not have wireless communication facilities. So online mobile services may become unavailable in some rural areas, and thus the popularity of mobile services may be suffered. Unless the mobile device is 2.SG or 3G technologies compatible, the applications will become sluggish and unreliable compared to wired network applications. Atmospheric interference and fading of signals transmitted through wireless networks sometimes cause severe data errors and may even lead to disconnections.

(3) Bandwidth Restrictions

A major disadvantage of mobile commerce is the bandwidth limitation, which imposes a



limitation on speed of operation in various m-commerce applications. Wireless networks use frequency spectrum to transmit information across the network. Regulatory bodies control the use of available frequency spectrum and allocate the spectrum to various mobile operators. In India, the frequency spectrum were initially allocated and regulated by Department of Telecommunication (DoT). Later, the Telecom Regulatory Authority of India (TRAI) was set up to control the usage of frequency spectrum. The limited availability of bandwidth to various mobile operators in turn restricts the data rate in mobile commerce applications. The GSM technology offers the data rate of the order of 10 Kbps and 3G technology can go up to 10 Mbps.

(4) Security Issues

Another concern that is often raised in connection with mobile commerce is the security issue. Mobile devices are more vulnerable to theft, loss and mishandling. Special care must be taken to ensure that the security and privacy of the mobile customer are not compromised at the event of loss of a mobile device. This includes not storing sensitive information in the mobile devices and changing/locking of PIN (password fast and simple at the time of need).

Mobile commerce employs public wireless networks for transmission of signals which can be easily intercepted by hackers for capturing/ altering stream of data travelling through the wireless medium. In wired networks, in order to gain access, the intruder has to gain physical access to the wired infrastructure. In wireless networks, anyone with the ability to receive signal in a mobile device can gain access to the network. In order to protect the wireless network from unwanted users, various encryption and authentication techniques should be employed. As the handheld devices have limited computing power and storage capacity, it is difficult to employ 256 bit encryption technique that requires enough computing power. However, the SIM cards inside a cell phone can include the digital signatures of PKI system. Thus, the PKI system of digital signatures can be integrated in a mobile device that adds to the security of the mobile application.

Authentication of mobile devices prior to carrying out any financial transaction is another important issue. The Subscriber Identity Module (SIM) stores the subscriber identity in the form of cryptographic keys. The authentication server of the wireless network stores the matching keys and verifies the user identity prior to any transaction. Though it is far easier to intercept signals over wireless networks, the encryption and authentication mechanism makes it harder to decipher by the unwanted user.



11.2.6 MOBILE COMMERCE FRAMEWORK

Despite of the described limitations, numbers of people performing m-commerce transactions are growing exponentially. As in-commerce provides mobility to busy professionals, more and more people tend to access internet through their mobile phones. People find it more convenient to shift from e-commerce to m-commerce. And the projected global revenue from m-commerce is expected to cross 400 billion USD, during 2015. The day-to-day functioning of individuals as well as corporations is being transformed to mobile applications and is embedded in mobile devices. The mobile network operators have started providing value-added services that supports the new concepts of anytime anywhere computing. Accordingly, a new mobile business model has emerged, which is based on shared revenue distribution through sales in respective channels. For example, in mobile retail, a diverse range of mobile applications are developed to enable the multi-channel retailer to perform the key functions, such as mobile promotions, mobile payment, product information display, order management, catalogue management, create and display shopping list, loyalty programmes and other value-added services. Similarly, in travel industry, location-based tourism, mobile ticketing, navigational guidance and local weather/and traffic information delivery results in new revenue generating opportunities.

In order to make these value-added services work efficiently, and in a cost-effective manner, perfect collaboration between various network providers, technology providers and application developers is required. In order to integrate different mobile services, applications and technologies in a well-coordinated and controlled architecture, a mobile commerce framework needs to be developed. The purpose of the framework is to develop a structured integration of mobile services, applications and technology resources so that it will be able to deliver diverse range of value-added services in different industry sectors, and at the same time aim to reduce operating cost and improve efficiency to attract the end user population. The mobile commerce framework consists of the four basic building blocks as follows:

Content Management

This component deals with the creation, distribution and management of diverse range of media rich digital contents that can be browsed through the small screens of the mobile devices. The digital



contents are used in performing various business transactions such as buying and selling of goods, making online payments, product promos and providing on line customer support. An important part of content management is the ability to track different content providers and maintain and manage the relationships among them. The security and authenticity of the contents must be guaranteed and the access control mechanism must be provided to prevent unwanted users from misusing the document. The content distribution, rights management and clearing financial settlements, all come under the purview of content management module.

Technology Infrastructure

This component deals with the distribution of digital contents and transaction details over wireless communication networks to customer locations or other business installations. The wireless network infrastructure provides the very foundation of mobile commerce framework as it fulfils the basic requirements of data transmission between various business partners while performing any business transaction. The technology infrastructure includes wireless communication technology, Wireless Application Protocol (WAP) and mobile security technology. These technologies need to support digital content distribution, mobile application development and distribution and also provide a secure technological platform for mobile billing and prepaid services through the use of mobile Virtual Private Networks (VPN). Figure 2 depicts the Mobile Commerce Framework.

Application Development

The application development component of mobile commerce framework deals with the diverse range of mobile commerce applications. The main purpose of these mobile applications is to provide the product information to the end users, and also to enable them in performing the mobile business transactions. There are four major categories of mobile applications namely the information applications, communication applications, entertainment applications and commerce applications. Several mobile applications, such as mobile ticketing, mobile banking, mobile advertising, mobile office applications, etc. Fall under these categories. These applications support key business functionalities in respective verticals and are meant to achieve higher revenue generation as well as cost reduction. Sometimes, more than one application are combined together to deliver an aggregated service, which leads to further cost reduction. With the rapid development in various emerging mobile technologies, the application development is going through an evolutinal stage. In



order to meet the requirements of today's rapidly evolving markets, the mobile applications must be developed in an innovative manner so that it allows the service provider to quickly address the growing demands of the market and also at the same time offer more profitability and greater cost reduction.

Business Service Infrastructure

The business service infrastructure provides the backbone to the mobile commerce framework. It supports the back office functionalities, such as payment services, location and search facilities and security arrangements of the mobile commerce systems. Production and fulfilment of these services are beyond the scope of traditional telecom service providers. These services are managed and delivered by some outside vendors, who have the ability and experience to provide such functionalities. They maintain the required infrastructure for supporting secured financial transactions in mobile commerce environments and also provide back-end support for searching and other facilities.

Such back office systems are meant to be flexible enough and also are capable of rapid deployment of new services. They have a direct impact on end user experience, and have the greatest influence on the success or failure of the service provider. With the help of such back office infrastructures, mobile service providers can avoid upfront capital IT expenditure, and also these managed services offer the service providers the ability to quickly upgrade to the newer technological environment without any significant investment.

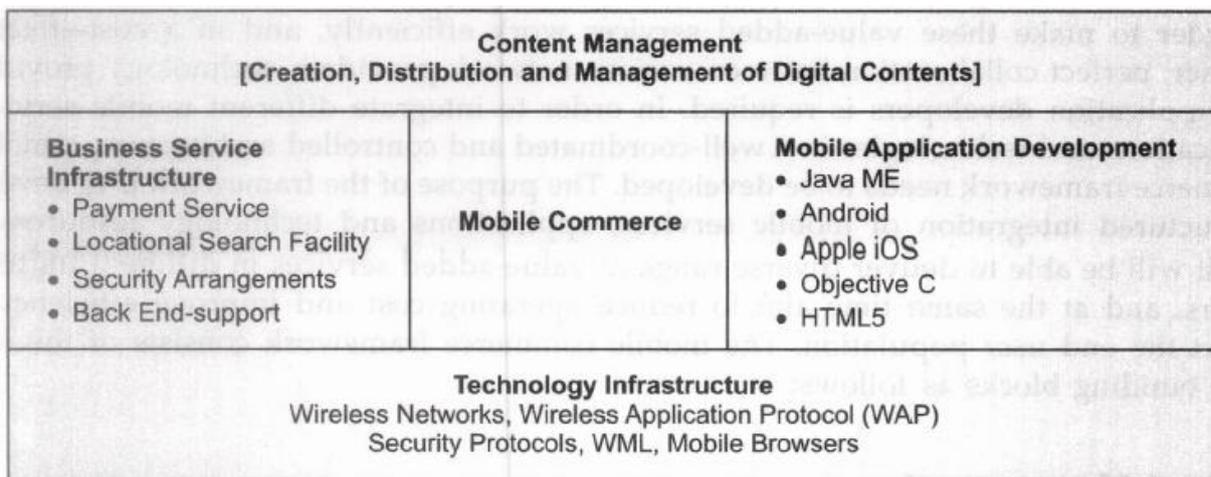


Fig 2 : Mobile Commerce Framework.



Above four components are the four pillars of mobile commerce framework and all m-commerce activities revolve around them. Whenever a mobile user tends to download MP3 music or a latest movie in his/her mobile device, sends an SMS requesting online payment to a bank, submits online order form requesting purchase in a mobile browser or books a mobile airline ticket, he/she is indulging in either or all four of the above mobile commerce framework components. In order to cope with the dynamic nature of the modern day lifestyle, people are demanding more mobility in accessing their business applications. A properly integrated and well-coordinated mobile commerce framework needs to be developed in order to provide easy-to-use and secure mobile services to end customers. The main purpose of a structured and balanced mobile commerce framework is to enable the organizations to rapidly adapt to the latest mobile technologies and to ensure customer loyalty by providing them improved and enhanced services in sync with the growing market demands.

11.2.7 MOBILE COMMERCE BUSINESS MODELS

A business model determines the path or process through which a business organization can realize some profit. It shows the way by which an organization can make some investment, add some value to the investment, get a finished product or service and generate some revenue through sales of the product or service. The revenue generated through sales must exceed the operating cost, so that the company gets some profit. Business models specify the mechanism for generating profit margins and to sustain in the value chain. Thus, business models help managers in strategic planning and formulating overall business strategy of the organization. Electronic commerce has some traditional business models that are widely followed by all major e-commerce vendors worldwide.

These include Merchant model, Broker model, Service Provider model, Advertiser model, etc. Mobile commerce business models differ from those of electronic commerce due to their intrinsic difference in operations and technology. As mobile commerce imparts extra mobility to the users, the business models also reflect the mobility in their nature. The four major services offered by mobile commerce are the payment services, mobile advertisements, mobile shopping and mobile entertainment. Accordingly, mobile commerce business models also revolve around these four applications. The four major mobile commerce business models are described below:

(1) Payment Model



In this model, mobile payment service providers offer mobile payment services that allow users to make cashless payment transactions including banking transactions, share trading, tax/bill payments and ticket or other retail purchases using credit/debit card or bank PIN. The payment service providers have collaboration with banks (or other financial institutions) and/ or mobile network operators, and accordingly get bank-controlled mobile payment model or operator controlled mobile payment model. The payment service provider charges a certain percentage fee for each payment transaction made through the payment application. Alternatively, the user can pay a nominal monthly subscription fee to the payment service provider and can use the service as and when required

(2) Advertiser Model

This model is an extension of traditional e-commerce advertiser model and provides mobile websites which can be viewed by mobile users in their handheld mobile devices. Advertising companies can display their advertising messages in the website and pay a rental fee to the hosting website for displaying their messages. These mobile advertising websites usually offer some basic services such as email service, search engines, news service or social networking service to the users and post advertising messages in these sites to enjoy greater coverage. The advertisements often come with purchase buttons that allow users to purchase the product directly from their mobile devices. The mobile payment service is also provided to facilitate mobile purchase directly from the advertising websites. The advertiser companies pay a fixed fee to the advertising website for displaying their advertising messages. Additional revenue is generated for each purchase transaction made by the user through the website.

(3) Shopping Model

This model is similar to e-commerce merchant model where retailers create mobile websites to display their range of products to the mobile devices of the customers. The mobile users can browse the mobile websites in their WAP enabled mobile screens and select and purchase any product of their choice. Mobile payment option is also provided in the website so that the users can make mobile payment for the purchased product and complete the deal even while in transit or far away from the actual store location. Thus, shopping model allows retailers to generate additional revenues through mobile shopping and can improve their profit margins.

(4) Content Provider Model



In this model, mobile service providers offer a host of entertainment contents, such as breaking news, weather forecast, traffic updates, music, mobile games, TV shows, video content, movies, etc. that could be downloaded to user mobile devices. Network operators have tie-ups with various content providers and offer both subscription-based services as well as pay-per-use services to mobile customers. Location-based services, such as map-based navigational services, discount coupons offered in local retail stores or restaurants, news of local events, etc. are also delivered in customer mobile devices. The revenue is generated through subscription fees (for news, traffic/weather updates, movies, and games), usage fees (TV shows, videos, games etc.) or data download fees (for e-mails, e-books, etc.). Various media houses, press agencies or content aggregators follow this model for generating extra revenue through mobile channel.

11.2.8M-COMMERCE APPLICATIONS

The main advantage of mobile commerce is that it offers instant connectivity to mobile users even if they are travelling in remote areas and want to communicate in the wee hours of the day. With the help of digital cellular technology and wireless broadband internet access, the mobile user can browse through websites on the screens of their mobile devices and perform business transactions anytime and from anywhere. Customers can place orders as well as pay their bills through their mobile devices while in transit. As the price of mobile phones are decreasing rapidly, number of mobile phone users are increasing in millions and more and more people resort to m-commerce activities.

With the increased use of mobile devices, mobile marketing and advertising have become an effective tool and all big corporations have started their product campaign through mobile devices. In financial sector, mobile banking allows customers to access their bank accounts and pay their bills from their mobile handheld devices. The same handheld device can be used for viewing the latest stock prices and also for conducting share trading. The service plan details of any mobile service, such as mobile phone service can be accessed, mobile bill payment can be achieved and account updates can be viewed through the mobile devices easily and effectively. In information services, delivery of financial news, sports events, weather reports and traffic updates, all can be achieved with a minimal cost and time. In retail industry, customers can place orders for goods/services from their mobile devices on-the-fly. All these applications (see Figure 3) come as the direct consequences of the instant connectivity feature of mobile commerce. The four major products of mobile commerce are as follows:



(1) Mobile Banking

Mobile banking is the process of performing banking transactions such as balance checking, account transfer, bill payments, credit card-based payments, etc. through a mobile device, such as a mobile phone or a Personal Digital Assistant (PDA). Such transactions could be performed from any remote locations and at any time of the day irrespective of the normal working hours of the bank. In order to avail the mobile banking facility, the customer must have an account in the bank, the mobile phone number must be preregistered in the bank and also the network service provider (for the mobile device of the customer) must have a tie-up with the bank. When the customer wants to perform a mobile banking transaction, the transaction request from the customer first goes to the premises of the mobile service provider, and from there it is finally routed to the bank. Depending on the type of transaction, two types of mobile banking are available, namely SMS-banking and WAP-based mobile banking. SMS banking is usually used for non-financial transactions, such as viewing of balance statement, requesting for a cheque book, status checking or stopping a check payment although some banks permit financial transactions also through SMS banking. In SMS banking, an SMS code requesting a transaction is sent to a particular number (as directed by the bank) from the mobile device of the customer. As soon as the bank receives the SMS, the required transaction is performed; the information is retrieved (in case of non-financial transaction) and sent back to the customer mobile phone in the form of another SMS. The entire transaction takes only a few seconds and the cost of the transaction is only that of an SMS. For different types of transactions different SMS codes are used.

In WAP-based mobile banking, the customers are provided with a mobile Personal Identification Number (PIN) by the bank. At the time of performing the transaction, the customer logs on to the WAP website of the bank from the WAP-enabled mobile device. In the bank website, the customer enters the PIN to gain access to the various financial/non-financial transactions of the bank. After the successful verification of the PIN by the bank, the customer is allowed to perform various financial/non-financial transactions, such as transfer of funds from one account to other, payment of bills, credit card-based payments, fixed deposit enquiry, etc. Another facility available in mobile banking is mobile banking alerts. The customers are provided regular alerts whenever a special type of transaction occurs. For example, the customers are alerted whenever credit/ debit crosses a threshold or a check is returned.

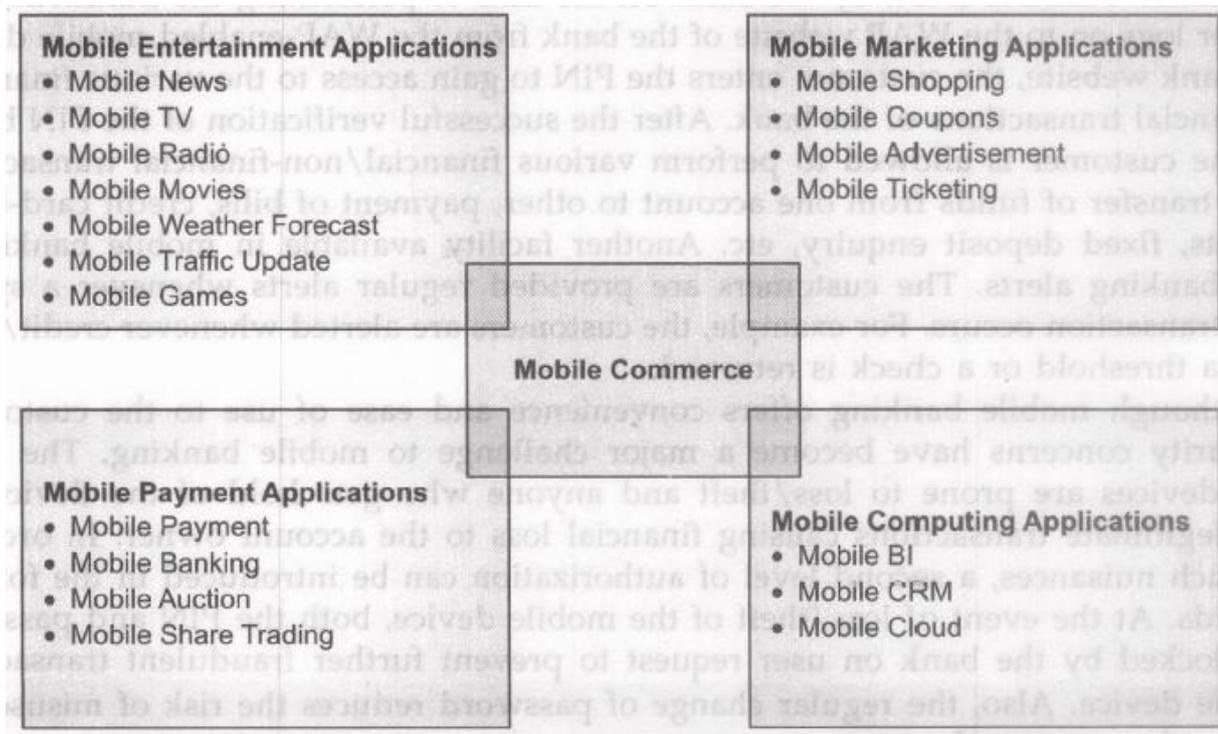


Fig 3: Mobile Commerce Applications.

Although mobile banking offers convenience and ease of use to the customers, the security concerns have become a major challenge to mobile banking. The small mobile devices are prone to loss/theft and anyone who gets hold of the device can make illegitimate transactions causing financial loss to the account owner. In order to avoid such nuisances, a second level of authorization can be introduced in the form of passwords. At the event of loss/theft of the mobile device, both the PIN and password can be locked by the bank on user request to prevent further fraudulent transactions using the device. Also, the regular change of password reduces the risk of misuse and tampering by unwanted users.

(2) Mobile Payments

Mobile payment is an alternative payment system where the mobile user makes payment using the mobile device for a wide range of services or goods. Depending on the mode of payments, mobile payments can be broadly classified in the following categories:

Mobile Phone Based Payments:

In this mode, the customer makes payment using the mobile device. In SMS-based payment, the payment is made by sending an SMS to the retailer. Both the customer and the retailer must have a



regular credit! Debit account in a partner bank. After selecting an item for purchase, the customer sends an SMS 'from his/her mobile device to the retailer requesting the purchase. The retailer responds by sending a payment request through SMS to the customer. The customer keys in the bank PIN number to approve the payment. The bank verifies the PIN and the amount is automatically debited from the customer bank account to the retailer's account. Both the retailer and the customer get SMS from the bank indicating the details of the transaction and the entire process takes only 10-15 seconds.

In SIM card based payment, the customer uses the mobile phone for purchase of digitized items such as mobile ringtones, MP3 music, video games, wallpapers, etc. that can be downloaded in the mobile device itself. The purchase amount is added to the monthly mobile bill of the customer. This offers an alternate cashless payment option that does not require use of credit! debit cards or any other online payment service provider, such as PayPal and thus bypass bank and credit card companies altogether. The payment is either debited from the subscriber's pre-paid account or added to the standard post-paid invoice of the subscriber as the case may be.

Card based Mobile Payments

In credit card based mobile payments, the mobile handset is used as a credit card for making payments. The credit card issuing bank gives a PIN number to the mobile handset user. At the time of making payments, the mobile user initiates the transaction by entering the PIN from his/her mobile handset. The issuing bank verifies the PIN and authorizes the payment. Next, the customer enters the amount to be paid and the transaction is completed. The amount is automatically deducted from the credit card account of the mobile user and credited to the bank account of the payee business partner, such as the shop owner.

In smartcard based mobile payments, the SIM (Subscriber Identity Module) card of a mobile handset are equipped with smart card capabilities. Smart cards are plastic cards with embedded integrated circuits. Containing microprocessor and memory to store personal data such as credit card number, PIN, driving license number, etc. The information stored in a smartcard can be read by a card reader in either contact or contact less mode. The SIM card of a mobile device is also a processor card containing programmable memory to store user information for authentication purpose. If the smartcard capabilities are combined with the SIM card of a mobile device, it can be used as a contact less smartcard, and can be used effectively in making mobile payments.



Mobile phones equipped with contact less smartcards employ Near Field Communication (NFC) technology to exchange data between the mobile device and the nearby smartcard readers. It combines the smartcard interface as well as the reader interface in the mobile device so that the mobile device can communicate with the card readers and other NFC devices/mobile phones, At the time of making payments, the mobile phone user waves his/her mobile phone (equipped with contact less smartcard) near a reader module installed in a store or in a public transport system. In order to make the transaction more secure, a PIN is used for authentication purpose, which is automatically supplied by the smartcard. After successful verification of the PIN, the transaction is completed and the payment is automatically deducted from the pre-paid account of the mobile user or charged to the bank account of the user directly. Such NFC-based contact less mobile payment finds wide application in transportation services, toll-tax collection, transit fare collection in mass transit networks, parking fee collection and other unattended POS terminals, where the users can pay with their smartcard enabled mobile phones sitting inside the car while driving.

Mobile Web Payments through WAP

In this mode of mobile payment, the payment is made through the web pages displayed in the micro browser of the mobile phone. The web page is displayed following Wireless Application Protocol (WAP) and associated technology. At the time of making a purchase, the mobile user types the URL of the website of a merchant in the mobile device. The website containing product information is displayed in the micro browser of the mobile handset. The user selects a product that he/she intends to buy and places order for the product through the website. The merchant then sends an invoice to the user. If the user intends to pay through a credit card, he/she enters the credit card number, which is transmitted to the partner bank through a secured channel that employs encryption. The partner bank verifies the credit card number, and if found OK, informs the acquirer bank for making the payment. Alternatively, if the user wants to pay directly from the partner bank in the form of account transfer, he/she enters the PIN number, which is sent to the partner bank for verification. After successful verification of the PIN, the partner bank debits the amount from the user's account and credits to the merchant's account. In either case, an SMS is sent to both the user and the merchant confirming the payment. The entire payment process is simple, quick and user-friendly as they have a similarity to the familiar online payment systems.



Above mobile payment systems are emerging as a potential payment mechanism that ensures fast, smooth and transparent micro payment solutions to mobile users. The mobile phones tend to replace the pocket money and provide a low cost alternative to credit/debit cards for cashless payments anytime, anywhere and for anything. However, like all other online payment systems, special care should be taken to secure such mobile payments. Stringent security arrangements in the form of encryption and/or password authentication should be adopted to ensure that the financial transaction performed through the mobile device cannot be duplicated, re-used or counterfeited.

(3) Mobile Ticketing

Mobile ticketing is a special application of m-commerce which allows users to purchase tickets for air/rail/bus travel or for any sports/ entertainment events from any location and at any time using mobile phones or any mobile device. The users can avoid tedious and time consuming process of getting paper tickets after waiting in a long line and the organizations can reduce production, distribution and infrastructural cost by providing simpler ways to purchase tickets anytime/anywhere. Mobile tickets are available for a number of cases, such as mass transit tickets, airline check-in, movie/theatre shows, sporting events, consumer voucher distribution, and so on. There are a variety of options by which a user can purchase mobile tickets, such as online purchase from merchant website, from WAP page in the mobile handset, purchase via SMS from the mobile handset, over the phone from a voice call or through a secure mobile ticketing application. Due to the convenience it offers to the customers and cost savings it offers to the companies, mobile ticketing is gaining momentum and more and more people are opting for mobile ticketing. Around 6 million mobile tickets were sold during 2012 worldwide, and the number is expected to increase manifold to cope with the ever increasing demand of the mobile users. At the time of purchasing a mobile ticket, the mobile handset owner logs on to the website of the organization (providing the mobile ticket) and choose "Mobile Ticketing" as the delivery option. Alternatively, the user can log on to WAP page of the organization in the mobile handset. Next, the cell phone number, mobile carrier and cell phone model is entered in the website. In another variation, the request for mobile ticket can be sent through an SMS from the mobile handset to the designated organization. After making online/mobile payment for the ticket, the user receives the mobile ticket in the form of a text message in the phone. The text message includes an image (MMS) with a barcode. At the venue of the event/airport/railway station, the text message with the barcode is produced at the gate.



The gate is usually equipped with a barcode reader which after successful verification allows the user to pass through. Alternatively, the alphanumeric number in the barcode can be manually entered in a computer at the gate for verification.

With affordable internet services, decline in handset prices, rapid evolution of secured and easy-to-use mobile applications and convenience of mobile usage, more and more people have started purchasing travel tickets through mobile devices. Realizing the potential of mobile ticketing, almost all major travel portals have launched their mobile ticketing applications for booking purpose. People at the time of making last minute changes to their travel plans find mobile ticketing the only option giving surety and security. In India, Indian Railways (website irctc.com), makemytrip.com, cleartrip.com, yatra.com and many more offer mobile ticketing in their travel offerings. Apart from ticket booking, such travel portals also allow other customer support features, such as cancellation of tickets, tracking refunds on cancelled tickets, and so on. In order to maintain security and integrity of service, special validation techniques have been adopted to avoid reuse of mobile tickets. Such systems employ encryption of barcode data of the mobile ticket, which is decoded at the venue and validated at the centralized server containing ticket database. The mobile ticket once scanned by the barcode reader can never be reused again, thus preventing the fraudulent practice of duplicate tickets.

(4) Mobile Computing

Mobile computing is a technology that allows users to perform normal computing operations, such as internet surfing, document preparation, spread sheeting, preparing PowerPoint presentations, send/receive e-mails or download MP3 audio files using portable computing devices while in transit. The portable computing devices include smart phones, personal digital assistants, laptops, ultra mobile PC or wearable computers. Some of these portable computers have bigger screens compared to mobile phones and hence overcome the small screen limitations. For example, Apple iPad comes with an 8" x 10" screen, which is suitable for reading e-books as well as viewing websites.

In order to communicate with the external world, mobile computing employs wireless communication technology. For wireless internet access, Wi-Fi or Wi-Max technology is used that utilizes radio waves to broadcast internet signal from a wireless router to the surrounding area. Alternatively, digital cellular technology can be employed that utilizes cellular modem in the form of a data card that connects to nearby cell towers for high speed broadband internet access. The data card



fits into the PC card slot of the laptop or the notebook computer. Broadband internet access is also provided to cell phones and PDAs using cellular broadband technology.

Mobile computing uses specially developed software that allows users to perform all the functions that are possible in standard desktop PCs connected under LAN environment. Such software are designed for small-power handheld devices such as Personal Digital Assistants (PDA), enterprise digital assistants or smart phones, and are either pre-loaded in these devices or downloaded by customers from internet. Usually, mobile software is developed by transforming existing software used by computers into software which can be used in any mobile device. Sometimes, new mobile applications are developed for different mobile platforms and programming languages based on the type of mobile device. Different mobile devices use different hardware components, and therefore, the corresponding mobile software needs to be developed using different software architectures and operating systems. Well-known mobile software platforms include Java ME, Symbian OS, Android, Windows mobile, and BREW & Palm OS. Each of these platforms supports a development environment that provides tools to allow software developers write numerous mobile applications in these mobile platforms. Apart from normal e-commerce and m-commerce operations, mobile computing finds wide application in transportation industry, manufacturing and mining industry and distribution industry. In transportation industry, mobile computing is used in exact delivery time tracking, consignment tracking, fleet management information gathering and real-time traffic reporting. Mobile networks are employed. to provide' two-way communication between fleet drivers and their dispatch centres. Real-time passenger information can be obtained from kiosks/bus stops/road signs. In mining industries, portable computers are used in mines for in-process monitoring. In manufacturing industry, portable computers fitted in shop floors help in real time asset management, instant purchase verification, delivery confirmation and order tracking. In hospitality industry, guest check-in can be done using handheld devices, such as PDAs, Blackberry and cellular phones. Portable computers can be employed in sales force automation and mobile POS (Point of Sale) applications. Another service associated with mobile computing is cloud computing that allows mobile users to access application software, databases and shared computing resources, such as server spaces through internet from a mobile computer, The application software such as Microsoft Office, databases etc. reside on a remote server and user can access and use the resource through internet as and when required and pay for .exactly what they use. Thus, the company field representatives can utilize company resources,



such as, databases or application software from remote locations through internet accessed in their mobile computers, rather than carrying the company resources with themselves in bulky machines. Mobile computing also provides access to company's Virtual Private Network (VPN) by tunnelling through the internet. Mobile computing has become an integral part of corporate world. From Gmail to Twitter, Skype to LinkedIn, cloud computing to VPN, it is virtually impossible to do without it just like it is without electricity.

11.2.9 E-COMMERCE vs. M-COMMERCE

Electronic Commerce (E-Commerce) is the process of conducting business transactions through internet using personal computers or laptops. It employs wired Local Area Networks and cable internet to perform an array of operations, such as online purchase, online payment, online banking, online share trading or online marketing and advertising. People get the freedom of conducting business from their home or making online payments from their offices without travelling to the shop location. However, in order to perform e-commerce transactions, wired internet connectivity as well as personal computers or laptops having internet facility is essential. Thus, in remote areas with limited or no internet facility as well as areas without electricity, e-commerce becomes completely ineffective.

Mobile commerce, on the other hand, allows mobile users to conduct business transactions through their internet enabled mobile devices, such as smartphones, tablets, digital assistants or PDAs. It employs high frequency radio waves for providing wireless internet connectivity and allows mobile users to perform mobile shopping, mobile payments, mobile auctions or mobile ticketing through their mobile devices even when they are out in the field or are travelling. Thus, mobile commerce offers freedom from wired internet connectivity, and supports critical business transactions under completely mobile environment. People can perform share transactions, make tax or bill payments or perform fund transfers through mobile banking, even if they are travelling in remote areas far from their home or office. In other words, mobile commerce aptly fits into the extremely mobile lifestyle of modern day business executives and has become an integral part of daily lives of billions of mobile users.



Table 1: Comparison of E-commerce and M-commerce

Factors	E-commerce	M-commerce
Mobility	E-commerce employs wired networks for internet connectivity and hence is restricted inside a building. It offers anytime connectivity.	M-commerce employs high frequency wireless networks for providing wireless internet and is completely ubiquitous in nature. It offers anytime anywhere connectivity.
Reliability	Wired networks are more reliable and suffer less interference and noise. Quality of data transmitted is better as there is little or no cross-talk.	Wireless networks suffer from interference from adjacent channel frequencies or reflected waves that tend to reduce the intensity and quality of transmission. Special error detection techniques are employed to eliminate errors in transmission and improve signal quality.
Speed	The transmission speed of wired networks are much higher (of the order of 1000 Mbps)	The transmission speed of modern wireless networks are usually of the order of 100 Mbps.
Security	E-commerce transactions are more secured as the networks remain well-protected inside campus buildings. Firewalls and proxy servers are used to keep confidential business data secured in the central server.	M-commerce transactions through wireless networks are more vulnerable to hacker and other security attacks and require stringent security arrangements in the form of encryption and firewalls to prevent damage or misuse of private data during transmission.
Cost	The initial network set-up cost is high and periodic maintenance is mandatory.	The initial set-up cost is much lower and maintenance cost is minimal.
Usability	E-commerce is performed through personal computers or laptops having larger screens, which are more convenient and user-friendly.	M-commerce is performed through handheld mobile devices having smaller screens and lower battery life. Also, the small devices have higher chance of getting lost or stolen, thus resulting to data loss.

Difference between E-commerce and M-commerce

The fundamental difference of e-commerce and in-commerce lies on the fact that the former uses wired networks and the latter uses wireless networks for internet connectivity. Although wired networks require cumbersome cabling and switching operations to provide connectivity to each and every computer and other peripheral devices, they offer better performance and better speed as compared to the wireless networks. A wired network can offer data rate of the order of 1000 Mbps, whereas a



wireless network usually offers data rate of the order of 100 Mbps. A wired network is much more secure than wireless networks, as it is much more difficult to gain access to the internal wired network inside a protected building without breaking in. On the other hand, it is much easier to break the security barrier of a wireless network and gain access to private and confidential data stored (or in transit) inside the wireless network. Proper security arrangements in the form of encryption are employed in order to make wireless networks as secure as their wired counterparts. The comparison between e-commerce and m-commerce is given in Table 1.

In spite of above disadvantages, mobile commerce is fast becoming the preferred choice of numerous mobile users for making online transactions during travel or while outside the range of conventional wired networks in their home or office buildings. They prefer to watch their favourite TV shows, play online games, connect with friends through mobile social networking sites or purchase train/bus/event tickets, while travelling inside a bus or while waiting inside an airport. The ubiquitous nature of mobile devices adds extra mobility to the mobile users worldwide, and as a result there is an exponential growth in the mobile online transactions across all industry sectors and verticals.

11.3 E-GOVERNANCE

The terms government and governance have been widely disputed. Saxena (2005) draws a key distinction between 'government' and 'governance'. He identifies the government as an institution, whereas governance may be seen as a wider concept illustrating forms of governance that can be undertaken not only by government authority but by private firms, non-governmental organization or associations of firms.

Governments are specific institutions that donate to governance. In other words, it is suggested that governance focuses on the approach in which decisions are made, while government focuses on the approach in which these decisions are carried out.

The Government of India views E-Governance as a strategic tool for transforming Governance and improving the quality of services provided by the government to its people. India's experience in E-Governance has demonstrated significant success in improving accessibility, cutting down costs, reducing corruption, extending help and increased access to un-served groups. In this phase of experimentation, many e-initiatives have reached millions of people belonging to these sections of



society. Improved access to information and services has provided economic and social development opportunities, facilitated participation and communication in policy and decision-making processes and empowerment of the weakest groups. This has led to fostering a sense of ownership and building of social capital, which in turn, constitute a basis for local revitalization.

The Government of India, in various forums, has indicated its commitment to provide efficient and transparent government to all strata of society. E-Governance is now mainly seen as a key element of the country's governance and administrative reform agenda. The Government of India aspires to provide:

- Governance that is easily understood by and accountable to the citizens, open to democratic involvement and scrutiny (an open and transparent government)
- Citizen-centric governance that will cover all of its services and respect everyone as individuals by providing personalized services.
- An effective government that delivers maximum value for taxpayers' money (quick and efficient services)

11.3.1 E-GOVERNMENT

E-Government is not simply a matter of giving government officials computers or automating old practices. Neither the use of computers nor the automation of complex procedures can bring about greater effectiveness in government or promote civic participation. Focusing solely on technological solutions will not change the mentality of bureaucrats who view the citizen as neither a customer of government nor a participant in decision-making.

Understood correctly, e-Government utilizes technology to accomplish reform by fostering transparency, eliminating distance and other divides, and empowering people to participate in the political processes that affect their lives.

Governments have different strategies to build e-government. Some have created comprehensive long-term plans. Others have opted to identify just a few key areas as the focus of early projects. In all cases, however, the countries identified as most successful have begun with smaller projects in phases on which to build a structure.



To assist policymakers in devising their own plans and initiatives, this handbook divides the process of e- government implementation into three phases. These phases are not dependent on each other, nor need one phase be completed before another can begin, but conceptually they offer three ways to think about the goals of e-government. The three phases are Publish, Interact and Transact.

Government to SMART Government

The one line translation of SMART Governance is in fact is very true in meaning. I want to illustrate every word in my thoughts as under:

Simple: When hierarchy of governing people is simple and is fit in the eyes of people for whom result of governance is meant, than only it is meaningful.

Moral: Governing people should be high in moral values. It is only inner moral value that inspire individual to do a justified job, which is essential for people looking towards them for justice.

Accountable: As per management principle accountability is more with more authority/power. Hence people sitting on every stage concerned with governance should give direction with feeling of accountability towards the result of action.

Responsive: People appointed for governing others have to responsive in action. Their action should be immediate and at the time of need, because something denied at the time of need is useless, if later given. It wipes the faith of people.

Transparency: Transparency is like a mirror in administration which always shows other the good and bad point, needs to be clarified or appreciated which are otherwise hidden in nature.

In continuation to above one more thing I would like to add is that it should be innovative in nature of good to very good and very good to outstanding and outstanding to super.

11.3.2E-GOVERNANCE: DEFINITION

'E-Government' or e-Governance is defined as 'The utilization of the Internet and the world-wide-web for delivering government information and services to the citizens.' (United Nations, 2006; AOEMA, 2005),

'Electronic Governance' essentially refers to the approach 'How government utilized IT, ICT, and other web-based telecommunication technologies to improve and/or enhance on the efficiency and effectiveness of service delivery in the public sector.' Like when you are using ATM facility of a Bank



to collect cash anytime from anywhere or you are using on line fund transfer facility of an Indian bank is an application of e-Governance.

One more definition of e-Governance is “the use of information and communication technologies, and particularly the internet, as a tool to achieve better government”. In this description, the internet is defined as a requirement and a possible medium for e-Governance.

11.3.3 FOUR STAGES OF E-GOVERNMENT

E-Government is a relatively new term that has emerged over the past several years. As governments all over the country have been making the commitment to E-Government, certain patterns have developed that reflect the stages of evolution:

Phase 1: Presence

This first stage of E-Government development is characterized by the existence of a presence on the Internet. During this first phase, the Internet sites are rather static in nature and are only meant to provide general information.

Phase 2: Interaction

This second stage of e-Government development is characterized by Internet sites that provide search capabilities, host forms to download, and provide links to other relevant sites. In most instances, this stage enables the public to access critical information online, but requires a visit to a government office in order to complete the task.

Phase 3: Transaction

This third stage of e-Government development is characterized by empowering the public to conduct and complete entire tasks online. The focus of this stage is to build self-service applications for the public to access online. This is the stage where Oakland County is currently.

Phase 4: Transformation

The fourth stage of e-Government development is characterized by redefining the delivery of governmental information and services. This phase relies on robust customer relationship management (CRM) tools, wireless access devices and new methods of alternative service delivery capabilities that reshape relationships between citizens, businesses, employees and governments.



11.3.4 IMPORTANCE OF E-GOVERNMENT

The importance of e-government is closely inter-related with importance of good government in country. We can see that good government as in exercise of administrative, political and economic authority to manage affair and transaction of country in each and every level. The main importance of e-government is to support and simplify e-governance for all parties, government, citizen and business. Following are some points which make clearer about E-government objective and importance.

- Better delivery of government services to citizens
- Improved interactions with businesses, industries, and citizen empowerment through access of information and Communication Technology.
- Supporting economic growth and poverty reduction through improved access to ICTs.
- Strengthening tenets of good governance – efficiency, transparency, accountability, and inclusiveness
- 365 days * 24 Hours fulfilling changed expectations of citizens –They expect the service from government as they get from private business.
- 365 days * 24 Hours Generating information and knowledge in line with socio-economic dynamism.
- 365 days * 24 Hours Ensuring citizen centricity (also extended to include businesses) and service orientation (amidst changing level of expectations at par with private sector entities)

11.3.5 NATIONAL E-GOVERNANCE PLAN

The National E-Governance Plan of Indian Government seeks to lay the foundation and provide the impetus for long-term growth of e-Governance within the country. The plan seeks to create the right governance and institutional mechanisms, set up the core infrastructure and policies and implements a number of Mission Mode Projects at the centre, state and integrated service levels to create a citizen-centric and business-centric environment for governance.

The National e-Governance Plan (NeGP), takes a holistic view of e-Governance initiatives across the country, integrating them into a collective vision, a shared cause. Around this idea, a massive countrywide infrastructure reaching down to the remotest of villages is evolving, and large-scale digitization of records is taking place to enable easy, reliable access over the internet. The ultimate



objective is to bring public services closer home to citizens, as articulated in the Vision Statement of NeGP.

“Make all Government services accessible to the common man in his locality, through common service delivery outlets, and ensure efficiency, transparency, and reliability of such services at affordable costs to realise the basic needs of the common man”

The Government approved the National e-Governance Plan (NeGP), comprising of 27 Mission Mode Projects (MMPs) and 8 components, on May 18, 2006. The Government has accorded approval to the vision, approach, strategy, key components, implementation methodology, and management structure for NeGP. However, the approval of NeGP does not constitute financial approval(s) for all the Mission Mode Projects (MMPs) and components under it. The existing or on-going projects in the MMP category, being implemented by various Central Ministries, States, and State Departments would be suitably augmented and enhanced to align with the objectives of NeGP.

11.3.6 MISSION MODE PROJECTS AND THEIR IMPLEMENTATION STATUS

NeGP comprises of 27 Mission Mode Projects (MMPs) encompassing 10 Central MMPs, 10 State MMPs and 7 Integrated MMPs spanning multiple Ministries/ Departments. "Mission Mode" implies that the objective and the scope of the project are clearly defined, that the project has measurable outcomes and service-levels, and the project has well-defined milestones and timelines for implementation.

MMPs are owned and spearheaded by various Line Ministries concerned for Central, State, and Integrated MMPs. The concerned Ministry/ Department is entirely responsible for all decisions related to their MMPs. However, decisions impacting NeGP as a whole are taken in consultation with DIT. Additionally, wherever required by the concerned Ministries/ Departments, DIT provides necessary support for project formulation and development.

Every State has the flexibility of identifying up to 5 additional State-specific MMPs (relevant for economic development within the State). In cases where Central Assistance is required, such inclusions are considered on the advice of the concerned Line Ministries/ Departments.

Central MMPs

- Banking
- Central Excise & Customs



- Income Tax (IT)
- Insurance
- MCA21
- National Citizen Database
- Passport
- Immigration, Visa and Foreigners Registration & Tracking
- Pension
- E-Office

State MMPs

- Agriculture
- Commercial Taxes
- e-District
- Employment Exchange
- Land Records
- Municipalities
- Gram Panchayats
- Police
- Road Transport
- Treasuries

Integrated MMPs

- CSC
- E-Biz
- E-Courts
- E-Procurement
- EDI For e-Trade
- National e-governance Service Delivery Gateway
- India Portal

Central MMPs

Banking



Evolution of core banking technology in India has brought in the convenience of "anytime, anywhere banking" to Indian customers. There is now a movement towards integration of core banking solutions of various banks, which is expected to bring in operational efficiency and reduce the time and effort involved in handling and settling transactions, thereby improving customer service and facilitating regulatory compliance.

The Banking MMP covers the following services:

- Electronic Central Registry under Sarfaesi Act, 2002
- One India One Account-for Public Sector Banks
- Electronic Mass Payment System

Central Excise & Customs

The Central Board for Excise and Customs (CBEC) is implementing this MMP with a view to facilitate trade and industry by streamlining and simplifying customs and excise processes, and to create a climate for voluntary compliance.

The project aims to network 20,000 users in 245 cities using wide area network, and equip taxpayers with up-to-date information relating to Customs, Central Excise, Service Tax Laws, etc. over the internet.

Some of the services proposed to be covered in this MMP are:

- Simplification of registration, returns, revenue reconciliation and exports procedures
- Movement towards integration of goods and service taxation
- e-Registration for excise and service tax
- e-Filing of returns and refunds
- Integration of e-filing with system driven, risk-based scrutiny
- Export facilitation through linkages between Excise and Customs
- Improved dispute resolution mechanism
- Monitoring of arrears and their recovery
- Central Excise Revenue reconciliation

Income Tax (IT)

The Income Tax Department of India is implementing a plan for setting up a comprehensive service that enables citizens to transact all businesses with the Department on an anywhere, anytime basis.

Some of the services proposed to be covered under the Income Tax MMP are:



- Allocation of Permanent Account Number (PAN)
- Tax accounting
- Taxpayer grievance redressal
- Taxpayer correspondence
- Tax compliance
- Online submission of returns
- Processing of tax return
- Processing of tax-deducted-at-source (TDS) return

Insurance

This MMP has been conceived with a view improve services for customers in the General Insurance sector. The MMP aims to:

- Facilitate customer service through education, information, speedy processing of claims and online issuance of policies on web
- Provide automated grievance reporting and redressal facility to customers
- Create and enlarge business opportunities
- Create holistic database of insurance users
- Integrate insurance database(s) with other government database(s) to analyse social security aspects and facilitate service delivery

The project is proposed to be implemented through the four PSU Insurance companies.

MCA21

The Ministry of Corporate Affairs (MCA), Government of India, has initiated the MCA21 project, which enables easy and secure access to MCA services in an assisted manner for corporate entities, professionals, and general public. The MCA21 project is designed to fully automate all processes related to enforcement and compliance of the legal requirements under the Companies Act, 1956. The project further seeks to achieve inter-operability with the National e-Governance Services Delivery Gateway (NSDG), which will help extend MCA services to businesses via multiple front-end delivery channels, and which will also help provide other value-added services over and above the base services offered by MCA21.



National Citizen Database

Project UID, a Planning Commission initiative, proposes to

- Create a central database of residents, initially of those above the age of 18 years
- Generate a unique identification number (UID) for all such residents

The UID is intended to provide a robust basis for efficient delivery of various social and welfare services to persons below the poverty line (BPL). It can also be used as the basis for identifying and authenticating a person's entitlement to government services and benefits through a single system rather than all government departments individually and independently investing in creating infrastructure, systems and procedures for verifying entitlement of residents under various schemes of the Government. To this end, the project envisages provision of linking of existing databases, as well as providing for future additions, by the user agencies.

Passport

The Passport Seva Project was launched by the Ministry of External Affairs with the objective of delivering Passport Services to the citizens in a comfortable environment with wider accessibility and reliability. The project envisages setting up of 77 Passport Seva Kendras (PSKs) across the country, a Data Centre and Disaster Recovery Centre, Call centre operating 18x7 in 17 languages, and a centralized nationwide computerized system for issuance of passports. The entire operation will function in a “less paper” environment with an attempt being made to deliver passports within 3 working days to categories not requiring police verification.

Immigration, Visa and Foreigner’s Registration & Tracking (IVFRT)

In order to Modernize and upgrade the Immigration services, “Immigration, Visa and Foreigners Registration & Tracking (IVFRT)” has been identified and included as one of the MMPs to be undertaken by the Ministry of Home Affairs under the National e-Governance Plan (NeGP). The core objective of this Project is to develop and implement a secure and integrated service delivery framework that facilitates legitimate travellers while strengthening security. The scope of the project includes 169 Missions, 77 ICPs (Immigration Check Posts), 5 FRROs (Foreigners Regional Registration Offices), and FROs (Foreigners Registration Offices) in the State/District Headquarters.

The implementation of this MMP will enable authentication of traveller’s identity at the Missions, Immigration Check Posts (ICPs) and Foreigners Registration Offices (FROs) through use of intelligent



document scanners and biometrics, updation of foreigner's details at entry and exit points, improved tracking of foreigner's through sharing of information captured during visa issuance at Missions, during immigration check at ICPs, and during registration at FRRO/ FROs.

Pension

Under this MMP, a Pensioner's Portal <http://pensionersportal.gov.in> has been set up with the following components:

- Non-interactive component to provide updated information on pension issues
- Interactive component to monitor grievance redressal at three interlinked levels, as follows:
 - Central-level in Department of Pensions & Pensioners' Welfare (nodal point)
 - Central Ministries/ Department-level
 - Pensioners' Associations-level (field level)

Pensioners registering grievances on the portal get unique access codes, which helps them monitor progress of their cases. The designated nodal officer at the level of Department of Pension & Pensioners' Welfare and at the level of Central Ministry/ Department can also monitor the progress of such registered cases.

E-Office

The Government of India, in recognition of the long-felt need for efficiency in government processes and service delivery mechanisms, has included e-Office as a core mission mode project (MMP) under the National e-Governance Plan (NeGP). It is estimated that this MMP has the potential of targeting over 2 lakh users.

This MMP aims at significantly improving the operational efficiency of the Government by transitioning to a "Less Paper Office".

The objectives of the MMP are:

- To improve efficiency, consistency and effectiveness of government responses
- To reduce turnaround time and to meet the demands of the citizens charter
- To provide for effective resource management to improve the quality of administration
- To reduce processing delays
- To establish transparency and accountability



State MMPs

Agriculture

There have been several initiatives by State and Central Governments to meet the various challenges facing the agriculture sector in the country. The Agriculture MMP has been included in NeGP in an effort to consolidate the various learning from the past, integrate all the diverse and disparate efforts currently underway, and upscale them to cover the entire country.

The MMP is to be operationalized by Department of Agriculture and Cooperation (DAC), and aims to provide services, such as:

- Information to farmers on seeds, fertilizers, pesticides
- Information to farmers on Govt. Schemes
- Information to farmers on Soil recommendations
- Information on crop management
- Information on weather and marketing of agriculture produce

Commercial Taxes

There has been a strong demand for streamlining VAT administration through citizen-centric, service-oriented processes, and establishing a certain degree of standardization with respect to Commercial Tax (CT) administration. Since the CT departments mainly interface with businesses and often account for 60–70 per cent of the total revenue of the States and Union Territories (UTs), their functioning can directly affect the attractiveness of a State or UT as a business destination. It is against this backdrop that the Commercial Taxes MMP was conceived. The initiative is spearheaded by the Department of Revenue (DoR), Ministry of Finance, with strategic consultancy provided by the National Institute for Smart Government (NISG) and Ernst & Young (E &Y).

Under this MMP, various recommendations have been made to facilitate simplification of administrative procedures and reduction of processing timelines. Some of the key recommendations are noted below:

- Electronic filing of returns
- Electronic clearance of refunds
- Electronic payment of tax
- Online dealer ledger



- Online issuance of CST statutory forms through Tax Information Exchange System (TINXSYS)
- Facility to dealer to obtain various online information services

E-District

Districts are the de facto front-end of government where most Government-to-Consumer or G2C interaction takes place. The e-District project was conceptualized to improve this experience and enhance the efficiencies of the various Departments at the district-level to enable seamless service delivery to the citizen.

Front-ends under the scheme, in the form of citizen facilitation centers, are envisioned to be built at District-, Tehsil-, Sub-division- and Block- levels. Village-level front-ends would be established through Common Services Centres (CSCs) for delivery of services. Indicative services planned to be delivered through this MMP include:

- Certificates: Creation and distribution of certificates for income, domicile, caste, Birth, Death etc.
- Licences: Arms Licenses etc.
- Public Distribution System (PDS): Issue of Ration Card, etc.
- Social Welfare Schemes: Disbursement of old-age pensions, family pensions, widow pensions, etc.
- Complaints: Related to unfair prices, absentee teachers, non-availability of doctor, etc.
- RTI: Online filing and receipt of information relating to the Right to Information Act
- Linking with other e government projects: Registration, Land Records, and Driving Licences, etc.
- Information Dissemination: About government schemes, entitlements, etc.
- Assessment of taxes: Property tax, and other government taxes.
- Utility Payment: Payments relating to electricity, water bills property taxes etc.

Employment Exchange

Ministry of Labour & Employment is in the process of conceptualizing this MMP. It is expected that the MMP will help match the requirements of employers against employee database. It is also expected that



the MMP will have mechanisms to provide valuable guidance and career counselling to the unemployed, and facilitate online registration of vacancies by employers.

Land Records

Maintenance of land records and the availability of easily accessible land information is one of the most important issues facing governance today. "Land Records" itself is a generic expression and can include records such as, the register of lands, Records of Rights (RoRs), tenancy and crop inspection register, mutation register, disputed cases register, etc. It can also include geological information regarding the shape, size, soil-type of the land; and economic information related to irrigation and crops

The Land Records MMP, being implemented by Ministry of Rural Development (MoRD), seeks to accomplish the following across States:

- Completion of all data entry related to digitization of land records
- Provision of legal sanctity to computerized Records-of-Rights (RoRs)
- Stopping further issue of manual RORs
- Setting up computer centers at Tehsils
- Enabling Web access

The main objectives of the MMP are:

- To facilitate easy maintenance and updates in land databases
- To provide for comprehensive scrutiny to make land records tamper-proof (in an effort to reduce the menace of litigation and social conflicts associated with land disputes)
- To provide the required support for implementation of development programmes for which data about distribution of land holdings is vital
- To facilitate detailed planning for infrastructural as well as environment development
- To facilitate preparation of an annual set of records in the mechanised process, thereby producing accurate documents for recording details such as collection of land revenue, cropping pattern, etc.
- To facilitate a variety of standard and ad-hoc queries on land data
- To provide database for agricultural census

Core Services offered under the Land Records MMP are:

- Issue of copies of RoRs



- Crop, irrigation and soil details
- Filing and tracking of status of mutation cases
- Availability and submission of forms

Municipalities

The Municipalities MMP aims to leverage ICT for sustained improvement in efficiency and effectiveness of delivery of municipal service to citizens. The key objectives of the MMP are:

- To provide single window services to citizens on anytime, anywhere basis
- To increase the efficiency and productivity of Urban Local Bodies (ULBs)
- To develop a single, integrated view of ULB information system across all ULBs in the State
- To provide timely and reliable management information relating to municipal administration for effective decision-making
- To adopt a standards-based approach to enable integration with other related applications
- This MMP is one with significant citizen interaction, given that municipalities provide a large number of basic services for millions of citizen living in urban centres across the Nation.

Panchayats

The Panchayat represents the first-level of Government interaction for over 60 per cent of the Indian populace, and provides a large number of basic services for millions of citizens living in rural locations across the Nation. It is against this backdrop that the Panchayat MMP has been included in NeGP. The MMP aims to address and overcome the typical challenges faced in the villages, such as lack of reliable communication infrastructure, delay in delivery of services to citizens, low revenue mobilization for implementing schemes at the Gram Panchayat level, and lack of monitoring mechanisms for schemes.

The MMP envisages implementation of various modules across the services and management functions within Gram Panchayat, such as the following:

- Issue of trade licences and NoC
- House-related services
- Issue of certificates of Birth and Death, Income and Solvency
- Dissemination of internal process of Panchayat agenda, voting, and resolution
- Copy of proceedings of Gram Sabha and Action Taken Report (ATR)
- Receipt of funds / progress report



- Dissemination of BPL data

Police

This MMP has been included in NeGP in light of the ever-increasing threats of terror attacks and of continually ascending crime graphs. It includes aspects such as creation of- and sharing of- crime-related databases across departments, effective personal management, and efficient inventory control.

Given the large variations in these functions across States, the MMP professes a phased approach towards implementation. The first phase broadly targets those functions that are common across States and which are driven by the Criminal Procedure Code (CrPC).

Road Transport

The Road Transport MMP was included in NeGP with a view to create a unified data schema which could be used by all States and Union Territories to computerize their respective transport offices (for faster and better-managed issue of vehicle registration certificates and driving licences). This MMP is being implemented as part of the Horizontal Transfer Programme of DIT.

Treasuries

Due to non-computerization or part-computerization of State Treasuries, most of the operational information continues to be exchanged in paper form. A Core Group on Computerization of Treasuries in State has been constituted to formulate a draft scheme on the Treasuries MMP under NeGP. The detailed concept note is being worked out by the Department of Expenditure.

Integrated MMPs

Common Services Centers

The CSC is a strategic cornerstone of the National e-Governance Plan (NeGP), as part of its commitment in the National Common Minimum Programme to introduce e-governance on a massive scale. The CSCs would provide high quality and cost-effective video, voice and data content and services, in the areas of e-governance, education, health, telemedicine, entertainment as well as other private services. A highlight of the CSCs is that it will offer web-enabled e-governance services in rural areas, including application forms, certificates, and utility payments such as electricity, telephone and water bills.

The Scheme creates a conducive environment for the private sector and NGOs to play an active role in implementation of the CSC Scheme, thereby becoming a partner of the government in the development



of rural India. The PPP model of the CSC scheme envisages a 3-tier structure consisting of the CSC operator (called Village Level Entrepreneur or VLE) the Service Centre Agency (SCA), that will be responsible for a division of 500-1000 CSCs and a State Designated Agency (SDA) identified by the State Government responsible for managing the implementation over the entire State.

The CSC Scheme has been approved by Government in September 2006 with an outlay of Rs. 5742 Crores over a period of 4 years. It is expected that 100% CSCs would be rolled by March 2011.

E-BIZ

The eBiz initiative, being piloted by the Department of Industrial Policy and Promotion, seeks to provide comprehensive Government-to-Business (G2B) services to business entities with transparency, speed, and certainty. It aims at reducing the points of contact between business entities and Government agencies, standardizing "requirement information", establishing single-window services, and reducing the burden of compliance, thereby benefitting stakeholders such as entrepreneurs, industries and businesses, industry associations, regulatory agencies, industrial promotional agencies, banks and financial institutions, and taxation authorities.

E-Courts

The Indian judiciary comprises of nearly 15,000 courts situated in approximately 2,500 court complexes throughout the country. Under the e-Courts MMP, it is proposed to implement ICT in Indian judiciary in 3 phases over a period of 5 years. The MMP aims to develop, deliver, install, and implement automated decision-making and decision-support systems in 700 courts across Delhi, Bombay, Kolkata and Chennai; 900 courts across 29 State/ Union Territory capitals; and 13,000 district and subordinate courts across the Nation.

The objectives of the project are:

- To help judicial administration in streamlining their day-to-day activities
- To assist judicial administration in reducing the pendency of cases
- To provide transparency of information to the litigants
- To provide judges with easy access to legal and judicial databases

E-Procurement

This MMP aims at making government procurement simplified, transparent, and result-oriented. It is being implemented through the Directorate General of Supplies & Disposals (DGS&D), a central



purchasing organization under the Ministry of Commerce and Industry, which has core competency in procurement of goods and services.

The objectives of the MMP are:

- To establish a one stop-shop for all services related to government procurement
- To reduce cycle time and cost of procurement
- To enhance transparency in government procurement
- To enhance efficiency of procurement
- To bring about procurement reform across the government

The e-Procurement MMP will cover all aspects of procurement from indent of tender to tender preparation, bidding, bid evaluation and award of contract. In light of the CVC mandate that all Departments publish their tenders on the internet, the MMP will deploy extensive security features for encryption and decryption of bids, and digital signatures.

NSDG

The National e-Governance Plan (NeGP) of the Govt. of India aims to cooperate, collaborate and integrate information across different departments in the Centre, States and Local Government. Government systems are characterized by islands of legacy systems using heterogeneous platforms and technologies and spread across diverse geographical locations, in varying state of automation, make this task very challenging.

The National e-Governance Service Delivery Gateway (NSDG), an integrated MMP under the National e- Governance Plan (NeGP), can simplify the above task by acting as a standards-based messaging switch and providing seamless interoperability and exchange of data across the departments. NSDG acting as a nerve centre, would handle large number of transactions and would help in tracking and time stamping all transactions of the Government.

11.3.7 NEED OF E-GOVERNANCE

The strategic need of e-Governance is to support and simplify governance for all parties' government, citizens and businesses. The use of ICTs can connect all three parties and support processes and activities. In other words, in e-Governance uses electronic means to support and stimulate good governance. Therefore the objectives of e-Governance are similar to the objectives of good



governance. Good governance can be seen as an exercise of economic, political, and administrative authority to better manage affairs of a country at all levels, national and local.

It is useful here to present objectives for e-democracy and e-government. The two main objectives of e-democracy are:

- To provide citizens access to information and knowledge about the political process, about services and about choices available
- To make possible the transition from passive information access to active citizen participation by:
 - Informing the citizen
 - Representing the citizen
 - Encouraging the citizen to vote
 - Consulting the citizen
 - Involving the citizen

Regarding e-government, the distinction is made between the objectives for internally focused processes (operations) and objectives for externally focused services.

External strategic objectives

The external objective of e-Governance is to satisfactorily fulfill the public's needs and expectations on the front office side, by simplifying their interaction with various online services. The use of ICTs in government operations facilitates speedy, transparent, accountable, efficient and effective interaction with the public, citizens, business and other agencies.

Internal strategic objectives

In the back-office, the objective of e-Governance in government operations is to facilitate a speedy, transparent, accountable, efficient and effective process for performing government administration activities. Significant cost savings (per transaction) in government operations can be the result. It can be concluded that e-Governance is more than just a Government website on the Internet. Political, social, economic and technological aspects determine e-Governance.

11.3.8E-GOVERNANCE EXPERIENCES IN INDIA

Recognizing that e-Governance shall be a major part of e-initiatives and shall play an increasingly important role in modern Governance, various agencies of the Government and civil society



organizations have taken a large number of e-initiatives across the country. Indicated below are some of the key e- initiatives taken in the country across some of the important citizen/business related departments:

Customs and Excise (Government of India)

- 98% of export and 90-95% of import documentation computerized
- Electronic filing through ICEGATE at 3 locations (Mumbai, Delhi, Chennai)
- 80% of Service Tax returns electronically processed
- Anywhere to Anywhere reservation from Anywhere
- Electronic Booking of tickets on select sectors
- Online Information on Railway reservation on Internet

Postal Department (Government of India)

- Direct e-credit of Monthly Income Scheme returns into the investors accounts
- Dematerialization of Savings Certificate (NSC) and Vikas Patras (KVP), offering full portability

Passport / Visa (Government of India)

- 100% passport information computerized
- All 33 Regional Passport Offices covered
- Machine readable passports at some locations

AP Online (State Government of Andhra Pradesh)

An Integrated Citizen Services Portal providing citizen centric services such as: Birth/Death Certificates, Property Registration, Driver's License, Govt. Applications & Forms, Payment of taxes / utility bills etc.

Bhoomi

Automation of Land Records (State Government of Karnataka) it provides computerized Record of Rights Tenancy & Crops (RTC) - needed by farmer to obtain bank loans, settle land disputes etc. It has also ensured increased transparency and reliability, significant reduction in corruption, exploitation and oppression of farmers. This project has benefited 20 million rural land records covering 6.7 million farmers.

CARD – Registration Project (State Government of Andhra Pradesh)



Computerization Administration of Registration Department (CARD) impacting 10 million citizens over a period of 3 years. It has completed registration of 2.8 million titles with title searches made in 1.4 million cases. The system ensures transparency in valuation of property and efficient document management system. The estimated saving of 70 million man-hours of citizen time valued at US\$ 35 mil (investment in CARD - US\$ 6million). Similar initiatives in other states like SARITA (State Government of Maharashtra) STAR (State Government of Tamil Nadu), etc. have further built upon this initiative.

Gyandoot: Intranet in Tribal District of Dhar (State Government of Madhya Pradesh)

This project offers e-Governance services including online registration of applications, rural e-mail facility, village auction site etc. It also provides services such as Information on Mandi (farm products market) rates, On-line public grievance redressal, caste & income certificates and Rural Market (Gaon ka Bazaar).

LOKMITRA (State Government of Himachal Pradesh)

- Offers e-Governance services:
- Online registration of applications,
- Rural e-mail facility, village auction site etc.
- Key services provided to citizens
- Information on Mandi (farm products market) rates
- On-line public grievance redressal
- Sending and receiving information regarding land records, income certificates, caste certificates and other official documents.
- Market rates of vegetables, fruits and other items

e-Mitra - Integrated Citizen Services Center (State Government of Rajasthan)

- Implemented using a PPP (Public Private Partnership) model
- Private partner paid by the government department / agency
- G2C services like:
 - Payment of electricity, water, telephone bills
 - Payment of taxes
 - Ticket Reservations
 - Filing of Passport applications
 - Registration of birth/death



- Payment by cash/cheque/ credit card

The above cases of e-initiatives are only illustrative. Many of the State Governments have successfully implemented several such e-initiatives. This has positively impacted the quality of life of citizens. Hence e- Governance as a major e-initiative affords an excellent opportunity for India to radically improve the quality of governance and thereby:

- Allow for two-way communication between government and citizens not only for service delivery but also to receive opinions of citizens on policies and government performance
- Provide greater access to excluded groups, who have few opportunities to interact with government and benefit from its services and schemes
- Include all sections of the society in the mainstream of development
- Enabling rural and traditionally marginalized segments of the population to gain fast and convenient access to services in their own neighbourhoods.

11.4 CHECK YOUR PROGRESS

1. _____ is the buying and selling of goods and services through wireless handheld devices such as smartphones and tablets.
2. _____ is a communications protocol that is used for wireless data access through most mobile wireless networks.
3. A _____ is a technology that creates a safe and encrypted connection over a less secure network, such as the internet.
4. The _____ is an initiative of the Government of India to make all government services available to the citizens of India via electronic media.
5. The utilization of the Internet and the world-wide-web for delivering government information and services to the citizens is known as _____.

11.5 SUMMARY

M-Commerce is the process of performing business transactions using handheld mobile devices which are connected through wireless networks. The business transactions may range from buying and selling goods, making mobile payments, downloading audio/video contents, playing online games, using



numerous software applications or getting mobile tickets. The mobile devices include cellular phones, handheld computers such as palmtops or laptops, pagers, smartphones and Personal Digital Assistants (PDA). Mobile commerce provides instant connectivity between mobile users irrespective of their geographical location and time of the day. With enormous growth of wireless and mobile technology and rapid penetration of mobile phones in developing countries worldwide, the scope of m-commerce has increased manifold.

11.6 KEYWORDS

M-Commerce: M-commerce (mobile commerce) is the buying and selling of goods and services through wireless handheld devices such as smartphones and tablets.

PDA: A Personal Digital Assistant (PDA) is a small device that can include computing, telephone/fax, paging, networking, and other features. It is typically used as a personal organizer.

WAP: Wireless application protocol (WAP) is a communications protocol that is used for wireless data access through most mobile wireless networks

VPN: A virtual private network (VPN) is a technology that creates a safe and encrypted connection over a less secure network, such as the internet.

E-Government: E-government (short for electronic government) is the use of technological communications devices, such as computers and the Internet to provide public services to citizens and other persons in a country or region.

NeGP: The National e-Governance Plan (NeGP) is an initiative of the Government of India to make all government services available to the citizens of India via electronic media. MMPs- Mission Mode Projects

MCA: The Ministry of Corporate Affairs is an Indian government ministry. It is primarily concerned with administration of the Companies Act 2013, the Companies Act 1956, the Limited Liability Partnership Act, 2008 & other allied Acts and rules & regulations framed there-under mainly for regulating the functioning of the corporate sector in accordance with law



11.7 SELF-ASSESSMENT TEST

1. Define mobile commerce. Describe how business transactions are performed through mobile devices.
2. What is mobile payment? Describe SMS-based transactional payment.
3. What is a cell site in a cellular network? What are the components of a cell site?
4. What are the benefits of mobile commerce? Describe in detail.
5. Describe the limitations of mobile commerce and suggest possible remedies.
6. Describe the features of mobile banking. What are the security challenges of mobile banking?
7. What are the various categories of mobile payment? Describe card-based mobile payment.
8. Describe mobile ticketing process. What are the challenges faced by mobile ticketing?
9. Define the term e-Governance and its applications for a normal user.
10. Do you think e-Governance will help the citizen to collect and contact with government services in future is yes then write your views?
11. What are the basic requirements to start with e-Governance?
12. For a normal user what will be the difficulties to access e-Governance services?
13. Study National e-Governance Plan from NEGP website and write about some pilot projects of e- Governance
14. Find our 10 Mission mode projects websites and write a note about them.
15. Explain the benefits of e-Governance for a common man also describe the barriers to avail those services.

11.8 ANSWERS TO CHECK YOUR PROGRESS

1. M-commerce
2. Wireless application protocol
3. virtual private network
4. National e-Governance Plan
5. E-Government

11.9 REFERENCES/SUGGESTED READINGS

- P. Candace Deans, *E-commerce and M-commerce Technologies (2005)*, Idea Group Inc (IGI).



- Nansi Shi, *Mobile Commerce Applications (2004)*, Idea Group Inc (IGI).
- Paul May, *Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business (2001)*, Cambridge University Press.
- Pandey U.S. & Shukla Saurabh, *E-Commerce and Mobile Commerce Technologies (2004)*, S. Chand Publishing.
- R. P. Sinha, *E-Governance in India: Initiatives & Issues (2006)*, Concept Publishing Company.
- Pankaj Sharma, *E-governance (2004)*, APH Publishing.
- Bidisha Chaudhuri, *E-Governance in India: Interlocking politics, technology and culture (2014)*, Routledge.
- <https://nceg.gov.in/> 24/11/2019.
- <https://www.toppr.com/guides/business-law-cs/elements-of-company-law-ii/e-governance/> 24/11/2019.
- <http://vikaspedia.in/e-governance> 24/11/2019.

