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B.B.A

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(Osmania University)

Latest Edition
2018

INFORMATION TECHNOLOGY

- ☞ **STUDY MANUAL**
- ☞ **SHORT NOTES**
- ☞ **PREVIOUS QUESTION PAPER**

- by -

WELL EXPERIENCED LECTURER

RAHUL PUBLICATIONS

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B.B.A

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INFORMATION TECHNOLOGY

Study Manual*, *Short Notes & Previous Question Paper

Inspite of many efforts taken to present this book without errors, some errors might have crept in. Therefore we do not take any legal responsibility for such errors and omissions. However, if they are brought to our notice, they will be corrected in the next edition.

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C O N T E N T S

INFORMATION TECHNOLOGY

STUDY MANUAL

SOLVED PREVIOUS QUESTION PAPER

SYLLABUS

UNIT - I

Introduction to Information Technology

Computer Systems- I/O devices, Memory devices, Processors-Software, Hardware Definitions- Classification of software- systems software, Application software- Operating Systems- Definition- Types of OS-real time, time sharing, multiprogramming, Multiprocessing etc- Understanding of GUI. Trends in Software & Hardware.-Networks- Definition- Types of Network- LAN, WAN, MAN, CAN.

UNIT - II

Introduction to Information Systems

Definition of Data, Information & Knowledge- Definition of IS- IT vs IS-Types of IS from functional perspective - Human resources IS, financial IS, Marketing IS-IS from managerial perspective- Operation, Tactical, Strategic IS-MIS and others Systems- MIS, DSS.

UNIT - III

Multimedia Concepts

Definition of Multimedia- Multimedia-devices-Multimedia Formats- Audio formats- Video formats-Compression/ Decompression issues-Multimedia Storage, Business Applications of Multimedia-Education-Entertainment-Training-Business.

UNIT - IV

Internet & Security Issues

Internet - History- Internet Addressing and architecture-WWW - Architecture-browsers- Servers-Search engines-Internet Services- Email- FTP- Remote Login-Chatting- Messaging- Groups- Social Networking-Internet in Business- e-commerce definition- types of online business-Security Issues in Internet-Security Threats-Measures to control them-Passwords-Smart cards-encryption/decryption-firewall-different types of firewall.

UNIT - V

Office Management Applications.

Intranets, Extranets, VPN- Internet Telephony-Use of Spreadsheets for office-spread sheet applications-Use of Databases for the Office- Database applications-Group ware- audio and video Conferencing.

Contents

UNIT - II

UNIT - III

UNIT - V

UNIT I

Introduction to Information Technology. Computer Systems- I/O devices, Memory devices, Processors-Software, Hardware Definitions- Classification of software- systems software, Application software- Operating Systems- Definition - Types of OS-real time, time sharing, multiprogramming, Multiprocessing etc- Understanding of GUI. Trends in Software & Hardware.-Networks- Definition- Types of Network- LAN, WAN, MAN, CAN.

1.1 Information Technology

Information technology (IT) is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise.

Definition of Information Technology (IT)

Information technology (IT) is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data.

1.1.1 Functions of IT

There are six basic functions of IT.

1. **Capture :** Compiling detailed records of activities.
2. **Processing :** Converting, analyzing, computing and synthesizing all forms of data and information.
3. **Generation :** Organizing information into a useful form.
4. **Storage :** Retaining information for further use.
5. **Retrieval :** Locating and copying stored data or information for further processing or for transmission to another user.
6. **Transmission :** Distributing information over a communication network different fields in IT

1.1.2 Advantages of IT

1. **Globalization :** IT has not only brought the world closer together, but it has allowed the world's economy to become a single interdependent system. This means that one can not only share information quickly and efficiently, but can also bring down barriers of linguistic and geographic boundaries.
2. **Communication :** With the help of information technology, communication has also become cheaper, quicker, and more efficient.
3. **Cost Effectiveness :** Information technology has helped to computerize the business process thus streamlining businesses to make them extremely cost effective money making machines.
4. **Bridging Cultural Gap :** Information technology has helped to bridge the cultural gap by helping people from different cultures to communicate with one another, and allow for the exchange of views and ideas, thus increasing awareness and reducing prejudice.
5. **All Time :** IT has made it possible for businesses to be open 24 x7 all over the globe.
6. **Creation of New Jobs :** Probably the best advantage of information technology is the creation of new and interesting jobs.

1.1.3 Disadvantages of IT

1. **Unemployment :** While information technology may have streamlined the business process it has also crated job redundancies, downsizing and outsourcing. This means that a lot of lower and middle level jobs have been done away with causing more people to become unemployed.
2. **Privacy and Safety Issues :** Though information technology may have made communication quicker, easier and more convenient, it has also bought along privacy issues. From cell phone signal interceptions to email hacking, people are now worried about their once private information becoming public knowledge.
3. **Lack of Job Security :** Industry experts believe that the internet has made job security a big issue as since technology keeps on changing with each day. This means that one has to be in a constant learning mode, if he or she wishes for their job to be secure.

4. **Dominant Culture :** While information technology may have made the world a global village, it has also contributed to one culture dominating another weaker one.

1.2 COMPUTER

Computer is an electronic machine which processes raw data to give meaningful informations. It accepts information (in the form of digitalized data) and manipulates it for some result based on a program.

1.2.1 Characteristics of Computer

1. **Speed :** Computer is very fast calculating device. It can execute basic operations like substraction, addition, multiplication and division at a few microseconds. It can move and copy data at a speed in the order of billion instruction per second.
2. **Accuracy** : Computer always gives accurate results. The accuracy of Computer does not go down when they are used continuously for hours together. It always gives accurate results.
3. **Storage Capacity** : Computer have a very large storage capacity. A large volume of information can be stored in the memory of computer and information can be retrieved correctly when desired.
4. **Versatility** : The working of computer with different types of data is known as versatility. That means computer can perform different types of job efficiently. Computer can works with differents type of data and information such as visuals, text, graphics & video etc. So, versatility is a most important characteristic of computer.
5. **Diligence** : A Computer can work for long hours with the same accuracy and speed because it is free from problems of boredom or lack of concentration.
6. **No Thoughts** : Computers have no thoughts because they are machine and they are devoid of emotions. They have no feelings. Since, computers have no thoughts and feelings so they can't make judgement based on thoughts and feelings.

1.3 Computer System

A computer system is a collection of hardware and software components designed to provide an effective tool for computation. Computer system are used in every walk of life to assist us in the various tasks we perform. The wide availability of the internet has enhance the use of computer for information sharing and communication. Computer system allows us to store, process, display and communicate information. In any modern computer system even a simple one, in general needs several different programs in order to accomplish its various functions.

A computer system consists of both hardware and information stored on hardware. Information stored on computer hardware is often called software.

The hardware components of a computer system are the electronic and mechanical parts. The software components of a computer system are the data and the computer programs.

1.3.1 Characteristics of Computer Systems

- Single user systems are systems that only allow for one user to access the computer at a time
- Multi User systems are systems that allow continuous access of multiple users at once and that are capable of running more than one process at a time in order to maximize the potential of all users
- Example: a server / computer where several people access a server / computer remotely
- Single Tasking is a reference to when a system is only doing one task at a time
- Multi Tasking allows a computer to run more than one task at a time by scheduling what tasks to do when in order to not have the computer make mistakes or do the wrong thing.

1.3.2 Types of Computer Systems

1. Analog Computers

Analog is the Greek word, which means similar. So, in analog computers, the similarities between any two quantities are measure by electrical voltages or current. The analog computers operate by measuring instead of counting. The analog computer works on the supply of continuous electrical signals. The display is also continuous. Its output is in the form of graphs.

2. Digital Computers

These computers work with quantities represented as digits. They operate on discrete quantities. In digital computer, both numeric and non-numeric information are represented as strings of digits. These computers use binary codes, 0's and 1's, to represent the information.

The information is given to the computer in the form of discrete electrical signals. The basic operation performed by a digital computer is addition. Hence, the other operations such as multiplication, division, subtraction and exponentiation are first converted into "addition" and then computed.

3. Hybrid Computers

The computer which possess the features of both analog and digital computers are called hybrid computers. That is, the hybrid computers have the good qualities of both analog and digital computer.

With the hybrid computer the user can process both continuous and discrete data. This computer accepts either digital or analog or both types of input and gives the results as per requirements through special devices. In the hybrid computers a converter is fixed to convert the analog data into digital data and vice versa. These are special purpose devices and are not widely used.

4. General Purpose Computer

These are designed and constructed to cater almost all the needs of the society. They can perform various operations. In fields of engineering, science, commerce and industry. They are able to perform according to the programs created to meet different needs. The general – purpose computer can be used to prepare stores reports, sales reports, payroll, etc. a general purpose computer can solve a much broader class problems specifically a general purpose digital computer is remarkably versatile.

5. Special Purpose Computers

These computers are designed to solve a particular problem or task, the computers are provided with limited memory and speed necessary for a particular job. The instructions needed to perform the particular task are incorporated into the internal memory of the computer. It does not posses unnecessary options, hence it is economical. E.g. Business purpose computers and scientific purpose computers.

6. Micro Computers

Because of its small size and the use of micro-processor, this computer is called micro computer. All the computers have three units namely input, output and

central processing unit, (CPU). The entire CPU is contained in a single or a few microchips. When equipped with memory and input/output control circuitry, it is called micro computer. Its storage capacity is low when compared to mini and main frame computers. It is able to accept most of the high level languages. However, it uses an interpreter or complier for running high level languages.

7. Workstation

Workstation is a type of computer used for engineering applications (CAD/ CAM), desk top publishing, software development, and other types of applications that required a moderate amount of computing power and relatively high quality graphics capabilities. Workstations generally come with a large, high-resolution graphics screen, at least 64MB (Mega bytes) of RAM, built – in network support, and a graphical user interface. Most workstations also have a mass storage device such as a dish drive, but a special type of workstation, called a diskless workstation, comes without a disk drive. The most common operating systems for workstations are UNIX and Windows NT. In terms of computing power, workstations lie between personal computers and minicomputers, although the line is fuzzy on both ends high-end personal computers are equivalent to low-end workstations. And high-end workstations are equivalent to minicomputers. Like personal computers, most workstations are single-user computers. However, workstations are typically liked together to form a local-area network, although they can also be used as stand-alone systems.

8. Mini Computers

The size of the mini-computer is in between the size of micro and main frame computers. It is more powerful than a micro computer. Mini computers are usually designed to serve multiple users. Today, mini-computers are the popular data processing systems in the field of business and industry. These computers accept all high level languages.

9. Super Computers

The super computers are very costly. Hence it is rarely used. Its capacity is abnormally high, it cannot be compared with any other computers in capacity, function, speed, accuracy, language etc., they have operations done in parallel, rather than sequential. They are employed for specialized applications that require immense amounts of mathematical calculations. The chief difference between a super computer and a main frame computer is that a super computer channels

all its power into executing a few programs as fast as possible. But main frame uses its power to execute many programs concurrently. CRAY – 3, Cyber 205, and PARAM are some well known super computers.

10. Laptop Computer

Laptop computer, simply laptop (notebook computer or notebook), is a small mobile computer, which usually weighs 2-18 pounds (1-6 kilograms), depending on size, materials, and other factors.

Laptops usually run on a single main battery or from an external AC/DC adapter which can charge the battery while also supplying power to the computer itself.

1.4 Basic Components of Computer System

There are several computer systems in the market with a wide variety of makes, models, and peripherals. In general, a computer system comprises the following components.

1. **Input Unit :** This unit accepts instructions and data.
2. **Central Processing Unit (CPU) :** This unit performs processing of instructions and data inside the computer.
3. **Output Unit :** This unit communicates the results to the user.
4. **Memory / Storage Unit :** This unit stores temporary and final results.

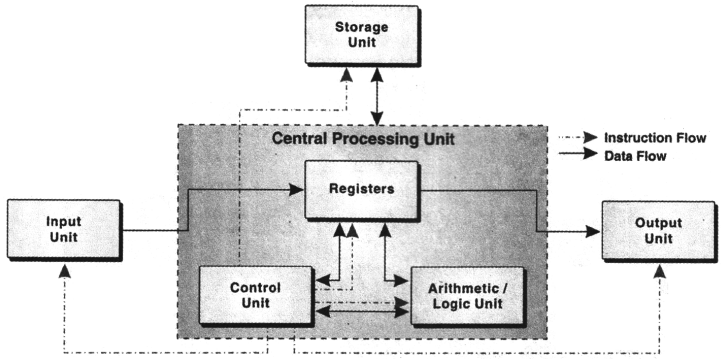


Fig. : Components of a Computer System

1. Input Unit

The foremost task of a computer is to accept data.

Input unit links external environment with the computer system by allowing data and instruction to enter the computer system before any computations can be performed. Regardless of their form, data and instructions are transformed into the binary codes that the computer is designed to accept.

2. Output Unit

The output unit 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. A special interface called output interfaces, attached to the output unit converts the information in binary form to human acceptable (readable) form. Output interfaces are designed to match the unique physical or electrical characteristics of output devices (terminals, printers, etc.) to the requirements of the external environment.

3. Memory Unit

The memory of a computer system is designed to store data and instructions that are entered into the computer system through input unit before the actual processing starts.

Similarly, it also stores the intermediate results produced by the computer for ongoing processing. The results produced by the computer after processing is also stored before being passed on to the Output Unit.

4. Central Processing Unit (CPU) V

The processor (CPU) is the 'brain' of any computer system. It has a built-in set of instructions, which it can execute. The kind of instructions present in the instruction set determines what the computer can do. CPU also called Processor.

1.4.1 Input Devices

Input devices are used to enter data and instructions into computer memory from external world. Examples include: Keyboard, Mouse, Track ball, Track Pad, Joy stick, Touch Screen, Light pen, Touch Screen, Scanner, Digital Camera, Microphone, Graphics tablet. They perform three main functions

1. Receive data from user
2. Convert data into binary form the language of 0 and 1 also called the machine language. Machine language is the only language, a computer can understand directly.
3. Provide converted data to computer memory for processing

Types of Input Devices

Following are the introduction to some popular types of input devices:

1. Key board

Keyboard is the most familiar input device. It is most widely used input device to enter data and instructions into the computer. Keyboard has a set of keys like a typewriter. It has alphabetic keys for A,B,C…Z or a,b,c,…z. It has numeric keys like 0,1,2,3,…9. It has function keys F1,F2,…F12 used to perform specific tasks.

It has other keys used for editing like Delete, Backspace, Home, End, etc.

2. Mouse

Mouse is an input device used to control motion of pointer on screen. A mouse has two or three buttons called Left, Right and Middle button. Buttons are used to perform different functions. It has a rubber or metal ball inside its body. Mouse is rolled over a flat surface called mouse pad. The movement of ball is detected by internal circuits of mouse. These circuits convert this movement into digital signals, which are sent to computer. Mouse is used in graphical applications. It is also used for playing video games on computer.

3. Track Ball

Track Ball is an input device like a mouse. It is used in Lap top computers to control motion of pointer on screen. It is a pointing device like upside down mouse. It has a ball on its upper side. This ball is moved by fingers or thumb and the pointer moves accordingly on screen.

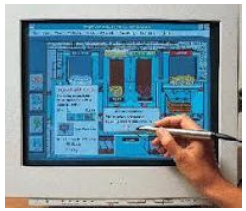
4. Track Pad

Track pad is a pointing input device. It is used in Lap top computers to control motion of pointer on screen. Track pad is a stationary input device. It has a flat surface of 1.5 to 2 square inch. Finger is moved on this surface to move pointer on screen.

5. Joy stick

Joystick is an input device used to play games on computer. It is used to control motion of an object quickly in game with the help of a hand held stick. This stick can be moved forward, backward or side ways. This stick is mounted on a ball. When stick is moved then ball is moved and signals are sent to the computer.

6. Light Pen



Light pen is an input device consisting of a special pen that is connected to a computer's monitor. The user points at the screen with the pen and selects items or chooses commands either by pressing a clip on the side of the light pen or by pressing the light pen against the surface of the screen (the equivalent of performing a mouse click).

7. Microphone

Microphone is an input device used to enter sounds into the computer. We can record sounds in computer with the help of microphone and sound card.

8. Scanner

Scanner is an input device. It is used to save pictures or text on paper into computer memory. It converts picture or text on paper in to binary form and saves it in computer memory. With the help of scanner we may save our time to type a lot of text. For example, if we have a book and wish to enter the whole text of book in to computer. It will be a long, tedious and time consuming job. But if we use a scanner, we can do this with in less time. We can scan each page of book. Editing of the scanned text is also possible. So our job will become very easy with the help of a scanner.

9. Graphics tablet / digitizer

A graphics tablet consists of a special pen called stylus and a flat pad. The image is created on the monitor screen as the user draws it on the pad with the help of stylus (special pen). Graphics tablet is also called a digitizer.

10. Touch Screen

In ATM and in latest smart phones, touch screen is used to receive input from the user. The user enters data by the touch of his finger on different menu options or icons present on touch screen.

11. Digital Camera

A digital camera is one of the latest input devices. We can take pictures with he help of digital camera. These pictures are saved on digital camera's internal memory. There is no need of a film role as used in traditional cameras. Later on we can easily input these pictures with the help of a data cable into computer's memory. Latest digital cameras can take still snapshots and can record video as well.

1.4.2 Output Devices

Out put devices are used to display results of processing to the user. They perform the following functions:

1. Receive results from memory
2. Convert data into human readable form
3. Display results to the user

Examples include: Monitor, printer, plotter, speaker, and multimedia projector.

Different Types of Output Devices

1. Monitor

LCD Monitor

CTR Monitor

Monitor is the most commonly used output device used to display results of processing. It has a TV like shape. Pictures on monitor are formed with picture elements called PIXEL. Monitors may be Monochrome that will display results in Black & White. Color Monitors are also available. They display results in multi colors. Monitor produces soft copy output.

2. Printers

Printers are used to produce hard copy out put. They print processing results on paper. Printers are divided into two main categories:

- Impact Printers
- Non Impact printers

These printers do not use striking mechanism for printing. They use electrostatic and laser technology. Quality and speed of these printers is better than Impact printers. For example Laser printer and Inkjet printers are non-impact printers.

3. Speaker

Figure: Speakers for Desktop computer

Speaker produces sound output. We can listen recorded voices, sounds or music with the help of speaker. Speaker produces sound output with the help of sound card.

4. Plotter

Plotters are used to draw different designs of buildings or internal structure of machines. Mostly Engineers and Architects use plotters.

5. Multimedia Projector

Multimedia Projector

Multimedia projector is used to produce computer output on a big screen. These are used in meeting rooms or in classrooms of educational institutes.

1.4.3 Memory Devices

Storing data is an important part of a computer system. The main concern of all computer designers is to create fast and efficient storage devices. As is commonly known, the primary memory inside the computer (Random Access Memory or RAM) is volatile i.e. whatever is stored in RAM is lost as soon as the computer is switched off.

So if there is a need to save data from getting lost, it can be put on a storage device like floppy disk, hard disks and CD-ROMS before switching off the Computer.

1. Floppy Disk

It is a smaller capacity removable storage device. It is made up of thin and flexible plastic material. This thin plastic film is coated with a magnetic material known as iron oxide for recording data and is protected by a hard outer cover. It is very useful in transferring data from one computer to another.

Working of a Floppy disk

Conventional floppy drives contain the following basic components :

1. A spindle clamping mechanism to hold the diskette in place as it spins.
2. Either one or two magnetic read/write heads mounted on a mechanism that moves the heads across the diskette's surface.
3. A sensor that detects the rotational position of the diskette via an index hole (or magnetic sensor in 3.5 inch drives) on floppy disks.

2. Hard Disk Drive

It is a storage device with very large capacity, which ranges from 1GB to Terabytes in the modernscenario. It is placed in side the cabinet of CPU (Although external hard drives are also available these days). It is not a removable drive in normal circumstances. A hard disk has a much larger storage capacity than a floppy disk.

It is fitted inside the computer and cannot be seen by us. There can be one or more hard disk in the system unit of a computer. At the simplest level, a hard disk uses magnetic recording techniques just like the floppy disk. Major benefits of magnetic storage - the magnetic medium can be easily erased and rewritten, and it will "remember" the magnetic flux patterns stored onto the medium for many years. The working of a hard disk is similar to that of a floppy disk.

In order to increase the amount of information the drive can store, most hard disks have multiple platters.

3. CD-ROM (Compact Disk Read only Memory)

It is a storage device with medium capacity i.e. to hold 650 MB/700 MB (60/80 Min. Audio/Video). Computer has special drive known as CD-Drive to provide support for placing and running CDs. It can store data, audio and video. It is made up of plastic with special surface having optical sensitivity. CD-Drive has a laser light source that reads data from the CD-ROM.

The CD-ROM surface is a mirror covered with billions of tiny bumps that are arranged in a long, tightly wound spiral track of data, circling from the inside of the disc to the outside. The CD-Drive reads the bumps with a precise laser and interprets the information as bits of data.

Working of a CD-ROM Drive

When you play a CD, the laser beam passes through the CD's polycarbonate layer, reflects off the aluminum layer and hits an optoelectronic device that detects changes in light. The bumps reflect light differently than the flat parts of the aluminum layer, which are called lands. The optoelectronic sensor detects these changes in reflectivity, and the electronics in the CD-player drive interpret the changes as data bits.

4. DVD (Digital Versatile Disc)

Computer has special drive known as DVD-Drive to provide support for placing and running DVDs. A DVD is very similar to a CD, but it has a much larger data storage capacity. A standard DVD media holds about seven times more data than a CD media.

This huge capacity means that a DVD has enough room to store a full-length, MPEG-2-encoded movie, as well as other information. A DVD can store data, audio and video. It is made up of plastic with special surface having optical sensitivity denser as compared to CDs.

5. Pen Drive

This is a type of flash memory storage device of the size of a thumb and can plug into the USB port of the computer. USB flash drives are more compact, generally faster, hold more data, and are more reliable (due to their lack of moving parts) than disk storage. Most flash drives use a standard USB connector, which is connected directly to the USB port on a personal computer.

Flash drive is nearly free from scratch and dust problems that exist in the other storage media, such as floppy disks and compact discs.

1.4.4 Processors / CPU

Central processing unit is considered as the brain of computer system.

CPU performs data processing in binary format i.e., it understand data only if it is in the form of either 1 or 0. Whenever an input is supplied, it is converted into binary

digit format by counting, listing and rearranging the digits according to the program instructions. Once the processing is done, the result is again translated back into characters or numbers that are easily understood by a human.

Components of CPU

1. Arithmetic Logic Unit
2. Control Unit
3. Memory Unit
4. Registers.

1. Arithmetic Logic Unit

All the arithmetic and logical operations are performed by Arithmetic Logic Unit. ALU gets the input from the memory unit, processes it and sends back the result to the internal storage. Data is moved to and from the ALU and internal storage, several times. After receiving the result, internal storage sends the data to the output device. Arithmetic unit performs all the mathematical operations like addition, substraction, multiplication division. Logic unit carry out logical operation depending on the instruction provided. It performs comparison between numbers, letters or special characters.

2. Control Unit

This unit is responsible for controlling the operations sequence. It takes its input from the primary storage unit, interprets it and checks whether the program execution is done correctly or not. It is also responsible for controlling the input/ output devices and manages the entire functionality of other system's components.

3. Memory Unit

This unit stores the intermediate result obtained during the calculations and provides the data to the user depending on their requirements. The internal storage is also known as primary memory or main memory. Input to memory unit is supplied by an input device. It stores the input until the computer processes it. After processing the data supplied as input, the processed data as well as intermediate result is send back to the memory unit. Once the processing is completed, the internal storage transfers the result to an output device (i.e., monitor).

4. Registers

Registers are considered as special purpose, high-speed temporary memory components that are capable of storing different types of information like data, instruction, addresses etc. It generally store that information which is currently being used by CPU. It performs its work by following the instruction of control unit that specify the way of accepting input, storing it, transferring instructions and performing arithmetic and logical comparison. Whenever an instruction present in the register is processed, it is immediately substituted by another instruction that needs to be processed.

1.5 Hardware and Software

A computer system consists of hardware, the physical unit (parts) of the computer that are capable of computing and manipulating information and *software* (set of instructions or programs) that carries out predefined tasks to complete a given job. The computer performs operations like addition, subtraction, multiplication and division only when the user instructs it to do so. The user issues instructions and the CPU acts in accordance with the instructions. The sets of instructions, which control the sequence of operations, are known as *programs*, and collectively programs are called software.

We can equate hardware and software with human body and human intelligence, respectively. All human physical actions such as walking and eating are based on the thoughts and feelings, which is raised by the brain. If the brain does not raise thoughts and feelings, we do not perform any physical activity. Similarly, the actions and functioning of every hardware equipment is driven by software. The combination of physical equipment (hardware) and logical instructions (software) gives modern computing system their power and versatility.

1.5.1 Hardware

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners.

The internal hardware parts of a computer are often referred to as components, while external hardware devices are usually called peripherals. Together, they all fall under the category of computer hardware. Software, on the other hand, consists of the programs and applications that run on computers. Because software runs on computer hardware, software programs often have system requirements that list the minimum hardware required for the software to run.

1.5.1.1 Features of Hardware

Hardware has many components which are important to the working of the computer like software hardware devices. The basic hardware of the computer is mother board, RAM and CPU. However there are many different devices which are supporting the functioning of computer like mouse, data ports, monitor and removable storage devices. The supporting hardware devices are divided into sub groups further like web cam, joystick, sound card and track ball etc. hardware is something which you can touch and feel and which can not communicate with you. Hardware is breakable or can be destroyed by external forces like shattered, hitting and electricity voltages.

1.5.1.2 Components of Hardware

I) Input unit : This unit accepts instructions and data.

II) Output unit : This unit communicates the results to the user.

III) Storage unit : This unit stores temporary and final results.

IV) Central Processing Unit (CPU) : This unit performs processing of instructions and data inside the computer.

The CPU has three components:

a) The Control Unit

b) The Arithmetic Logic Unit (ALU) and

c) The Memory Unit.

1.5.1.3 Types of Hardware

Most computer hardware is embedded and so is not visible to normal users. Below are the different types of hardware's found in a computer.

1, Motherboard

It is the central or primary circuit board making up a complex electronic system such as a computer. A motherboard is also known as a main board, logic board or system board.

2. Central processing Unit

A CPU is the main component of a digital computer that interprets instructions and process data in computer programs.

3. Random Access Memory

A RAM allows the stored data to be accessed in any order. RAM is considered as the main memory of the computer where the working area is used for displaying and manipulating data.

4. Basic Input Output System

BIOS prepares the software programs to load, execute and control the computer.

5. Power Supply

Power Supply supplies electrical energy to an output load or group of loads.

6. Video Display Controller

It converts the logical representation of visual information into a signal that can be used as input for a display medium.

7. Computer Bus

It is used to transfer data or power between computer components inside a computer or between computers.

8. CD-ROM drive

It contains data accessible by a computer

9. Floppy disk

It is a data storage device

10. Zip Drive

It is a medium capacity removable disk storage system.

11. Hard Disk

It is a non-volatile data storage system that stores data on a magnetic surface layered unto hard disk platters.

1.5.2 Software

Software is a generic term for organized collection of computer data and instructions. It is responsible for controlling, integrating, and managing the hardware components of a computer and to accomplish specific tasks. In other words, software tells the computer what to do and how to do it. For example, software instructs the hardware what to display on the user's screen, what kinds of input to take from the

user, and what kinds of output to generate. Thus, software communicates with the hardware by organizing the control sequences, and the hardware carries out the instructions defined by the software.

A computer needs to be instructed to perform any task. These instructions are given in the form of computer programs, which are written in computer programming languages. A program controls the activity of the processor. The moment the hardware (processor, memory, etc.), acts as per the instructions of a program, the program is said to be in running or executing state.

A set of programs, which are specifically written to provide the user a precise functionality like solving a specific problem is termed as a software package. For example, word processing software package provides functionality to the computer so that it can be used to create text documents like letters and mailing lists. Similarly, an image processing software package assists a user in drawing and manipulating graphics.

1.5.2.1 Features of Software

1. Ease of use

The software systems and applications are becoming more and more easy to use. In fact, software developers and system analysts go to great lengths to ensure that the products they develop are user-friendlier than their competitor's products.

2. Graphical user interface (GUI)

GUI or graphical user interface has now become the default standard for most of the software applications. Gone are the days of the crude character based interfaces of UNIX and DOS application. Today's software applications and products provide the users with perceptive, graphical and easy-to-use interfaces. Now the users do not have to remember the cryptic system commands or shortcut keys that were a must in the character based era. Now almost any task can be accomplished by a mouse click.

3. Multi-platform capability

Today's software applications are not developed for just one platform. Most of the software applications supports multiple platforms-both hardware and software platforms. There are software applications that support hardware platforms ranging from mainframes to PCs and different software platforms like MVS, Solaris, AIX, UNIX, Windows and so on. For example IBM's DB2 Universal database is available for a variety or hardware and software platforms. Another important

feature of today's software application is that they support multiple languages and multiple currencies. Many vendors are providing their applications in many languages like English, Arabic, Japanese, and Chinese and so on.

4. Compatibility with other Software

Now the competition for each market segment in the software marketplace is rather fierce. We have many software vendors battling for the market share in the same segment. For example, Microsoft Word 2000 supports all previous versions of Work like Word 97, Word 6, Word and so on. The two features –compatibility with earlier versions and compatibility with other products make it easier for the users, as they can choose the application they want and still use the old files they have created using other applications or using older versions of the same application.

5. Mail enabling

Mail enabled applications are designed to take advantage of on e-mail. These are the familiar word processors, spreadsheets, and other individual desktop applications that have email features built to them. There is another class of message-centered programs that are built specifically around e-mail functions.

6. Web enabling

With the ever-increasing popularity of internet and the amount of information that is available on the net, most software applications are now web-enabled. Web enabling helps the user in many different ways. Its use starts while the user is installing the application. During installation, most of the applications will automatically connect to the Internet and to the vendor's web site and will register their products (earlier one had to fill in a paper form and mail or fax it to the vendor).

1.5.2.2 Classification of Software

The software used by the computer can be classified into two categories :

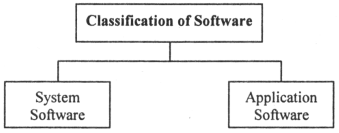


Fig. : S/W Categories

1.5.2.2.1 System Software

System software consists of several programs, which are directly responsible for controlling, integrating, and managing the individual hardware components of a computer system. You must have noticed that a new computer system is always accompanied by some software, either stored in a floppy or CD, which is supplied by the manufacturer. This software manages and supports the computer system and its information processing activities.

System software is more transparent and less noticed by the users, they usually interact with the hardware or the applications this software provides a programming environment in which programmers can create applications to accommodate their needs. This environment provides functions that are not available at the hardware level and performs the tasks related to the execution of an application program. Hence, system software acts as an interface between the hardware of the computer and the software application.

In simple terms, system software makes the computer functional. They provide basic functionality like file management, visual display, and keyboard input are used by application software to accomplish these functions.

Some examples of system software are:

1. Operating system
2. Device drivers
3. Language translators
4. System utilities.

1. Operating System

It is the first layer of software loaded into computer memory when it starts up. As the first software layer, all other software that gets loaded after it depends on it for various common core services. These common core services include disk access, memory management, takes scheduling, and user interfacing. In addition the operating system ensures that different programs executing at the same time do not interfere with each other. It provides a software platform on top of which other programs can run. In simple words, the operating system organizes and controls the hardware. Examples of operating systems are Windows XP, UNIX, and Linux. The basic functions of an operating systems are:

a) Process Management : It handles the creation, deletion, suspension, resumption, and synchronization of process.

b) Memory Management : It handles allocation and de-allocation of memory space as required by various programs.

c) File Management : It is responsible for creation and deletion of files and directories. It also organizes, stores, retrieves, names, and protects all the files.

d) Device Management : It manages all the devices of the computer system such as printers and modems. If any device fails, it detects the device failure and notifies the same to the user.

e) Security Management : Protects system resources and information against destruction and unauthorized use.

f) User interface : Provides the interface between the user and the hardware.

2. Device Drivers

Device drivers are system programs, which are responsible for proper functioning of devices. Every device, whether it is a printer, monitor, mouse or keyboard, has a driver program associated with it for its proper functioning. Whenever a new device is added to the computer system, a new device driver must be installed before the device is used. A device driver is not an independent program; it assists and is assisted by the operating system for the proper functioning of the device.

3. Language Translators

Computers only understand a language consisting of 0s and 1s called machine language. To ease the burden of programming entirely in 0s and 1s, special programming languages called high-level programming languages were developed that resembled natural languages like English. Language translators help in converting programming languages into machine language. To be precise, they convert programming statements into the 0s and 1s that the computer is able to process.

Depending on the programming language used, language translators are divided into three major categories: compilers, interpreter, and assembler.

a) Compiler : The programs written in any high-level programming language (C or Pascal) needs to be converted into machine language. This is achieved by using a complier.

b) **Interpreter :** An interpreter analyses and executes the source code in line-by-line manner, without looking at the entire program. In other words, an interpreter translates a statement in a program and executes the statement immediately, before translating the next source language statement.

c) **Assembler :** Compared to all the types of programming languages, assembly language is closest to the machine code. It is fundamentally a symbolic representation of machine code. The assembly language program must be translated into machine code by a separate program called an assembler. The assembler program recognizes the character strings that make up the symbolic names of the various machine operations, and substitutes the required machine code for each instruction. In short, an assembler converts the assembly codes into machine codes, making the assembly program ready for execution.

4. System Utility

System utility programs perform day-to-day tasks related to the maintenance of the computer system. They are used to support, enhance, and secure existing programs and data in the computer system. They are generally small programs, having specific tasks to perform:

a) **File Management :** These utilities make it easier to manage data files. Many programs are written to help users to find the files, create and organize directions, copy, move, and remove files.

b) **Backup :** It may happen that sometime data files are corrupted, or accidentally deleted. In such a case, data backups become very useful. A backup system utility is essential for those organizations, which want to keep their data intact.

c) **Data Recovery :** It is the process of retrieving deleted or inaccessible data from failed electronic storage media such as computer hard disk drives, removable media, optical devices, and tape cartridges.

d) **Virus Protection :** Anti-virus programs are essential system utilities for a computer system functioning in a network. They provide the security to the system form viruses that can damage the computer system.

e) **Disk Management :** Disk management program includes various system softwares like disk defragmenter, data compressor and disk formatting tools. De-fragmentation implies putting fragments of files in a sequential order onto the disk which reduces the time to access the file.

f) **Firewall :** It is commonly used to protect information such as e-mail and data files within a physical building or organization. Essentially, a firewall is designed to protect a computer from unauthorized access, especially via network.

g) **Disk Cleanup :** To keep a computer running smoothly, regular maintenance is vital. Therefore, one should use the disk cleanup utility, which easily determines which files on hard drive are no longer needed, then delete those files.

1.5.2.2.2 Application Softwares

The most often seen software by a user is the application software. It used to accomplish specific tasks rather than just managing a computer system. For a user, the computer system has no specific use without application software. Application software may consist of a single program, such as Microsoft's Note pad (for writing and editing simple text). It may also consist of a collection of programs, often called a software package, which work together to accomplish task, such as database management software. Application software may also include a larger collection of related but independent programs and packages (a software suite), which have a common user interface or shared data format, such as Microsoft Office suite.

Applications softwares are dependent on system softwares. A system software (like operating system) acts as an interface between the user and the computer hardware, while application software performs specific tasks. Applications are pieces of software that perform tasks for the user besides helping the computer operate, which is the tasks of system software.

Applications softwares are controlled by system software, which manages hardware devices and performs background tasks for them. The distinction between the two is important. Without system software, the computer will not run, and without application software, the computer, no matter how powerful, will not be helpful in meeting user requirements. Think of it this wayapplications apply the computer's thinking power to business tasks such as tracking the general ledger or billing your customers.

Application software ranges from games, calculators, and word processors (document creating programs), to programs that "paint" images on screen (image editors). Applications represent real world tasks. They can be easily divided by looking at exactly what function they serve. Some of the most commonly used application software is discussed below:

1. Word processor

A word processor is software used to compose, format, edit, and print electronic documents. Word processing is one of the earliest applications for office productivity and the personal computer. It involves not only typing, but also checking the spelling and grammar of the text and arranging it correctly on the page. A variety of different typefaces is available for a verity of effects. It is possible to include pictures, graphs, charts and many other things within the text of the document. It also allows for changes in margins, fonts, and colour. Nowadays, virtually all personal computers are equipped with a word processing program, which has the same function as a typewriter for writing letters, reports or other documents, and printing. Examples of some well-known word processors are Microsoft Word and Word Perfect.

2. Spreadsheets

One of the first commercial uses of computers was in processing payroll and other financial records, so the programs were designed to generate reports in the standard "spreadsheet" format bookkeepers and accountants used. A spreadsheet application is a rectangular grid, which allows text, numbers, and complex functions to be entered into a matrix of thousands of individual cells. The spreadsheet provides sheets containing cells each of which may contain text and / or numbers. Cells may also contain equations that calculate results from data placed in other cells or series of cells. A simple example might be a column of numbers totaled in a single cell containing an equation relating to that column. Spreadsheet software are used predominantly for accounting a other numerically-based tasks, because financial and mathematical data and analysis are often managed in a tabular style, with columns of financial figures being manipulated and then influencing other data computations. Microsoft Excel and Lotus 1-2-3 are examples of spreadsheet applications.

3. Image Editors

Image editor programs are designed specifically for capturing, creating, editing, and manipulating images. These graphics programs provide a variety of special features for creating and altering images. In addition to offering a host of filters and image transformation algorithms, some image editors also enable the user to create and superimpose layers. Most graphic programs have the ability to

import and export one or more graphic file formats. These computer programs enable the user to adjust an image to improve its appearance. With image editing software, one can darken or lighten an image, rotate it, adjust it contrast, crop out extraneous detail, and much more. Examples of these programs are Adobe Photoshop, Adobe Illustrator and CorelDraw.

4. Database Management Systems

Database management software is a collection of computer programs that allow storage, modification, and extraction of information from a database in an efficient manner. It supports the structuring of the database in a standard format and provides tools for data input, verification, storage, retrieval, query, and manipulation. When such software is used, information systems can be changed much more easily as the organization's information requirements change. New categories of data can be added to the database without disrupting the existing system. It also controls the security and integrity of the database from unauthorized access. FoxPro and Oracle are database management systems.

5. Presentation Applications

A presentation is a means of assessment, which requires presentation providers to present their work orally in the presence of an audience. It combines both visual and verbal elements. Presentation software allows the user to create presentations by producing slides or handouts for presentation of projects. Essentially, such computer programs allow users to create a variety of visually appealing electronic slides for presentation. Microsoft PowerPoint is one of the most famous presentation application.

6. Desktop Publishing Software

The term desktop publishing is usually used to describe the creations of printed documents using a desktop computer. It is a technique of using a personal computer to design images and pages, and assemble type and graphics, then using a laser printer or image-setter to output the assembled pages onto paper, film, or printing plate. These softwares are used for creating magazines, books, newsletters, and so on. Such software assist in creating sophisticated documents including complicated page designs, detailed illustrations, and camera-ready types faces. Quark Express and Adobe PageMaker are desktop publishing software.

1.5.3 Difference between Hardware and Software

	Hardware	Software
1.	It is the physical unit of the computer	It is a collection of programs to bring the hardware system into operation
2.	It has permanent structure and cannot be altered	It has no permanent structure but can be altered and reused
3.	It is normally affected by agent like dust, heat, humidity, etc	It is not affected by these agents to some extent
4.	Hardware understands only machine language, lower level language or binary	It is written by a well versed programmer and generally in higher level language which is readable by human being
5.	It works with binary code, the presence or absence of Pulses as 1's or 0's.	It is represented by the Higher Level

1.6 Operating Systems

Operating systems are the system software that makes the hardware usable. Hardware provides "raw computing power". Operating system makes the computing power conveniently available to users, by managing the hardware carefully to achieve good performance.

It is considered the backbone of a computer, managing both software and hardware resources. Operating systems are responsible for everything from the control and allocation of memory to recognizing input from external devices and transmitting output to computer displays or output devices.

1.6.1 Definition of Operating System

"An operating system is a program that acts as an intermediary between a user of a computer and the computer hardware. The purpose of operating system is to provide an environment in which a user can execute programs."

1.6.2 Objectives of Operating System

The operating system has two objectives, which are as follows:

1. **Managing Hardware:** The prime objective of the oper-ating system is to manage and control various hardware resources of a computer system. These hardware

re-sources include processor, memory, disk space, I/O de-vices, and so on. The operating system supervises which input device's data is requesting for being processed and which processed data is ready to be displayed on the output device. In addition to communicating with hardware, the operating system provides an error han-dling procedure and displays an error notification. If a device is not functioning properly, the operating system tries to communicate with the device again. If it is still unable to communicate with the device, it provides an error message notifying the user about the problem. Figure illustrates how operating system manages the hardware resources of a computer system.

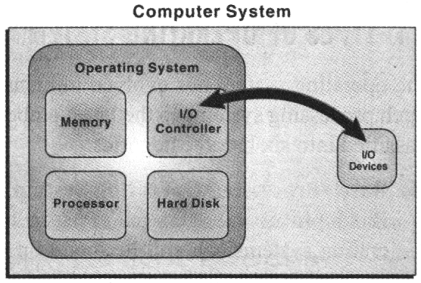


Fig. : Managing Hardware

2. **Providing an Interface:** The operating system organises applications so that users can easily access, use, and store them. When an application is opened, the operating system assists the application to provide the major part of the user interface. It provides a stable and consistent way for applications to deal with the hardware without the user having to know all the details of the hardware. If the application program is not functioning properly, the operating system again takes control, stops the application, and displays an appropriate error message.

1.6.3 Functions of Operating Systems

The operating system is a software program that acts as an interface between the user and the computer. It is used to control and manage the hardware components such as keyboard, monitor, printer, scanner etc.

a) Process Management

It handles the creation, deletion, suspension, resumption, and synchronization of process.

b) Memory Management

It handles allocation and de-allocation of memory space as required by various programs.

c) File Management

It is responsible for creation and deletion of files and directories. It also organizes, stores, retrieves, names, and protects all the files.

d) Device Management

It manages all the devices of the computer system such as printers and modems. If any device fails, it detects the device failure and notifies the same to the user.

e) Security Management

Protects system resources and information against destruction and unauthorized use.

f) User interface

Provides the interface between the user and the hardware.

1.6.4 Types of Operating Systems

The operating system has evolved immensely from its primitive days to the present digital era. From batch processing systems to the latest embedded systems, the different types of operating system can be classified into six broad categories:

1. Batch Processing Operating System

This type of operating system was one of the first to evolve. Batch processing operating system allowed only one program to run at a time. These kinds of operating systems can still be found on some mainframe computers running batches of jobs. Batch processing operating system works on a series of programs that are held in a queue. The operating system is responsible for scheduling the jobs according to priority and the resources required. Batch processing operating systems are good at churning through large numbers of repetitive jobs on large computers. For example, this operating system would be best suited for a company wishing to automate their payrolls. A list of employees will be entered, their monthly salaries' will be calculated, and corresponding pay slips would be printed. Batch processing is useful for this purpose since these procedures are to be repeated for every employee and each month.

2. Multi-user or Time-sharing Operating System

This system is used in computer networks which allow different users to access the same data and application programs on the same network. The multi-user operating system builds a user database account, which defines the rights that users can have on a particular resource of the system.

3. Multi-tasking Operating System

In this system, more than one process (task) can be executed con-currently. The processor is switched rapidly between the processes. Hence, a user can have more than one process running at a time. For example, a user on his computer can have a word processor and an audio CD player running at the same time. The multi-tasking operating system allows the user to switch between the running applications and even transfer data between them. For example, a user can copy a picture from an Internet opened in the browser application and paste it into an image editing application.

4. Real-time Operating System (RTOS)

This system is designed to respond to an event within a predetermined time. This kind of operating system is primarily used in process control, telecommunications, and so on. The operating system monitors various inputs which affect the execution of processes, changing the computers model of the environment, thus affecting the output, within a guaranteed time period (usually less than 1 second). As the real-time operating systems respond quickly, they are often used in applications such as flight reservation system, railway reservation system, military applications, etc.

5. Multi-processor Operating System

This system can incorporate more than one processor dedicated to the running processes. This technique of using more than one processor is often called parallel processing. The main advantage of multi-processor systems is that they increase the sys-tem throughput by getting more work done in less time.

6. Embedded Operating System

It refers to the operating system that is self-contained in the device and resident in ROM. Since embedded systems are usually not general-purpose systems, they are lighter or less resource intensive as compared to general-purpose operating systems. Most of the embedded operating systems also offer real-time operating system qualities. Typical systems that use embedded operating systems are household appliances, car management systems, traffic control systems, and energy management systems.

1.6.4.1 Real Time Systems

Real Time Operating System (RTOS) is special purpose operating system. It is used when rigid time requirements have been placed on the operation of processor or data flow. It is used as control device in a dedicated system.

A real time system has well defined, fixed time constraints. Processing must be done within defined constraints otherwise system will fail. That means a real time system, functions correctly only if it returns correct result within its time constraints. RTOS is used as an abstraction layer between application software and the hardware as shown in figure 2.8.

A primary objective of real time system is to provide quick event response time and thus meet the scheduling deadlines. User convenience and resource utilization are of secondary concern to real time system designers.

Types of Real Time Systems

1. Hard Real Time System

It guarantees that critical tasks complete on time. For this, it is required that all delays in the system must be bounded. Such time constraints can be achieved using devices whose functionality and time for performing function is exactly known. That is why; advanced operating system features such as virtual memory, secondary storage etc. are absent. These are used in industrial control and robotics.

2. Soft Real Time System

In these systems, critical real time task gets priority over other tasks and retains that priority until it is completed. The delays are not bound in these systems and they need advance operating system features. They are used in multimedia, virtual reality etc.

Characteristics of Real-Time Systems

1. It is special purpose operating system.
2. It is used when rigid time requirements have been placed on the operation of processor or data flow. It is used as control device in a dedicated system.
3. A real time system has well defined, fixed time constraints. Processing must be done within defined constraints otherwise system will fail. That means a real time system, functions correctly only if it returns correct result within its time constraints.

4. Real time operating systems are used in environments where large number of events, mostly external to computer system, must be accepted and processed in a short time or within certain deadlines. Such applications include industrial control, telephone switching equipment, weather forecasting, flight control etc.

Advantages of Real-Time Systems

1. **Increased Availability and Reliability :** Real time systems operate in multi-programming and multi-processing environment, which increases both availability and reliability of system.
2. **Interactive System :** These systems are interactive and usually involve more than one user of the computer. However, the only requirement is speed as low of few seconds can be critical.

Disadvantages of Real-Time Systems

1. **Hardware Expensive :** Due to fined time constraints / hardware is expensive.
2. **Duplicacy :** These systems are duplicated so that in event of break down backup facilities is immediately available for the continuous operation of the system (recovery).
3. **Communications Hardware Problem :** Most real time systems involve remote Input/Output station, which leads to problem of communications hardware.

1.6.4.2 Time Sharing Systems

In this system multiple users can use system. Time sharing operating system is the logical extension of multiprogramming. In this system more than one job are executed by CPU switching between them. Here, the CPU time is divided into time slot or one can say processor's time is shared among multiple users'. The CPU scheduler selects a job from ready queue and switches the CPU to that job.

The main idea of time sharing systems is to allow a large number of users to interact with a single computer (system) concurrently. Hence, it extended the idea of multiprogramming to allow multiple terminals with each- in-use terminal to be associated with one or more jobs. Hence, there are spaces for more than one user, each associated with a program or more.

The main objective of these systems is to minimize the response time to user commands. CPU scheduling and multi-programming provide one time slice (slot) to

each user in a time-shared system. A program in execution is referred to as a process. A process executes for one time slice at a time. A process may needs more than one time slice to complete.

During a time slice a process may finish execution or go for an I/O. The I/O in this case is usually interactive like a user response from the keyboard or a display on the monitor.

The CPU switches between processes at the end of a time slice. The switching between processes is so fast that the user gets the illusion that the CPU is executing only one user's process.

In Time Sharing Operating System a timer interrupt is used to multiplex CPU among jobs. The working of time sharing OS is shown in figure.

Time sharing operating system is logical extension to multiprogramming. CPU executes multiple jobs by switching among them, but the switches occur so frequently that the users can interact with each program while it is running.

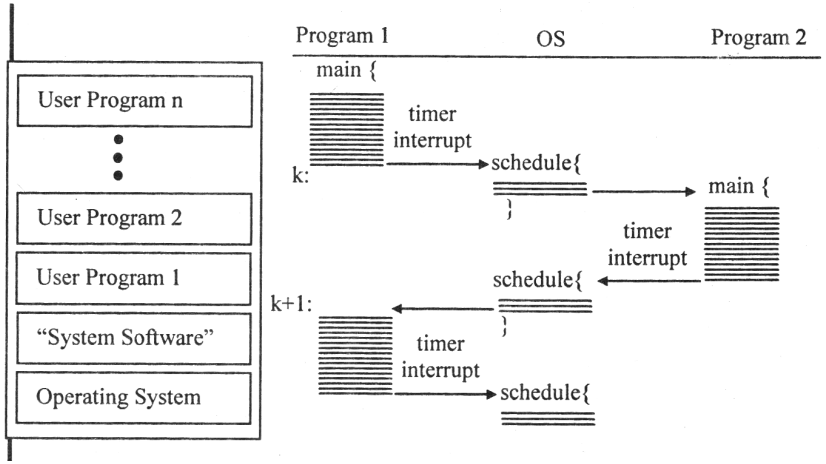


Fig. : Time Sharing OS

Time-sharing operating systems are more complex than multi-programmed operating systems. This is because in multi-programming several jobs must be kept simultaneously in memory, which requires some form of memory management and

protection. Jobs may have to be swapped in and out of main memory to the secondary memory. To achieve this goal a technique called virtual memory is used. Virtual memory allows execution of a job that may not be completely in a memory. The main logic behind virtual memory is that programs to be executed can be larger physical memory, its execution takes place.

Characteristics of Time Sharing Systems

1. Time sharing operating system is logical extension to multiprogramming.
2. CPU executes multiple jobs by switching among them, but the switches occur so frequently that the users can interact with each program while it is running.
3. Time sharing OS allows many users to share the computer system simultaneously.
4. Every user program is allocated a small period of CPU time (typically 10 to 20 milliseconds) known as time slice. As system switches rapidly from one user to another user each user is given impression that the entire computer system is dedicated to him, even though it is being shared among users.

Advantages of Time-Sharing Systems

1. **Interactive Computing :** Unlike multiprogramming batch systems where errors are corrected offline, in time-sharing systems users can interact with the computer, i.e., the errors can be detected while a statement/instruction is being written and can be corrected immediately. That is why; these systems are found most suitable for program development and testing.
2. **Reduces CPU Idle Time :** CPU utilization and throughput is increased to a great extent as the CPU does not have to wait during set up times or during I/O operations as in batch processing systems.
3. **Avoids Duplication of Software :** Several programs are frequently used by many users. In time-sharing systems, such programs are kept in a system library and can be accessed by any user online. Thus user can save his time of writing similar programs again and duplicating them.
4. **Reduces Paper Work :** To get specific information, managers can use online file instead of using a bulky file containing much of unnecessary information.
5. **Gain for Small Users :** Small users who can't afford to buy sophisticated hardware and software can gain access to such resources in time-sharing systems at a minimal cost.

Disadvantages of Time-Sharing Systems

1. **Security :** Since many users use a time-sharing system simultaneously, security methods such as password protection etc. must be applied to protect the programs and data of users from illegal access.
2. **Short Memory :** The main memory is not so large to accommodate the programs of all users. So, at a particular instant, only the active programs and some ready programs are presenting main memory. Later on, programs, which enter into wait state, are swapped to disk and new ready programs are brought into the main memory.
3. **Overhead :** A Large amount of CPU time is wasted in switching from user to user and swapping programs in and out. As the number of users in the system increases, the overhead also increases, resulting in poor response.
4. **Increased Response Time :** If number of terminals increases, response time is also affected.

1.6.4.3 Multiprogramming Systems

As we know that in the batch processing system, there are multiple jobs execute by the system. System first prepares a batch and after that execute all the jobs those are stored into the batch. But the main problem is that:

1. If a process or job requires an input and output operation, then it is not possible.
2. There will be the wastage of the time when preparing the batch and CPU will remain idle at that time.

When two or more programs are residing in memory at the same time, then sharing the processor is referred to the multiprogramming. With the help of multiprogramming one can execute multiple programs on the system at a time and in the multiprogramming the CPU will never get idle, because with the help of multiprogramming one can execute many programs on the system and when working with the program then one can also submit the second or another program for running and the CPU will then execute the second program after the completion of the first program. And in this one can also specify input means a user can also interact with the system.

Multiprogramming assumes a single shared processor. Multiprogramming increases CPU utilization by organizing jobs so that the CPU always has one to execute. The multiprogramming operating systems never use any cards because the process is entered on the spot by the user. But the Operating System also uses the process of allocation and deallocation of the memory, means he will provide the memory space to all the running and all the waiting processes. There must be the proper management of all the running jobs.

In general, multiprogramming implies multitasking but multitasking does not imply multiprogramming. Multitasking is one of the mechanisms that a multiprogramming operating system employs in managing the totality of computer system resources. Multiprogramming with two programs is shown in the figure.

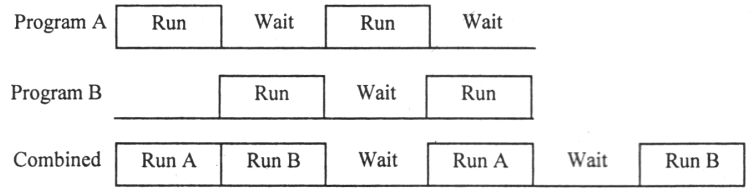


Fig. : Multiprogramming with two Programs

Advantages of Multi-Programming Systems

1. **Throughput :** Number of jobs executed during a given period of time increases.
2. **Response Time :** Time between submission of request and production of first response from CPU is response time. In multiprogramming systems, the response time is lowered.

Disadvantages of Multi-Programming Systems

1. **Large Memory :** The main memory should be large enough to accommodate many programs at same time.
2. **Scheduling :** Some mechanism is needed to decide which job should be brought from disk to main memory. Similarly, scheduling is also needed to decide which program in the main memory is allocated to the CPU first. Such scheduling is required so that a proper mix of I/O and CPU bound jobs are present in memory for effective utilization of CPU.

3. **Memory Protection :** A protection mechanism should be used so that the programs in a particular area of memory are prevented from changing information or instructions of other programs.

4. **Preserving Program Status :** When CPU switches from one job to other, the status of previous job must be preserved so that its execution can be resumed at later time.

1.6.4.4 Multiprocessing Systems

There are basically two ways to increase the speed of computer system:

1. By using high speed components architecturally. Such components tend to be expensive and are often less reliable than standard.
2. By introducing multiprocessor system which provides an appealing architecture alternative for improving performance of computer systems by coupling a number of low cost standard processors.

Thus multiprocessor system has more than one processor in close communication, sharing the computer bus, clock and sometimes memory and devices as shown in figure.

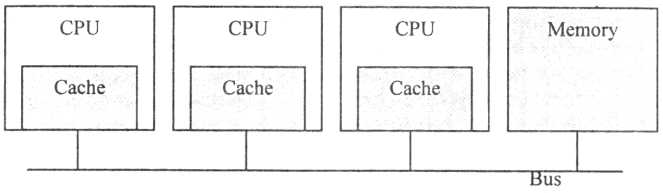


Figure: Multiprocessor OS

Multiprocessing is the use of two or more central processing units (CPUs) within a single computer system. The term also refers to the ability of a system to support more than one processor and/or the ability to allocate tasks between them.

Multiprocessing refers to the ability of a system to support more than one processor at the same time. Applications in a multi-processing system are broken to smaller routines that run independently. The operating system allocates these threads to the processors improving performance of the system.

Advantages of Multiprocessor System

Multiprocessing can be applied to provide.

1. **Increased system throughput :** By executing a number of different user process on different processors in parallel.
2. **Application Speedup** : This is done by executing some portion of the application in parallel:
   i) Throughput can be improved by executing a number of unrelated user processes on different processes in parallel. Thus throughput is improved by completing large number of tasks in a unit time.
   ii) Application speed-up may be obtained by exploiting parallelism within an application and by creating multiple processes or threads that may be schedule for execution on different processes.
3. **Economy of Scale :** Multiprocessor systems can save more than single processors systems, because they can share peripherals, mass storage and power supplies.
4. **Fault Tolerance :** If functions can be distributed properly among several processors, then failure of one processor will not halt the system, but it will be just slow. If we have to process and one fails then remaining nine processors will share the work of failed processor. Thus the entire system will run 10% slower rather than failing altogether.

Disadvantages of Multiprocessor System

1. **Lower Expected Gains :** The speed-up ratio with N processors is not N; rather it is less than N. It is just because when multiple processors cooperate on a task, a certain amount of overhead is incurred in keeping all the parts working correctly. This overhead, plus contention for shared resources lowers the expected gain from additional processors.
2. **Complexity :** Complexity in handling multiple processors.

1.7 Understanding of Graphical User Interface (GUI)

A **graphical user interface** is fondly called "GUI" pronounced "gooey." The word "graphical" means pictures; "user" means the person who uses it; "interface" means what you see on the screen and how you work with it. So a graphical user interface, then, means that you (the user) get to work with little pictures on the screen to boss the computer around, rather than type in lines of codes and commands.

(GUI) An INTERACTIVE outer layer presented by a computer software product (for example an operating system) to make it easier to use by operating through pictures as well as words. Graphical user interfaces employ visual metaphors, in which objects drawn on the computer's screen mimic in some way the behaviour of real objects, and manipulating the screen object controls part of the program.

1.7.1 Features of GUIs Include

- They are much easier to use for beginners.
- They enable you to easily exchange information between software using cut and paste or 'drag and drop'.
- They use a lot of memory and processing power. It can be slower to use than a command-line interface if you are an expert user.
- They can be irritating to experienced users when simple tasks require a number of operations.

When discussing user interfaces, it is important to note that Windows XP-Windows Vista, Apple OSX and Ubuntu all have graphical user interfaces.

Good User Interfaces

A good user interface should :

- be attractive and pleasing to the eye
- allow the user to try out different options easily
- be easy to use
- use suitable colours for key areas
- use words that are easy to understand aimed at the type of user
- have help documentation

It should also consider the needs of the users. For example, young children are likely to prefer pictures to words and people with disabilities may benefit from particular input or output devices.

1.7.2 Basic Components of a GUI

Graphical user interfaces, such as Microsoft Windows and the one used by the Apple Macintosh, feature the following basic components:

- **Pointer :** A symbol that appears on the display screen and that you move to select objects and commands. Usually, the pointer appears as a small angled arrow. Text-processing applications, however, use an I-beam pointer that is shaped like a capital I.
- **Pointing device :** A device, such as a mouse or trackball, that enables you to select objects on the display screen.
- **Icons :** Small pictures that represent commands, files, or windows. By moving the pointer to the icon and pressing a mouse button, you can execute a command or convert the icon into a window. You can also move the icons around the display screen as if they were real objects on your desk.
- **Desktop :** The area on the display screen where icons are grouped is often referred to as the desktop because the icons are intended to represent real objects on a real desktop.
- **Windows :** You can divide the screen into different areas. In each window, you can run a different program or display a different file. You can move windows around the display screen, and change their shape and size at will.
- **Menus :** Most graphical user interfaces let you execute commands by selecting a choice from a menu.

In addition to their visual components, graphical user interfaces also make it easier to move data from one application to another. A true GUI includes standard formats for representing text and graphics. Because the formats are well-defined, different programs that run under a common GUI can share data. This makes it possible, for example, to copy a graph created by a spreadsheet program into a document created by a word processor.

1.7.3 Benefits of the Graphical User Interface

The Graphical User Interface, or GUI (pronounced "gooey") is the technological interface most of us are familiar with. There was a time when you told a computer what to do through text commands (before that it was an index card with holes punched in it called a "punch card"). As you might imagine a point and click approach to computing provided a lot of benefits over a text based approach.

A) Benefits to Organization

The benefit to companies and other organizations include:

- Less skill - most anybody can use a computer with a well designed GUI, so where computers use to only benefit the technically savvy and highly paid expert they now benefit almost everyone.

- Higher Productivity - I once watched a gentleman born in the 1920 put together a user's manual. It was about 40 pages. He took two months working with a pair of scissors, a bottle of glue and a typewriter. When he was done he handed off to the graphic artist who digitized it, prettied it up and readied it for printing in two days. You can do complicated things quickly with a computer.

B) Benefits to Individuals

The benefits to you include:

- Greater Accessibility - you have more capability at your cursor tip
- Lower Cognitive Lode - By having everything laid out in front of you, you don't have to remember a lot of mundane things (like the proper formatting and the list of text commands needed to copy a document). The GUI takes care of most of that freeing up your mental processing power for the important stuff.
- Higher Productivity - when you get down to it the GUI is all about productivity.

1.7.4 Types of GUI's

GUI's can be categorized as

1. Pen based interfaces
2. Touch screen interfaces and
3. Conversational interfaces.

1. Pen based interfaces

If you want a computer that fits in your pocket, a different O.S and User Interface is needed. The interface is touch-sensitive you use a stylus to write on it or to point to commands and the text or command is read off the screen. Screen can sense the position of the stylus and either executes commands or display handwriting on the screen.

2. Touch Screen Interfaces

You will find lots of Kiosks in airports, museums, and other public places that are operated by pointing to pictures or icons on the screen. These systems are so simple to use that no instructions are necessary.

3. Conversational Interfaces

For computers to be as useful as possible, they will eventually Java to respond to spoken commands. Progress has been slow in this area. However, programs are improving and you can now both operate your applications and enter data using voice recognition software.

1.8 Computer Networks

A network is a group of interconnected computers to share resources, exchange files or allow communication.

A computer network is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users.

According to Tenenbaum, "network as an interconnected collection of autonomous computers."

Computer networking is the process of inter connecting two or more computers so that the users can communicate with each other, share resources and overcome other limitations of stand-alone systems. The network can be established with a variety of combinations of computers such as a net of only microcomputers, microcomputers and one or more minicomputers and a set of microcomputers connected to a mainframe computer. The computers in typical network are autonomous in the sense that they have processing capability independent of the network.

Two computers are said to be interconnected if they are capable of exchanging information. Central to this definition is the fact that the computers are autonomous. This means that no computer on the network can start, stop, or control another.

1.8.1 Types of Computer Networks

Computer networks can be divided in following categories :

1. LAN (Local Area Networking)
2. WAN (Wide Area Networks)
3. MAN (Metropolitan Area Networks)
4. CAN (Campus Area Networks)

1.8.1.1 Local Area Network (LAN)

Local Area Networks (LANs) are most often described as privately owned networks that offer reliable high speed communication channels optimized for connecting information processing equipment in a limited geographical area, namely, an office building, complex of buildings, or campus.

A LAN is a form of local (limited-distance), shared packet network for computer communications. LANs interconnect computers and peripherals over a, common medium in order that users might share access to host computers, databases, files, applications, and peripherals.

The main users of LANs include business organizations, research and development groups in science and engineering, industry, educational institution.

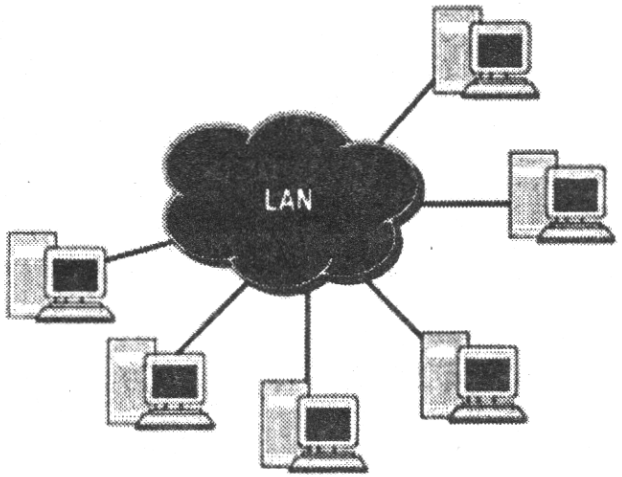


Fig. : LAN Architecture

Advantage of LAN

1. File and Program Sharing

It permits sharing of software, files and etc. For example, suppose your friend or junior in office wanted you to check a document, he or she doesn't need to carry that document from ground floor to 4th floor. When computers are networked together one can open the file from your computer, make changes, and then save the file on that computer without interrupting others.

2. Sharing of Printers

Hardware resource like a laser printer is very expensive. An organization cannot afford to attach a printer to each of its computers. Since there is a need of printers, several employees would need to share one. It is tedious for an employee to carry a printer and attach it to his/ her machine after his/her colleague has finisher using it. With a LAN, employees can sit on their computers, give print commands, and the printer that may be attached to a machine in some other corner of the office would do the printing.

3. **Communication :** Another use of a LAN is that it can help make the computer do the job of an office intercom. We can use the computer to flash messages on the screen of one computer, or a selected group of computers or all the computers in the office. This would save employees the time they would use in going to some desk in another department, on some other floor to deliver a message or a notice. This also reduces the need for face-to-face meetings and the need to circulate a notice among the employees.

Disadvantage of LAN

1. **Reliability :** With a single LAN, a service interruption, even of short duration, could result in a major disruption for users.
2. **Capacity :** A single LAN could be saturated as the number of devices attached to the network grows over time.
3. **Cost :** A single LAN technology is not optimized for the diverse requirements of interconnection and communication. The presence of large numbers of low-cost microcomputers dictates that network support for these devices be provided at low cost. LANs that support very-low-cost attachment will not be suitable for meeting the overall requirement.

1.8.1.2 Metropolitan Area Network (MAN)

MAN is ideal for many kinds of network users because it is a medium-size network. MANs are used to build networks with high data connection speeds for cities and towns.

A MAN is a relatively new class of network, it serves a role similar to an ISP (Internet Service Provider), but for corporate users with large LANs.

The network size falls intermediate between LANs and WANs. A MAN typically covers an area of between 5 and 50 km diameter.

Many MANs cover an area the size of a city, although in some cases MANs may be as small as a group of buildings or as large as the entire city.

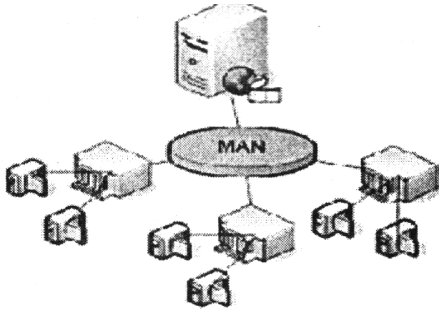


Fig. : Metropolitan Area Network

A MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities.

Advantages of MAN

1. The biggest advantage of MANs is the bandwidth (potential speed) of the connecting links. This means that resources (such as databases and files) shared on the network can be accessed extremely quickly.
2. Accommodates large number of clients.
3. Moderate error rates

Disadvantages of MAN

1. Large space requirements
2. Slower data access
3. More expensive equipment.

1.8.1.3 Wide Area Network (WAN)

A WAN is a data communications network that covers a relatively broad geographic area and that often uses transmission facilities provided by common carriers, such as telephone companies.

WANs are interconnection of any number of LANs and MANs. They connect networks across cities, states and countries. The internet can be thought of as the largest WAN.

WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

Advantages of WAN

1) WANs enable people to communicate with one another very quickly over large distance.
2) Can grow without bound
3) Multiple uses

Disadvantages of WAN

1) Large space requirements at different locations
2) Setting up a network can be an expensive and complicated experience. The bigger the network the more expensive it is.
3) Highest error rates
4) Encryption of secure data such as financial transactions is necessary because it is even easier to intercept data.
5) Once set up, maintaining a network is a full-time job which requires network supervisors and technicians to be employed.

1.8.1.3.1 Difference between LAN, MAN and WAN

Basis	LAN	MAN	WAN
Coverage	Diameter of not more than a few kilometers.	Diameter covers a town or a city.	Span entire countries
Data Rate	A total data rate of atleast 10 to 100 Mbps.	A total data rate is variable.	Data rate more than 1 Mbps (Megabits per second).
Ownership	Complete ownership by a single organization.	Complete ownership is collectively held by few (3 -4) organizations.	Owned by multiple organization.
Error Rate	Very low error rates.	Low error rate.	Comparatively higher error rates.
Topology	Symmetrical topology, ring, bus.	Topology of bus or star.	Several topologies star, ring, mesh.
Standard	It uses IEEE 802 standard.	It uses IEEE 802 standard.	It uses ITU standard.

1.8.1.4 Campus Area Network (CAN)

Campus Area Networks are usually a connection of many small LAN networks which are often used on university campuses and office buildings. Campus Area Networks allow for easy file sharing between different departments as all the files are usually shared on the server machines of each LAN network. This type of network offers a lot of simplicity in the transfer and downloading of files.

1.8.2 Network Topologies

Network topology refers to the physical layout of the network. Each topology has its own strengths and weakness. Various types of topology commonly used in the network. They are bus, star, ring, tree and mesh topology

1. Bus Topology

Bus topology also called horizontal topology. In bus topology all the devices are connected to a single link, sometimes called as backbone. This single link is a cable on which the connections to number of devices are established by tapping the short cables connecting device to the link (cable 1), these short cables are called as drop lines.

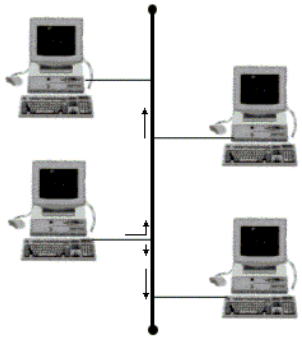


Fig. : Bus Topology

2. Star Topology

A star topology consists of a number of devices connected by point to point links to a central hub. Easy to control and traffic flow is simple. Data travels from the sender to central hub and then to the receiver.

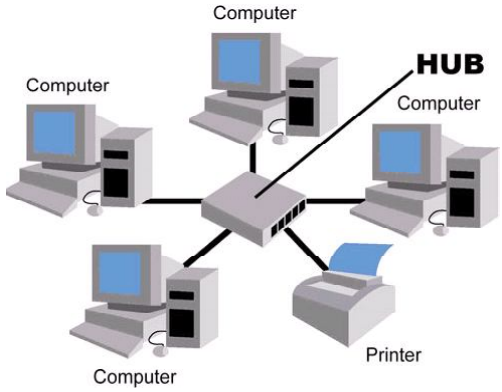


Fig. : Star Topology

3. Ring Topology

In a ring topology, each computer is connected to the next computer, with the last one connected to the first. The signals travel on the cable in only one direction. Since each computer retransmits what it receives, a ring is an active network.

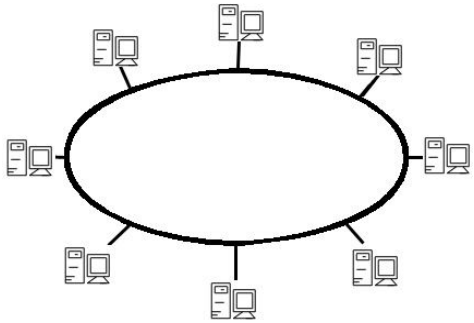


Fig. : Ring Topology

4. Tree Topology

In this all the devices are connected in a tree fashion with 1st node (control hub) acting as an active hub. There are some secondary hub, they are called as passive

hubs of devices are connected to the secondary hubs. Active hub contains a repeater, a hardware device, that regenerates the received bit patterns before sending them to other devices.

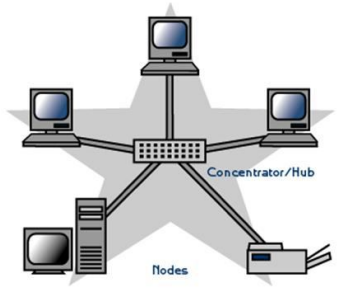


Fig. : Tree Topology

5. Mesh Topology

The mesh topology has a link between each device in the network. It is more difficult to install as the number of devices increases. A fully connected mesh network has $n(n-1)/2$ physical channels to link n devices. There must be $n-1$ input/output ports on each device in the mesh.

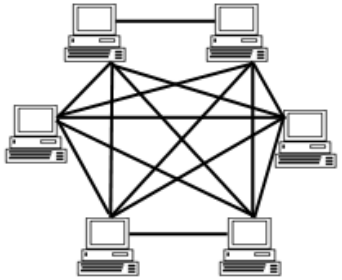


Fig. : Mesh Topology

1.8.3 Applications of Networks

Telecommunication has added new efficiencies in the work place. They also help business to achieve competitive advantage.

1. Electronic Mail

Electronic mail or e-mail, as it is popularly known, is a method of sending and receiving messages (mail) electronically over a computer network.

E-mail is a system allows a person or a group to electronically communicate to others through Internet. A typed message is transmitted through the use of telephone line and high speed modem the message is send in the digital form which is a machine readable language and it is stored in the mail boxes of the receiver. Message can be retrieved by the concept of the receipt; users can edit, sort, classify and forward the message.

2. Video Conferencing

It enables direct face-to-face communication across networks. A video conferencing system has two or more parties in different locations, which have the ability to communicate using a combination of video, audio, and data. A videoconference can be person to person (referred to as 'point-to- point') or can involve more than two people (referred to as 'multipoint') and the video conferencing terminals are often referred to as 'endpoints'.

The following five elements are common to all video conferencing endpoints:

i) **Camera :** The camera captures live images to send across the network.

ii) **Visual Display :** It displays the images of the people taking part in the videoconference.

iii) **Audio System :** It includes both microphones to capture audio from the endpoint and loudspeakers to play back the audio received from other endpoints across the network connection.

iv) **Compression :** Videos are very bandwidth-intensive and they take a long time to load. Therefore, video systems include technologies, for conferencing allowing transmission across a network connection in near-real time.

v) **User Interface and Control System :** The user interface allows the users to control interactions, such as placing calls, storing and locating numbers, and adjust environment settings such as volume. The control system handles the underlying communication that takes place between endpoints.

3. Electronic Data Interchange (EDI)

Refers to the structured transmission of data between organizations by electronic means. It is used to transfer electronic documents from one computer system to another (i.e.,) from one trading partner to another trading partner.

The advantages of EDI include :

i) **Paperless :** EDI save company money by providing an alternative to, or replacing information flows that require a great deal of human interaction and materials such as paper documents, meetings, faxes, etc.

ii) **Reduced Data Handling Costs :** Even when paper documents are maintained in parallel with EDI exchange, e.g. printed shipping manifests, electronic exchange and the use of data from that exchange reduces the handling costs of sorting, distributing, organizing, and searching paper documents.

iii) **No Manual Manipulation of Data :** EDI and similar technologies allow a company to take advantage of the benefits of storing and manipulating data electronically without the cost of manual entry.

iv) **Error Less :** EDI reduces errors, such as shipping and billing errors, because EDI eliminates the need to rekey documents on the destination side.

v) **Speed :** One very important advantage of EDI over paper documents is the speed in which the trading partner receives and incorporates the information into their system thus greatly reducing cycle times.

4. Electronic Funds Transfer (EFT)

Refers to the computer-based systems used to perform financial transactions electronically. Electronic Funds Transfer (EFT) provides for electronic payments and collections. EFT is safe, secure, efficient, and less expensive than paper check payments and collections.

5. Facsimile (Fax)

It is a word from Latin facsimile, "make like. Fax is a copy or reproduction of an old book, manuscript, map, art print or other item of historical value that is as true to the original source as possible using, normally, some form of photographic technique. It differs from other forms of reproduction by attempting to replicate the source as accurately as possible in terms of scale, color, condition, and other material qualities.

6. Telecommuting

It is a work arrangement in which employees enjoy flexibility in working location and hours. In other words, the daily commute to a central place of work is replaced by telecommunication links.

7. Distance Learning

It is the process of creating an educational experience of equal qualitative value for the learner to best suit their needs outside the classroom. Rather than attending courses in person, teachers and students may communicate at times of their own choosing by exchanging printed or electronic media, or through technology that allows them to communicate in real time and through other online ways.

8. Telematics

It is integrated use of telecommunications and informatics. More specifically it is the science of sending, receiving and storing information via telecommunication devices.

1.8.4 Advantages of Networks

The main advantages of networking are:

(i) Hardware Resource Sharing : Network enables sharing of expensive resources such as processor, storage space and peripherals like modern, fax, and laser printer.

(ii) Sharing of Databases : The network permits concurrent access to the same data file by many users in the network. Thus, user in the sales department, production department, inventory department etc share corporate databases.

(iii) Sharing of Software : Any user in a network can load and use the software installed on any of the computer of fileserver in the network.

(iv) Communication between users : The Network users can communicate between them. E-mail facility can also be used for communication.

(v) Decentralized Data Processing : In a network, the data processing can be decentralized by enabling local offices to capture and store data, and generate information to meet most of their requirements a local level itself.

(vi) Security of Data : In a networked environment the data is backed up with duplicate storage. Adequate security measures are also put in place to product the data.

1.8.5 Disadvantages of Networks

(i) Crashes : The biggest disadvantage is on a server-based network. When the server crashes, work gets disrupted as all network resources and its benefits are lost. Unless proper precautions are taken to ensure regular backups, the crash may result in the loss of days' and even months' of critical data and time.

(ii) Data Security : As all the data resources are all pooled together, it is possible for unauthorized personnel to access classified information if network security is weak or poorly implemented.

(iii) Privacy : A network may also mean loss of privacy as anyone, especially your boss, with the right network privileges may be in a position to read your private e-mail.

SHORT NOTES

1. Information Technology

Information technology (IT) is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise.

Information technology (IT) is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data.

2. Computer System

A computer system is a collection of hardware and software components designed to provide an effective tool for computation. Computer system are used in every walk of life to assist us in the various tasks we perform. The wide availability of the internet has enhance the use of computer for information sharing and communication. Computer system allows us to store, process, display and communicate information. In any modern computer system even a simple one, in general needs several different programs in order to accomplish its various functions.

A computer system consists of both hardware and information stored on hardware. Information stored on computer hardware is often called software.

The hardware components of a computer system are the electronic and mechanical parts. The software components of a computer system are the data and the computer programs.

3. Input Devices

Input devices are used to enter data and instructions into computer memory from external world. Examples include: Keyboard, Mouse, Track ball, Track Pad, Joy stick, Touch Screen, Light pen, Touch Screen, Scanner, Digital Camera, Microphone, Graphics tablet. They perform three main functions

(i) Receive data from user

(ii) Convert data into binary form the language of 0 and 1 also called the machine language. Machine language is the only language, a computer can understand directly.

(iii) Provide converted data to computer memory for processing

4. Output Devices

Out put devices are used to display results of processing to the user. They perform the following functions:

(i) Receive results from memory

(ii) Convert data into human readable form

(iii) Display results to the user

5. Processors / CPU

Central processing unit is considered as the brain of computer system.

CPU performs data processing in binary format i.e., it understand data only if it is in the form of either 1 or 0. Whenever an input is supplied, it is converted into binary digit format by counting, listing and rearranging the digits according to the program instructions. Once the processing is done, the result is again translated back into characters or numbers that are easily understood by a human.

Components of CPU

(i) Arithmetic Logic Unit

(ii) Control Unit

(iii) Memory Unit

(iv) Registers

6. Hardware

Computer hardware refers to the physical parts of a computer and related devices. Internal hardware devices include motherboards, hard drives, and RAM. External hardware devices include monitors, keyboards, mice, printers, and scanners.

The internal hardware parts of a computer are often referred to as components, while external hardware devices are usually called peripherals. Together, they all fall under the category of computer hardware. Software, on the other hand, consists of the programs and applications that run on computers. Because software runs on computer hardware, software programs often have system requirements that list the minimum hardware required for the software to run.

7. Software

Software is a generic term for organized collection of computer data and instructions. It is responsible for controlling, integrating, and managing the hardware components of a computer and to accomplish specific tasks. In other words, software tells the computer what to do and how to do it. For example, software instructs the hardware what to display on the user's screen, what kinds of input to take from the user, and what kinds of output to generate. Thus, software communicates with the hardware by organizing the control sequences, and the hardware carries out the instructions defined by the software.

8. System Software

System software consists of several programs, which are directly responsible for controlling, integrating, and managing the individual hardware components of a computer system. You must have noticed that a new computer system is always accompanied by some software, either stored in a floppy or CD, which is supplied by the manufacturer. This software manages and supports the computer system and its information processing activities.

9. Difference between Hardware and Software

	Hardware	Software
1.	It is the physical unit of the computer	It is a collection of programs to bring the hardware system into operation
2.	It has permanent structure and cannot be altered	It has no permanent structure but can be altered and reused
3.	It is normally affected by agent like dust, heat, humidity, etc	It is not affected by these agents to some extent
4.	Hardware understands only machine language, lower level language or binary	It is written by a well versed programmer and generally in higher level language which is readable by human being
5.	It works with binary code, the presence or absence of Pulses as 1's or 0's.	It is represented by the Higher Level

10. Operating Systems

Operating systems are the system software that makes the hardware usable. Hardware provides "raw computing power". Operating system makes the computing power conveniently available to users, by managing the hardware carefully to achieve good performance.

It is considered the backbone of a computer, managing both software and hardware resources. Operating systems are responsible for everything from the control and allocation of memory to recognizing input from external devices and transmitting output to computer displays or output devices.

11. Multiprogramming Systems

As we know that in the batch processing system, there are multiple jobs execute by the system. System first prepares a batch and after that execute all the jobs those are stored into the batch. But the main problem is that:

(i) If a process or job requires an input and output operation, then it is not possible.

(ii) There will be the wastage of the time when preparing the batch and CPU will remain idle at that time.

12. GUI

A graphical user interface is fondly called "GUI" pronounced "gooey." The word "graphical" means pictures; "user" means the person who uses it; "interface" means what you see on the screen and how you work with it. So a graphical user interface, then, means that you (the user) get to work with little pictures on the screen to boss the computer around, rather than type in lines of codes and commands.

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Computer networking is the process of inter connecting two or more computers so that the users can communicate with each other, share resources and overcome other limitations of stand-alone systems. The network can be established with a variety of combinations of computers such as a net of only microcomputers, microcomputers and one or more minicomputers and a set of microcomputers connected to a mainframe computer. The computers in typical network are autonomous in the sense that they have processing capability independent of the network.

UNIT II

Introduction to Information Systems. Definition of Data, Information & Knowledge- Definition of IS-IT vs IS- Types of IS from functional perspective - Human resources IS, financial IS, Marketing IS- IS from managerial perspective - Operation, Tactical, Strategic IS-MIS and others Systems - MIS, DSS.

2.1 INFORMATION SYSTEMS

Information systems play an important role in the design, control, support, and improvement of business processes. IT enables new business processes and information systems can only be useful if they are "aware" of the operational business processes in an organization. Examples of organizations that heavily depend on information systems are multinationals, banks, insurance companies, governments, hospitals, travel agencies and web shops.

2.1.1 Meaning of Information System

An information system is a collection of hardware, software, data, people, and procedures that work together to provide information to a person or an organization.

An information system is a collection of components. That means that the individual components of the system all work together for a common purpose. In the case of an information system, the purpose is to provide information. The organization uses that information to operate the organization, manage the organization, and evaluate opportunities for the organization.

2.1.2 Definition of Information System (IS)

Information systems is defined as the process of and tools for storing, managing, using and gathering of data and communications in an organization. An example of information systems are tools for sending out communications and storing files in a business.

An information system (IS) refers to a collection of multiple pieces of equipment involved in the dissemination of information. Hardware, software, computer system connections and information, information system users, and the system's housing are all part of an IS.

2.1.3 Components of Information Systems

Information systems consist of the following general components:

(i) Hardware

(ii) Software

(iii) Databases

(iv) Human resources

(v) Procedures

(i) Hardware

(a) Multiple computer systems : microcomputers, minicomputers, mainframes, together with their peripherals. Computer system components are: a central processor(s), memory hierarchy, input and output devices.

(b) Computer processor: The central processor carries out the instructions of a program, translated into a simple form.

(c) Memories: Included in a computer system form a hierarchy. They range from the fast electronic units, such as the main memory, to the slower secondary storage devices such as magnetic disks. Moore's Law says that "the increases in the number of transistors on chips correspond to the increase in the microprocessor speed and memory capacity" and thus the growth of the processing power.

Down sizing in information systems, transferring some or all of the organization's computing from centralized processing on mainframes or minicomputers to systems built around networked microcomputers (often in a client/server configuration).

(ii) Software

Computer software falls into two classes: systems software and applications software.

Systems Software : Manage the resources of the computer system and simplifies programming. An operating system is the principal system software. It manages all the resources of a computer system and provides an interface through which the system's user can deploy these resources.

Application Software : Are programs that directly assist end users in doing their work. They are purchased as ready-to-use packages. Applications software directly assists end users in doing their work.

(iii) Database

Database are organized collections of interrelated data used by applications software. Databases are managed by systems software known as database management systems (DBMS) and shared by multiple applications.

(iv) Human Resources

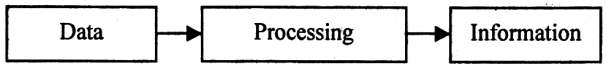
Professional information systems personnel include development and maintenance managers, systems analysts, programmers, and operators, often with highly specialized skills. End users are the people who use information systems or their information outputs, that is, the majority of people in today's organizations. The hallmark of the present stage in organizational computing is the involvement of end users in the development of information systems.

2.2 Information Systems Concepts - Data, Information, and Knowledge

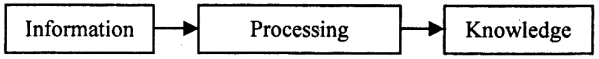
Business intelligence plays a central role in producing up-to-date information for operative and strategic decision-making. It is common knowledge that quality business information is a manager's essential resource. Operating with business information is what business intelligence is all about.

The information is usually categorized into data, information, knowledge, intelligence, and even wisdom and truth. This categorization seems to be useful when analysing the value of information.

Data are symbols that represent properties of objects, events and their environments. When data is organized, it becomes information. Information can be processed and used to draw generalized conclusions or knowledge.



Once the meaning information is processed, one gets the knowledge.



2.2.1 Data

Data becomes information when evaluated in a specific situation or applied to solving a particular problem. That is, data becomes information when used to make a decision. Since value derives solely from solving problems, it is meaningful to speak only of the value of information and not of the value of data. Information is formed when data and a problem come together; the supplier and the user of information both must contribute to the making of product. The supplier or supplying system cannot produce a complete product - information - without the user who had been faced with a problem.

2.2.2 Information

Once the data have been sifted through and organized so as to be relevant to the context of the decision at hand, the data can be called information.

Characteristics of Information

Information as a corporate resource has the following characteristics :

1. **Timeliness :** Information must reach the user in a timely manner, just when it is needed; not too early, because by the time it is used it would be out-of-date; not too late because the user will not be able to incorporate it into his/her decision-making.
2. **Appropriateness :** Information must be relevant to the person who is using it. It must be within the sphere of his/her activities so that it can be used to reduce uncertainty in his/her decision-making.
3. **Accuracy :** Accuracy includes various costs. There is no need of 100% accurate information so long as one knows the degree of accuracy it represents (e.g.: + or - 5%).

4. **Conciseness :** Information should always contain the minimum amount of detail that is appropriate for the user. Too much detail causes information overload.
5. **Frequency :** Frequency is related to timeliness. Too often the information presented is linked to the calendar (end of the week, beginning of the month); its frequency should be synchronized with the timing of the decision making of the user.
6. **Understandability :** The format and presentation of information are very important. Some people prefer tabular information, whereas others may need it in a graphical form.
7. **Relevant :** It pertains to the particular problem. What data is relevant depends on the decision-making model used. For example, university admissions officials may choose to consider the results of some high- school test irrelevant, if they believe that it does not improve the chances of some applicant later becoming a successful student.
8. **Complete :** All the relevant parts are included. For example, marketing data about household incomes may lead to bad decisions, if not accompanied by consumption habits of the target population.
9. **Current :** Decisions are often based on the latest information available.
10. **Economical :** The costs of gathering information should be justified by the overall benefits.

Classification of Information

The information can be classified in a number of ways provide to a better understanding which classifies information. Information can be classified according to following manner :

1. **Classification by Characteristics**

The following is the classification of information on the basis of its characteristics:

i) **Action versus No-action Information :** The information which induces action is called action information. The information which communicates

only the status of a situation is no-action information. 'No stock' report calling a purchase action is action information but the stock ledger showing the store transactions and the stock balances is no-action information.

ii) **Recurring versus Nonrecurring Information:** The information generated at regular intervals is recurring information. The monthly sales reports, the stock statements, the trial balance, etc. are recurring information. The financial analysis or the report on the market research study is non-recurring information.

iii) **Internal versus External Information:** The information generated through the internal sources of the organization is termed as an internal information, while the information generated through the Government reports, the industry surveys, etc. is termed as an external information, as the sources of the data are outside the organization.

2. **Classification by Application :** Following is the classification of information on the basis of application.

i) **Planning Information :** Certain standards, norms and specifications are used in the planning of any activity. Hence, such information is called the planning information. The time standards, the operational standards, the design standards are the examples of the Planning Information.

ii) **Control Information :** Reporting the status of an activity through a feedback mechanism is called the control information. When such information shows a deviation from the goal or the objective, it will induce a decision or an action leading to control.

iii) **Knowledge Information :** A collection of information through the library reports and the research studies to build up a knowledge base as an information source for decision making is known as knowledge information. Such a collection is not directly connected to decision making, but the need of knowledge is perceived as a power or strength of the organization.

3. **Classification by Management Hierarchy :** Following is the classification on the basis of its use in organization (figure) :

Figure: Organization and Information

i) **Strategic Information :** This is the information needed for long range planning and directing the course business should take. For example, should new branches be opened? Should the business be diversified? For such information one has to obtain information on trend, effect of advertising etc. This is mainly meant for the top level management.

ii) **Tactical Information :** This type of information is needed to take short-range decisions to run the business efficiently. For example, should credit limits of customer be changed? How much of each item should be stocked? Tactical information requires specifically designed processing of data. Most of it is obtainable from day to day collection of routine data. This is mainly meant for the middle level management.

iii) **Operational Information :** This type of information is needed for day-to-day operation of a business organization. For example, list of items to be recorded, list of defaulting customers. Operational information is easy to obtain by straightforward clerical processing of data. This is mainly meant for the operational level management.

2.2.3 Knowledge

Knowledge is the facts, feelings or experiences known by a person or a group of people. It is considered to be present in ideas, judgment, root causes, relationships, perspectives and concepts. Knowledge is the result of learning and is stored in an individual brain or encoded in documents, product, facilities and concepts.

According to Davenport and Prusak, "Knowledge is a fluid mix of framed experience, contextual information, values and expert insight that provides a framework for evaluating and incorporating new experiences and information."

It is gained from the certitude that comes from experience, a logical argument, or a preponderance of evidence. Knowledge knows what works and how it works.

Important Points Regarding Knowledge

1. Data/information with beliefs.
2. Information with higher certainty and validity.
3. Shared information.
4. Information with experience.
5. Organized information that is internalized.
6. Condition of knowing.

2.2.4 Relationship between Data, Information, Knowledge and Intelligence

Data, information and knowledge are closely related as shown in **figure.** Data acts as a raw material for information.

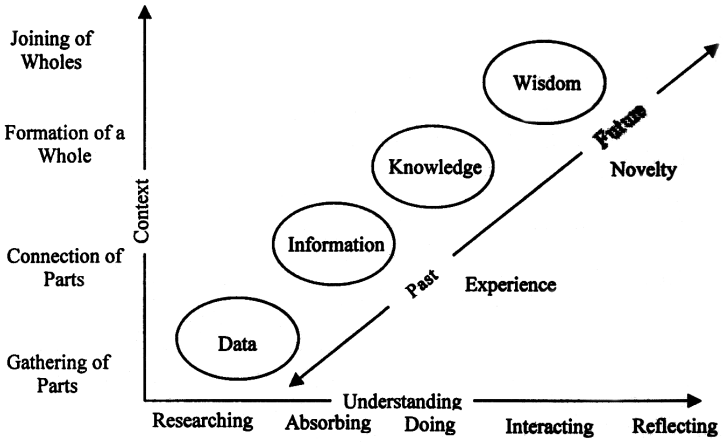


Figure: Relation between Data, Information and Knowledge

Knowledge is the collection of data and information whereas data is a small part of the information.

According to Peter Drucker, "Information only becomes knowledge in the hands of someone who knows what to do with it". Knowledge is information that changes something or somebody - either by becoming grounds for actions, or by making an individual (or an institution) capable of different or more effective action.

A basic understanding of Data, information and knowledge helps in understanding of knowledge management system.

2.3 Information Systems vs Information Technology

Information technology and information systems are two closely related fields of study that people find very confusing to differentiate between. This is because of overlapping of topics in courses that are designed to teach these subjects. Despite all the similarities there are differences that need to be highlighted to enable students to choose one of the two as a career option depending upon suitability.

Information Technology

Information technology can be considered as a subset of information systems. It deals with the technology part of any information system, and as such deals with hardware, servers, operating systems and software etc.

Information Systems

'Information systems' is in essence bridging the gap between business and the ever growing field of computers. On the other hand, information technology is all about managing technology and making use of it for the betterment of business.

A) Comparison of Information System and Information Technology

Information system and information technology are similar in many ways but at the same time they are different. Following are some aspects about information system as well as information technology.

- **Origin:** Information systems have been in existence since pre-mechanical era in form of books, drawings, etc. However, the origin of information technology is mostly associated with invention of computers.
- **Development:** Information systems have undergone great deal of evolution, i.e. from manual record keeping to the current cloud storage system. Similarly, information technology is seeing constant changes with evermore faster processor and constantly shrinking size of storage devices.

- **Business Application:** Businesses have been using information systems for example in form of manual books of accounts to modern TALLY. The mode of communication has also gone under big change, for example, from a letter to email. Information technology has helped drive efficiency across organization with improved productivity and precision manufacturing.

B) Future of Information System and Information Technology

Information technology has shown exponential growth in the last decade, leading to more sophisticated information systems. Today's information technology has tremendously improved quality of life. Modern medicine has benefited the most with better information system using the latest information technology.

Information systems have been known to mankind in one form or the other as a resource for decision making. However, with the advent of information technology information systems have become sophisticated, and their usage proliferated across all walks of life. Information technology has helped managed large amount of data into useful and valuable information.

2.4 Types of Information System from Functional Perspective

Functional Information System is based on the various business functions such as Production, Marketing, Finance and Personnel etc. These departments or functions are known as functional areas of business. Each functional area requires applications to perform all information processing related to the function. The popular functional areas of the business organization are:

1. Financial Information System
2. Marketing Information System
3. Production/Marketing Information System
4. Human Resources System

1. Financial Information System

Financial information system is a sub-system of organizational management information system. This sub-system supports the decision-making process of financial functions at the level of an organization.

2. Marketing Information System

This sub-system of management information system provides information about various functions of the marketing system of an organization. Marketing is another functional area of the business organization, which is engaged in marketing (selling) of its products to its customers.

Important functions of the marketing process include the following.

- The marketing identification function
- The purchase motivation function.
- The product adjustment function
- The physical distribution function
- The communication function
- The transaction function
- The post-transaction function

3. Production /manufacturing Information System

Manufacturing or production information system provides information on production /operation activities of an organization and thus facilitates the decision-making process of production managers of an organization.

4. Human resources information system

This functional information system supports the functions of human resource management of an organization. The human resource management function, in its narrow sense, it also known as personnel management. The function involves:

- Manpower planning.
- Staffing
- Training and development
- Performance evaluation, and
- Separation activities

2.4.1 Human Resources Information Systems (HRIS)

Human Resources Information Systems (HRIS) is an integration of HRM and Information Systems (IS). HRIS or Human resource Information system helps HR managers perform HR functions in a more effective and systematic way using technology. It is the system used to acquire, store, manipulate, analyze, retrieve, and distribute pertinent information regarding an organization's human resources.

A human resource information system (HRIS) is a system used to acquire, store, manipulate, analyze, retrieve, and distribute pertinent information about an organization's human resources (Tannenbaum, 1990). The HRIS system is usually a part of the organization's larger management information system (MIS) which would include accounting, production, and marketing functions, to name just a few. Human resource and line managers require good human resource information to facilitate decision-making. An extensive study by Towers Perrin study revealed the following benefits of

2.4.1.1 Application of HRIS

HRIS can be applied in the following areas of HRM

- HR planning
- Succession planning
- Work force planning
- Work force dynamics analysis
- Staffing
- Applicant recruitment and tracking
- Employee data base development
- Performance management
- Learning and development
- Compensation and benefits
- Pay roll
- Job evaluation

- Salary survey
- Salary planning
- International compensation
- Benefits management
- Develop innovative Org. Structure
- Develop IT

2.4.1.2 HRIS Benefits

HRIS has showed many benefits to the HR operations. A few of them can be detailed as;

- Faster information process,
- Greater information accuracy,
- Improved planning and program development, and
- Enhanced employee communications

2.4.1.3 Barriers to the success of an HRIS

- Lack of management commitment
- Satisfaction with the status quo
- No or poorly done needs analysis
- Failure to include key people
- Failure to keep project team intact
- Politics / hidden agendas
- Failure to involve / consult significant groups
- Lack of communication
- Bad timing (time of year and duration

2.4.1.4 Critical Analysis

Although almost all HR managers understand the importance of HRIS, the general perception is that the organization can do without its implantation. Hence only large companies have started using HRIS to complement its HR activities.

But HRIS would be very critical for organizations in the near future. This is because of a number of reasons.

- Large amount of data and information to be processed.
- Project based work environment.
- Employee empowerment.
- Increase of knowledge workers & associated information.
- Learning organization

The primary reason for delay in HRIS implementation in organizations is because of the fear psychosis created by "technology" and "IT" in the minds of senior management. They may not be very tech savvy and fear being left out.

But trends are changing for the better as more and more organizations realize the importance of IT and technology. Major HRIS providers are concentrating on the small and middle range organizations as well as large organizations for their products. They are also coming up with very specific software modules, which would cater to any of their HR needs. SAP and Peoplesoft provide HR modules within their business intelligence software. Hence HRIS would soon be an integral part of HR activities in all organization.

2.4.2 Financial Information System (FIS)

A financial information system (FIS) accumulates and analyzes financial data used for optimal financial planning and forecasting decisions and outcomes. An FIS is used in conjunction with a decision support system, and it helps a firm attain its financial objectives because they use a minimal amount of resources relative to a predetermined margin of safety. An FIS can be thought of as a financial planner for electronic commerce that can also produce large amounts of market and financial data at once obtained from financial databases worldwide.

Features of Financial Information Systems are

- **Payroll :** Handles all the recurring and non-recurring payments and deductions for employees. All recurring transactions can be automatically generated each payroll period with non-recurring transactions such as overtime added to the payroll upon approval. It is also possible to maintain employee pay rates, entitlements, full salary movements and payroll histories.

- **Patient Accounting :** This concentrates on financial transactions generated during a patient's visit to the hospital. These include inpatient and outpatient charges, doctors' fees generated across the hospital, the cost of procedures, operations and medications.
- **Accounts Payable :** Handles the processing of invoices and payments within the hospital.
- **Accounts Receivable :** This provides support for and the maintenance of the records of all clients, invoices and payments.
- **General Ledger :** This handles the collection, processing and reporting of financial data generated by all transactions, enabling a current, accurate and instant view of the financial status of the hospital at any point in time.
- **Fixed Asset Management :** This deals with asset data retention and depreciation forecasting. The transfer of fixed assets between locations, cost centres or departments; reclassification of assets and reassessments of asset values can functions that can be done by the Financial Information System.
- **Claims Management :** Manages all claims that are made to insurance companies
- **Contract Management :** Keeps track of all ongoing contracts.

2.4.3 Marketing Information System (MIS)

A marketing information system (MIS) is a set of procedures and methods designed to generate, analyze, disseminate, and store anticipated marketing decision information on a regular, continuous basis. An information system can be used operationally, managerially, and strategically for several aspects of marketing.

Meaning of MIS

Marketing Information System, abbreviated as MIS, means to collect, analyze and supply marketing information to the marketing managers. The marketing managers use this information to take marketing decisions. MIS is a permanent and continuous process.

Definitions of Marketing IS

According to Prof. Mudit Katyani, "MIS is a planned tactic to do analysis of mainly three system requirements viz., people, information, and technology. It is required at all levels of management in executing operational, managerial, and strategic

decisions. Its intention is to design the procedures which give a comprehensive report in a timely manner inuous system of collecting information. It collects information continuously.

2.4.3.1 Objectives of MIS

1. **Basic objective** : The basic objective of MIS is to provide the right-information at the right-time to the right-people to help them take right decisions.
2. **Computer based system** : MIS is a computer-based system. It uses computers for storing, analyzing and supplying information. It also uses micro-films for storing information. Therefore, it is very quick and accurate.
3. **Future-oriented** : MIS is future-oriented. It provides information for solving future problems. It is not past-oriented.
4. **Used by all levels** : MIS is used by all three levels of management, i.e. top, middle and lower. It is used for making marketing plans, policies and strategies. This is used to solve marketing problems and to take advantage of business opportunities.
5. **Sources** : MIS collects information from both, internal and external sources. For example, information is collected from company records, publications, etc.
6. **Collects marketing information** : MIS collects all types of marketing information. It collects information about the consumer competition, marketing environment, government policies, etc. It supplies this information to the marketing managers.
8. **Helps in decision making** : MIS supplies up-to-date and accurate information. It helps marketing managers to take quick and right decisions

2.4.3.2 Components of Marketing Information System MIS

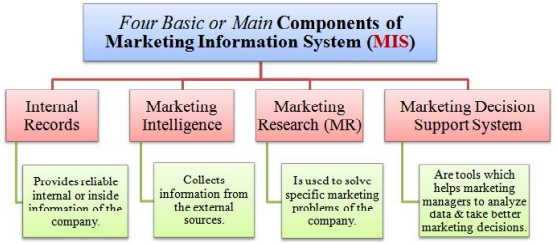
Marketing Information System (MIS) collects, analyses, and supplies a lot of relevant information to the marketing managers. It is a valuable tool for planning, implementing and controlling the marketing activities.

The role of MIS is to identify (find out) what sort of information is required by the marketing managers. It then collects and analyzes the information. It supplies this information to the marketing manager at the right time. MIS collects the information through its subsystems. These subsystems are called components.

The four main components of Marketing Information System (MIS) are:

1. Internal Records,
2. Marketing Intelligence,
3. Marketing Research (MR), and
4. Marketing Decision Support System.

The basic components of MIS are depicted and explained below.



1. **Internal records** : The first component of MIS is 'Internal Record'. Marketing managers get lots of information from the internal-records of the company. These records provide current information about sales, costs, inventories, cash flows and account receivable and payable. Many companies maintain their computerized internal records. Inside records help marketing managers to gain faster access to reliable information.

2. **Marketing intelligence**

The second component of MIS is 'Marketing Intelligence'. It collects information from external sources. It provides information about current marketing-environment and changing conditions in the market. This information can be easily gathered from external sources like; magazines, trade journals, commercial press, so on. This information cannot be collected from the Annual Reports of the Trade Association and Chambers of Commerce, Annual Report of Companies, etc. The salesmen's report also contains information about market trends.

The information which is collected from the external sources cannot be used directly. It must be first evaluated and arranged in a proper order. It can be then used by the marketing manager for taking decisions and making policies about marketing.

So, marketing intelligence is an important component of MIS.

3. **Marketing research** : The third important component of MIS is 'Marketing Research'. MR is conducted to solve specific marketing problems of the company. It collects data about the problem. This data is tabulated, analyzed and conclusions are drawn. Then the recommendations are given for solving the problem. Marketing research also provides information to the marketing managers. However, this information is specific information. It can be used only for a particular purpose. MIS and MR are not substitutes of each other. The scope of MIS is very wide. It includes 'MR'. However, the scope of MR is very narrow.

4. **Marketing Decision Support System :** The fourth component of MIS is 'Marketing Decision Support System'. These are the tools which help the marketing managers to analyze data and to take better marketing decisions. They include hardware, i.e. computer and software programs. Computer helps the marketing manager to analyze the marketing information. It also helps them to take better decisions. In fact, today marketing managers cannot work without computers. There are many software programs, which help the marketing manager to do market segmentation, price fixing, advertising budgets, etc.

2.4.3.3 Essentials of a Good Marketing Information System (MIS)

The essentials of a good Marketing Information System (MIS) is listed below:

1. MIS must be unified and centralized.
2. It must facilitate decision making.
3. It must provide quick and accurate information.
4. It must be economical.
5. It must be selective.
6. It must be future oriented.
7. It must supply information regularly.
8. It must use new techniques.

2.4.3.4 "How a good MIS must be?"

1. Unified and Centralized

MIS must be unified and centralized. It collects and stores different types of market information. All of this information must be unified and centralized. That is, all the marketing information must be brought together (unified) and kept at

one central place (centralized). So, it must be at the central-office. This will result in easy access and quick reference. The managers will be able to find all the required information at one place.

2. Facilitate Decision Making

MIS must facilitate decision making. That is, it must guide the marketing managers in decision making. It must provide required information to the managers to help in taking decisions. This information must be of a good quality. That is, it must be relevant, reliable, and up-to-date. This will result in an accurate decision-making process. So, it must not only be a data bank. It must play a positive role in the decision-making process.

3. Quick and Accurate Information

MIS must provide quick and accurate information. Today, managers have to take quick-decisions because the marketing is moving very fast. If they don't take quickest decisions, then they will lose many marketing opportunities. Therefore, it must provide quick information to the managers. This information must also be accurate, regular and continuous. It must be a user-oriented one. It must collect, classify, verify, store and supply information quickly and accurately.

4. Economical

MIS must be economical. That is, it must not be very costly. The expenditure on it must be minimum. It must not exceed its value. It must give maximum benefits to the company at a minimum cost. It will be economical only if it is selective. It must be particular in collecting, analyzing, storing and supplying information. It must use a minimum number of employees in its operation. It must be economical because it is not directly productive. It is a service and support function.

5. Selective

MIS must be selective. That is, it must not collect all the market information. It must only collect relevant information. It must collect information, which is very essential and useful for decision making. If it is not selective there will be a waste of time, energy, storage space and money.

6. Future oriented

MIS must be forward looking i.e. future-oriented. It must not be a past-oriented one. It must give more importance to future-oriented information. It must provide information for solving problems, which may come up in the future. The company will be successful if their marketing managers are future-oriented. The marketing managers can be so only if the MIS is also future oriented.

7. Supply information regularly

MIS must supply information regularly. The business environment is changing constantly. So, the marketing managers have to take marketing decisions continuously. Therefore, they require a regular and continuous flow of market information. This information must be provided by MIS. So, it must supply information regularly to the marketing managers.

8. Use new techniques

MIS must use new techniques for collecting, analyzing, storing and supplying information. It must use computers and micro-films. It must use new communication techniques. It must also make the use of the Internet and latest software programs. These newer techniques will increase the efficiency and accuracy of MIS. MIS will also become more economical by using new techniques.

2.5 IS FROM MANAGERIAL PERSPECTIVE

2.5.1 Operation Support Systems

The operations support system provides information about the day-to-day activities of the organization. They support the operations of the organization, by keeping track of the resources and the transactions.

Every business organisation requires information system to process data generated by business organisation and used in business operations. Operations support produces a variety of information for internal and external use. Its role is to efficiently process business transactions, control industrial processes, support enterprise communications and collaboration and update corporate databases.

Classification of OSS

These are classified as below:

1. Transactions Processing Systems (TPS)
2. Process Control Systems (PCS)
3. Enterprise Collaboration System (ECS)

2.5.1.1 Transaction Processing Systems (TPS)

Transaction processing systems were among the earliest computerized systems. Their primary purpose is to record, process, validate, and store transactions that take place in the various functional areas/of a business for future retrieval and use.

A transaction processing system (TPS) is an information system that records company transactions (a transaction is defined as an exchange between two or more business entities).

Transaction processing systems (TPS) are cross-functional information systems that process data resulting from the occurrence of business transactions.

Features of TPS

There are four characteristics that all transaction processing systems should have:

1. **Rapid Response :** Customers should not be made wait a long time. The quicker the response time the happier the customer and the more revenue that can be collected.
2. **Reliability :** This information system involves cash. Any mistakes here can have serious consequences for the company's bottom line, customer satisfaction, auditors, the taxation department and the list goes on.
3. **Inflexibility :** One doesn't want people making up their own rules when it comes to money. It must be performed the same way every time. If any step is altered it becomes more likely that a mistake may be made. With computers it must be rigidly adhered to.
4. **Controlled Processing :** There must be procedures in place to check that everything and everyone is doing the right thing. On the computers end is something called a transaction processing monitor to ensure that everything is right with the TPS but there must also be human controls to ensure that everyone is doing the right thing.

Transaction Processing Cycle/Functions of TPS

Transaction processing systems capture and process data describing business transactions, update organisational databases, and produce a variety of information products. Transaction processing cycles of several basic activities are shown in figure.

The steps of transaction processing cycle are:

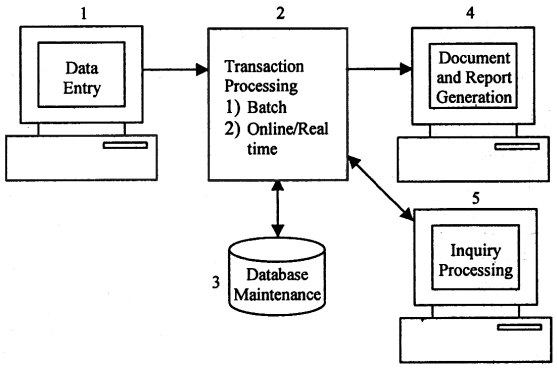


Fig. : Transaction Processing Cycles

1. Data Entry

The first step of the transaction processing cycle is the capture of business data. For example, transaction data may be collected by point-of-sale terminals using optical scanning of bar codes and credit card readers at a retail store or other business. Or transaction data can be captured at an electronic commerce website on the internet. The proper recording and editing of data so they are quickly and correctly captured for processing is one of the major design challenges of information systems.

2. Transaction Processing

Transaction processing systems process data in two basic ways:

i) **Batch Processing :** Where transaction data are accumulated over a period of time and processed periodically.

ii) **Real-Time Processing :** Real-time processing (also called online processing), where data are processed immediately after a transaction occurs.

All online transaction processing systems incorporate real-time processing capabilities. Many online systems also depend on the capabilities of fault tolerant computer systems that can continue to operate even if parts of the system fail.

3. Database Maintenance

An organisation's databases must be maintained by its transaction processing systems so that they are always correct and up-to-date. Therefore, transaction processing systems update the corporate databases of an organisation to reflect changes resulting from day-to-day business transactions. For example, credit sales made to customers will cause customer account balances to be increased and the amount of inventory on hand to be decreased. Database maintenance ensures that these and other changes are reflected in the data records stored in the company's databases.

4. Document and Report Generation

Transaction processing systems produce a variety of documents and reports. For example, purchase orders, paychecks, sales receipts, invoices, and customer statements. Transaction reports might take the form of a transaction listing such as a payroll register, or edit reports that describe errors detected during processing.

5. Inquiry Processing

Many transaction processing systems allow one to use the internet, intranets, extranets, and web browsers or database management query languages to make inquiries and receive responses concerning the results of transaction processing activity. Typically, responses are displayed in a variety of pre-specified formats or screens. For example, one might check on the status of a sales order, the balance in an account, or the amount of stock in inventory and receive immediate responses at PC.

Advantages of TPS

1. **Handling Operations :** This system is helpful for any business that wants to make selling goods and services easier for consumers.
2. **Good Data Placement :** The database in this system is designed to access patterns of data from simultaneous users.
3. **Short Transactions :** Short transactions enables quick processing. This avoids concurrency and paces the system.
4. **Real Time Backup :** Backup is scheduled between low times of activity to prevent lag of the server.

5. **High Normalization :** This lowers redundant information to increase the speed and also improves backups.
6. **Archiving Historical Data :** Uncommonly used data are moved to other database to improve backup times.

Disadvantages of TPS

1. **Data Redundancy :** Redundancy problem happens because of following reasons:
   i) Causes integrity problems
   ii) Temporal integrity problems
2. **Too Much Consolidation :** To have this system, this business requires technical people that can perform maintenance of the system 24 hours a day, seven days a week.
3. **Security and Hardware Problems :** Transaction processing systems are a combination of software and hardware used to handle immense quantities of consumer and business data. Because of this, viral security breaches may occur in this system, especially since consumers' private information is held within the database. Also, any hardware malfunction, such as an electrical outage, could damage a well-integrated system that serves millions of consumers.

2.5.1.2 Process Control Systems (PCS)

Decision rules outline the actions to be taken when an information system is confronted with a certain set of events. This includes a category of information systems called process control systems (PCS), in which decisions adjusting a physical production process are automatically made by computers. For example, Petroleum refineries and the assembly lines of automated factories use such systems.

Process control is a state whereby statistical inference techniques are used to monitor and control a specified process in order to achieve improved quality and gains in productivity.

The control concept utilizes both historical and present technical knowledge of the process in understanding cause- and-effect relationships combined with statistical techniques to control and minimize defects. The implementation of process control concepts and techniques is achieved by providing a control system for defect and error detection, a control system for defect and error analysis and a control system for defect and error correction.

A process control system is a feedback mechanism that provides information about the process characteristics and variables, process performance, action on the process inputs, transformation process and action on the output.

Components of PCS

The major components of a process control system are presented in figure.

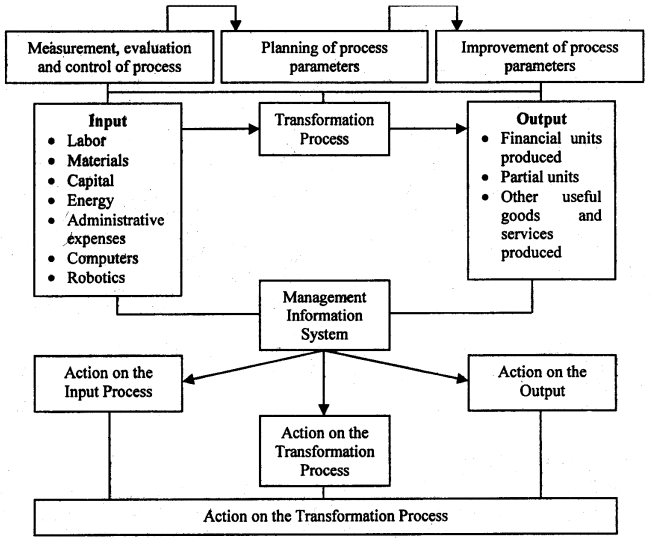


Fig. : Components of a Process Control System

Requirements of PCS

In order to improve the quality of products or services from a process, the following basic requirements are necessary:

1. The management philosophy must be one that is geared toward continuous quality improvement at the source of production or service. Process control is not a one-time action. It is a continuous feedback mechanism that involves both management and employees in producing good products and services.
2. There must be a system for measurement, control, evaluation, planning and improvement.

3. There must be a database for the storage, retrieval and access of information about the process.
4. There must be a clear definition of process parameters and variables. Input and output elements must be clearly identified.
5. All process parameters must be characterized with complete understanding of repeatability and variability.
6. There should be process ownership by everyone involved in the management process.
7. Management philosophy must be that no level of defect is acceptable.
8. Quality improvements from key process control actions must be documented and rewarded on a timely basis.
9. The management information system for process control must provide a real-time feedback mechanism to everyone involved in the quality improvement effort.
10. There should be provision for ongoing training in process control techniques.
11. The attainment of a good quality product should be through the prevention of defects, not through the detection of defects.
12. The removal of defects from a process should be done through root cause analysis and the implementation of proper corrective action.

Advantages of PCS

1. Facilitates process capability improvement. It helps in determining the root cause of a problem and monitoring of corrective actions.
2. Facilitates increases in productivity through control of rework, machine downtime, scrap and work-in- process inventory.
3. Provides a basis for both management and employee to understand and control assignable causes that affect a process performance.
4. Facilitates the minimization of the "cost of quality", the expense of doing things right the first time.
5. Creates a basis for effective control and understanding of the complex interaction among production and human variables, such as machines, fixtures, materials and human work habits and efficiency.
6. Facilitates improvements in quality yield and reduction in product cycle time.
7. With tools, such as control charts, provides a common language for communications about the performance of a process.

2.5.1.3 Enterprise Collaboration System (ECS)

Enterprise collaboration system is a group of hardware, software, data, and network resources to support communication, coordination, and collaboration among the members of business teams and workgroups.

An Enterprise Collaboration System (ECS) is an information system used to facilitate efficient sharing of documents and knowledge between teams and individuals in an enterprise.

The objective of an ECS are:

1. **Communication :** Sharing of Information with each other
2. **Coordination :** Coordinate individual work efforts and use of resources with each other.
3. **Collaboration :** Work together cooperatively on joint projects and assignments.

Enterprise collaboration systems enhance team and workgroup communications and productivity, and include applications that sometimes called office automation systems (OAS). For example, knowledge workers in a project team may use electronic mail to end and receive electronic messages, and videoconferencing to hold electronic meetings to coordinate their activities.

Components of ECS

Groupware is collaborative software that helps teams and workgroups work together in a variety of ways. Groupware provides many software tools for electronic communications, electron conferencing, and collaborative work management.

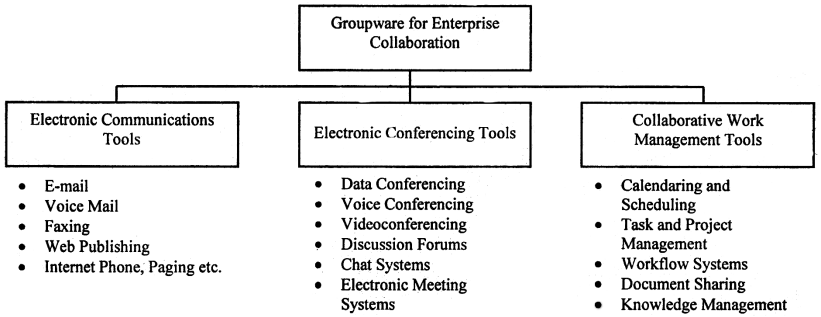


Fig. : Software Tools for Enterprise Collaboration

1. Electronic Communication Tools

Electronic communication tools include electronic mail, voice mail, faxing, Web publishing, bulletin board systems, paging, and Internet phone systems. These tools enable to electronically send messages, documents, and files in data, text, voice, or multimedia over computer networks. This helps to share everything from voice and text messages to copies of project documents and data files with the team members, wherever they may be. The ease and efficiency of such communications are major contributors to the collaboration process. The communication tools are:

i) **Electronic Mail :** Widely used to send and receive text messages between networked PCs over telecommunications networks. E-mail can also include data files, software, and multimedia messages and documents as attachments.

ii) **Voice Mail :** Unanswered telephone messages are digitized, stored, and played back to you by a voice messaging computer.

iii) **Faxing :** Transmitting and receiving images of documents over telephone or computer networks using PCs of fax machines.

iv) **Web Publishing :** Creating, converting, and storing hyperlinked documents and other material on Internet or intranet Web servers so they can easily be shared via Web browsers or netcasting with teams, workgroups, or the enterprise.

2. Electronic Conferencing Tools

Electronic conferencing tools help people communicate and collaborate while working together. A variety of conferencing methods enable the members of teams and workgroups at different locations to exchange ideas interactively at the same time, or at different times at their convenience. Electronic conferencing options also include electronic meeting systems, where team members can meet at the same time and place in a decision room setting. Electronic conferencing tools include:

i) **Data Conferencing :** Users at networked PCs can view, mark up, revise, and save changes to a shared whiteboard of drawings, documents, and other material.

ii) **Voice Conferencing :** Telephone conversations shared among several participants via speaker phones or networked PCs with Internet telephone software.

iii) **Videoconferencing :** Real-time video- and audio conferencing (1) among users at networked PCs (desktop videoconferencing) or (2) among participants in conference rooms or auditoriums in different locations (teleconferencing). Video conferencing can also include white boarding and document sharing.

iv) **Discussion Forums :** Provide a computer network discussion platform to encourage and manage online text discussions over a period of time among members of special interest groups or project teams.

v) **Chat Systems :** Enable two or more users at networked PCs to carry on online, real-time text conversations.

vi) **Electronic Meeting Systems :** Using a meeting room with networked PCs, a large-screen projector, and EMS software to facilitate communication, collaboration, and group decision making in business meetings.

3. Collaborative Work Management Tools :

Collaborative work management tools help people accomplish or manage group work activities. This category of groupware includes calendaring and scheduling tools, task and project management, workflow systems, and knowledge management tools. Other tools for joint work, such as joint document creation, editing, and revision, are found in the software. The groupware tools in this category are so diverse that one needs to explain them individually in order to understand how they support enterprise collaboration:

i) **Calendaring and Scheduling :** Using electronic calendars and other groupware features to automatically schedule, notify, and remind the computer networked members of teams and workgroups of meetings, appointments, and other events.

ii) **Task and Project Management :** Managing team and workgroup projects by scheduling, tracking, and charting the completion status of tasks within a project.

iii) **Workflow Systems :** Help networked knowledge workers collaborate to accomplish and manage the flow of structured work tasks and electronic document processing within a business process.

iv) **Knowledge Management :** Organizing and sharing the diverse forms of business information created within an organization. Includes managing and providing personalized access to project and enterprise document libraries, discussion databases, hypermedia website databases, and other types of knowledge bases.

Advantages of ECS

1. Improved access to information & people across the organization
2. On-demand availability of data for accelerated decision making
3. People centric processes that are flexible and meets the demands of the new generation work group
4. Seamless collaboration across geographically distributed teams
5. Innovation enabled by extended teams and global project networks
6. Enterprise-wide sharing of knowledge and resources
7. Optimal utilization of distributed resources to improve productivity and profits

Disadvantages of ECS

1. Office staff becomes dependent on computers and other technologies, they do not want to do work manually or mostly even cannot do work manually in case of failure of automated systems.
2. These systems are generally expensive than manual systems if not appropriately installed and implemented and without considering the financial resources of the organization.
3. Automated collaboration can also create health problems to the employees if they continuously work on computers for a long time.

2.5.2 Tactical Information System

Tactical Information Systems is an innovative leader in the development of complex, large-scale, cloud-based biometric software applications and provides secure hosting and management services for customizable biometric data system to both the private and government sectors around the world. The company is based in Austin, Texas, and its executives have a combined 20 years of experience in the commercialization of emerging technologies and profitable

Tactical Information Systems has created an elastic computing cloud based platform for low-cost biometric matching of fingerprints, iris and face images as a service. The technology allows for rapid creation of biometric applications. The first application is WanderID, service that uses biometric face matching to identify people who cannot identify themselves in case of emergency.

Tactics

Strategy involves the future vision of the business; tactics involve the actual steps needed to achieve that vision. For example, a marketing strategy for a motel might be to develop a business package targeting travel agents that includes an e-commerce solution. Tactics are practical steps for implementing strategy. Other tactics for the travel-agent strategy might include:

- building a list of local travel agents
- preparing a business incentive scheme
- outlining how they can use the motel website to make reservations and keep up-to-date
- personally visiting the agents to follow up
- monitoring the response to determine if the sales target is met

One can see from this that strategy always comes first, followed by tactics. For example, a value-based commitment to environmentally responsible hospitality could be reflected strategically by working toward Green Globe certification and tactically by incorporating energy efficient appliances in the motel retrofit.

IS supports in making strategic decision for competitive advantage

By analyzing data collected from different sources, IS can provide valuable information such as which items to launch in which location; so that the company can have advantage over their competitors using this information. IS can also help business houses; in carrying out their business processes differently than their competitors.

Tactical Level

IS helps making better decisions: Many managers operate in an information bank and they never have the relevant information at the right moment to make a learned decision; poor outcomes like these loose customers and raise costs. Managers can use real time data while making decisions; IS allow managers to use real-time data from the marketplace while making decisions. An example is the Verizon Corporation, which uses a Web-based digital dashboard that gives managers accurate real-time information on customer complains and network performances. By using this information, managers can rapidly inform customers of the repair work, assign repair resources to the involved areas, and restore service promptly.

Competitive advantage: When the firms achieve the business objectives, for example, customer intimacy, operational excellence, improved decision making, new services, products and business models, than it is most like that they have achieved a competitive advantage already. Accomplishing these things finer than their objects, responding to suppliers and customers in real time, charging less for premium products all add up to higher sales and profits. An example is the Toyota Production System which mainly focuses on organizing work to make continuous improvements, eliminating waste; Toyota Production System is based on what the customers actually ordered.

2.5.3 Strategic Information System (SIS)

The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company strategic advantages over the competitive forces it faces in the global marketplace. This creates strategic information system, information systems that support or shape the competitive position and strategies of an enterprise. So a strategic information system can be any kind of information systems (TPS, MIS, DSS, etc.) that helps an organization gain a competitive advantage, reduce a competitive disadvantage, or meet other strategic enterprise objectives.

Features of the Strategic Information Systems

A Strategic Information System (SIS) is a system that helps companies change or otherwise alter their business strategy and/or structure. It is typically utilized to streamline and quicken the reaction time to environmental changes and aid it in achieving a competitive advantage.

Key features of the Strategic Information Systems are the following:

1. Decision support systems that enable to develop a strategic approach to align Information Systems (IS) or Information Technologies (IT) with an organization's business strategies
2. Primarily Enterprise resource planning solutions that integrate/link the business processes to meet the enterprise objectives for the optimization of the enterprise resources
3. Database systems with the "data mining" capabilities to make the best use of available corporate information for marketing, production, promotion and innovation. The SIS systems also facilitate identification of the data collection strategies to help optimize database marketing opportunities.

4. The real-time information Systems that intend to maintain a rapid-response and the quality indicators.

Advantages of Strategic Information System

A Strategic Information System can offer competitive advantage to an organization in the following ways:

1. **Creating barriers to competitor's entry**: In this strategy, an organization uses information systems to provide products or services that are difficult to duplicate or that are used to serve highly specialized markets. This prevents the entry of competitors as they find the cost for adopting a similar strategy very high.
2. **Generating Databases to Improve Marketing :** An information system also provides companies an edge over their competition by generating databases to improve their sales and marketing strategies. Such systems treat existing information as a resource. For example, an organization may use its databases to monitor the purchase made by its customers, to identify different segments of the market, etc.
3. **'Locking in' customers and suppliers :** Another way of gaining competitive advantage is by locking in customers and suppliers. In this concept, information systems are used to provide such advantages to a customer or a supplier, that it becomes difficult for them to switch over to a competitor. For example, an organization may develop its information system and give many benefits to its customers, like reliable order filling, reduced transaction costs, increased management support and faster delivery service.
4. **Lowering the costs of the products** : strategic information systems may also help organizations lower their internal costs, allowing them to deliver products and services at a lower price than their competitors can provide. Thus such information systems can contribute to the survival and growth of the organization. For example, airlines use information systems strategically to lower costs so that they may counter competitor's discount fares.
5. **Leveraging technology in the value chain :** This approach pinpoints specific activities in the business where competitive strategies can be best applied and where information systems are likely to have a greater strategic impact. This model advocates that information technology can best be used to gain competitive advantages by identifying specific, critical leverage points.

2.5.4 Management Information System (MIS)

A management information system (MIS) is a computer-based system that provides the information necessary to manage an organization effectively. An MIS should be designed to enhance communication among employees, provide an objective system for recording information and support the organization's strategic goals and direction.

Definition of MIS

A Management Information System is an integrated user-machine system, for providing information, to support the operations, management, analysis and decision-making functions in an organization

According to Kennevans, MIS is an organised method of providing past, present and projection information relating to internal operations and external intelligence.

According to Gordon B. Davis, MIS is an integrated man/machine system for providing information to support the operations management and decision making functions of an organisation.

According to Robert G. Mardick, MIS is the System intended to provide information for decision making, planning, organising and controlling the operations of the subsystems of the firm and to provide a Synergistic organisation in the process.

2.5.4.1 Characteristics of MIS

MIS generally has the following characteristics.

a) **Management oriented :** Beyond any doubt is the fact that MIS is a management oriented system. This could be understood from the terminology itself. The information processing carried out by MIS if always attempting at helping the management.

b) **Management directed :** Similarly, all the activities of MIS are initiated by the management. It is the management's need that the MIS strives to satisfy. Hence, MIS is management directed.

c) **User-machine system :** The concept of user-machine system implies that some tasks of MIS are done by the users while others are best done by machines. There is co-existence of both men and machines in MIS.

d) **Integrated system :** MIS hopes to provide the basis of integration of information processing. This leads to common data flows. Even tough applications in a system are implemented one at a time, their design is guided by an overall plan. In essence information system is designed as a federation of small systems.

e) **Involves large planning :** The concept of MIS goes only with planning. There is a huge amount planning coupled with the installation and maintenance of MIS

f) **Sub systems :** Naturally, a vast system like the MIS will be having plenty of sub systems which are mutually related with defined with definite relationships and properly ordered. It is based on subsystem concept.

g) **Use of models :** MIS uses scientific and mathematical models for planning, organizing, directing and controlling for its analysis.

h) **Data base :** One of the pre-requisites for installing, implementing and successful operating of MIS is data. Hence, there has to be a way to maintain data in data in data bases and there has to be a central database.

i) **Information as a resource :** MIS transforms data into information and the management is behind MIS. MIS provides procedure for measuring and matching cost of obtaining and using information.

j) **Flexibility in use :** MIS is so designed that it is flexible and adaptable to user requirements.

k) **Others :** MIS is predictive and related to organizational levels.

2.5.4.2 Objectives of MIS

The goals of an MIS are to implement the organizational structure and dynamics of the enterprise for the purpose of managing the organization in a better way and capturing the potential of the information system for competitive advantage.

Following are the basic objectives of an MIS:

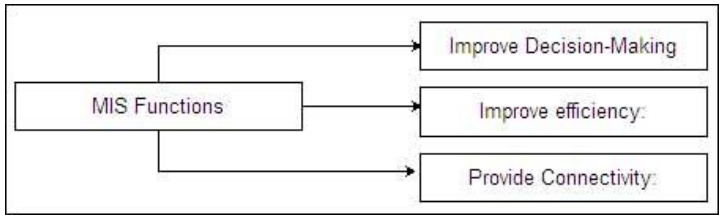
1. **Capturing Data:** Capturing contextual data, or operational information that will contribute in decision making from various internal and external sources of organization.
2. **Processing Data:** The captured data is processed into information needed for planning, organizing, coordinating, directing and controlling functionalities at strategic, tactical and operational level. Processing data means:

- making calculations with the data
- sorting data
- classifying data and
- summarizing data

3. **Information Storage:** Information or processed data need to be stored for future use.
4. **Information Retrieval:** The system should be able to retrieve this information from the storage as and when required by various users.
5. **Information Propagation:** Information or the finished product of the MIS should be circulated to its users periodically using the organizational network.

2.5.4.3 MIS Functions

The broad functions of MIS are as given below:



1. To improve decision-making

MIS helps management by providing background information on a variety of issues and helps to improve the decision-making quality of management. The fast and accurate information supplied by MIS is leveraged by the managers to take quicker and better decisions thereby improving the decision-making quality and adding to the bottom line of the company.

2. To improve efficiency

MIS helps managers to conduct their tasks with greater ease and with better efficiency. This reflects in better productivity for the company.

3. To provide connectivity

MIS provides managers with better connectivity with the rest of the organization.

2.5.4.4 Different MIS Functions to Meet Objectives

MIS is set up by an organization with the prime objective to obtain management information to be used by its managers in decision-making. Thus, MIS must perform the following functions in order to meet its objectives.

1. Data Capturing

MIS captures data from various internal and external sources of an organization. Data capturing may be manual or through computer terminals. End users, typically record data about transactions on some physical medium such as paper form or enter it directly into a computer system.

2. Processing of data

The captured data is processed to convert it into the required management information. Processing of data is done by such activities as calculating, comparing, sorting, classifying and summarizing.

3. Storage of information

MIS stores processed or unprocessed data for future use. If any information is not immediately required, it is saved as an organizational record. In this activity, data and information are retained in an organized manner for later use. Stored data is commonly organized into fields, records, files and databases.

4. Retrieval of information

MIS retrieves information from its stores as and when required by various users. As per the requirements of the management users, the retrieved information is either disseminated as such or it is processed again to meet the exact demands.

5. Dissemination of MI

Management information, which is a finished product of MIS, is disseminated to the users in the organization. It could be periodic, through reports or on-line through computer terminals.

2.5.4.5 Prerequisites of an Effective MIS

(i) Qualified System and Management Staff : The prerequisite of an effective MIS is that it should be managed by qualified officers. These officers should have a mutual understanding about the roles and responsibilities of each other and be understand clearly the view of their fellow officers. For this, each organization should have two categories of officers :

(a) System and Computer Experts who in addition to their expertise in their subject area , they should also be capable of understanding management concepts to facilitate the understanding of problems asked by concern. They should also be clear about the process of decision making and information requirements for planning.

(b) Management experts who should also understand quite clearly the concepts and operations of a computer. This basic knowledge of computer will be useful will place them in a comfortable position, while working with systems, technicians in designing or other wise, of the information system.

(ii) Futuristic Perspective : An effective MIS should be capable of meeting the future requirements of its executives as well. This capability can be achieved by regular monitoring and updating the MIS.

(iii) Support of Top Management : For a management information system to be effective, it must receive the full support of top management. The Reasons for this are **:**

(a) Subordinate managers are usually lethargic about activities which do not receive the support of their superiors.

(b) The resources involved in computer based information system are larger and are growing larger and larger in view of importance gained by management information system.

(iv) Common Database : It is an integrated collection of data and information which is utilized by several information subsystems of an organization. A common database may be defined as a super file which consolidates and integrates data records formerly stored in a separate data file. Such a database can be organized as an integrated collection of data records into a single super file or it can be organized as an integrated collection of several data file.

(v) Control and maintenance of MIS : Control of the MIS means the operation of the system as it was designed to operate. Some times, users develop their own procedures or short cut methods to use the system which reduces its effectiveness.

2.5.4.6 Steps of Management Information System

Following are the steps of Management Information System.

i) Collection of Data : The designing of MIS is based on the collection of data. Generally, data are not collected independently for special purposes,

but they are collected for multiple uses; such as, data of inventory can be used by managers in production, accounting and purchase department. After collection of data, assembly is immensely important. Data should be assembled according to needs and purposes of the management. There are mainly two sources of data and information: Internal source and external source. The company should use both these sources.

ii) Processing : In the second step, data should be processed in a systematic manner. Processing of data implies editing of data, their classification and summation. By the editing of data, correction and modification can be done and classification should be done according to the need of organisation. Summation is the process of grouping the data on the basis of similar nature as well as purpose.

iii) Storage and Retrieval : In this step of MIS different activities such as indexing, coding, filing of data and information are done. As a result of this step, the managers and directors of the company can easily use and operate the data and information as per their requirement.

iv) Evaluation : It is an important step, where accuracy and relevance of data can be determined. Determination of relevance of data is immensely important for taking effective decision at each level.

v) Dissemination : By this step relevant information is supplied in the proper form at the right time. Information should be supplied according to the requirement of the top management. So, it may be different for different companies and also may be different -at different times of the same company,

2.5.4.7 Merits of MIS

Following are the merits of MIS

1. Helps in formulation of planning

With the help of MIS, the management can formulate correct planning because, preparation of planning requires various data and information, which can be systematically supplied by the process of MIS.

2. Provides coordination

Under this system of MIS, data and information are collected from each subsystem of the organisation, through unifying the concept of each Sub-System. So, the MIS can provide the facility of coordination.

3. Systematic decentralization

MIS also provides systematic decentralisation in the organisation. Under the process of MIS, different middle and lower level officers and managers are authorised to supply their information. So, by implementing MIS, the authority can be distributed among various officers and managers of middle and lower levels without the loss of control. It also provides a system for monitoring performance. Likewise, the MIS can help in decentrslisation.

4. Help in control system

To be an effective control system, it should be based on relevant data and information. On the other hand, relevant data and information can be provided regularly in a systematic manner by the MIS. So, MIS can help in taking proper control.

5. Increase Speed in Operation

In order to increase the speed of operation of a business, data and information should be supplied at the right time at the right place. Because, without data and information no operation can be done in a proper way.

By supplying necessary data and information, MIS can increase the speed of the operation of a business.

6. Reduce duplication of efforts

Under the Process of MIS, various data and information are stored in a scientific manner. So, the managers can take the help of these data and information before and at the time of performing their activities. Thereby, the MIS can prevent unnecessary duplication of efforts likely to be done by the managers. Generally, duplication of effort happens owing to the lack of sufficient data provided timely to the managers.

2.5.4.8 Factors Responsible for Development of MIS

Factors Responsible for the development of MIS are numerous and have been a prime concern for many Researchers and Practitioners. Both Inter and external factors must be taken into account when trying to understand and organization's criteria for deciding about technology. The following are the factors which are responsible for development of MIS :

1. External Factors
2. Internal Factors
3. Other Factors

1. External Factors

External Factors are conditions that exist in organization's external environment. The factors can be found at the industry level or in national policies.

(a) Industry level : At the industry level, we are looking at characteristics as degree of diffusion of certain technologies, the availability of external know-how, for example, technology suppliers, the degree of innovativeness of the industry, the requirements imposed by major customers and external markets and overall levels of competition and technology sophistication in the industry.

(b) National Policies : For the external factors the national policies also affect the organization that indirectly affects the subsystems of the organization.

2. Internal Factors

Internal factors internal of the firm that may affect the development of MIS can be grouped into three categories:

i) Past Experience with Technology : The organizations past experience about the technology in terms of exposure and organizational learning ultimately affects its future in developing technology.

ii) Organizational Characteristics : An organization's characteristic like size, influence the adoption of MIS application in organization. The adoption of certain technologies may appear more appropriate for the larger firms because of the large capital investments and the skilled human resources involve in the implementation and operation of such technologies. Smaller firms are less affected by organizational inertia and they show a greater degree of involvement of organizational member's especially top management during implementation. Ready to use software and less expensive equipments of MIS application are more attractive to smaller firms.

iii) Organizational Pursued strategy : Internal factors deal with the organizations pursued strategy on both orientation and technology policy. An organization's strategy reflects its action with market and technology, which ultimately modify its experience and consequently its overall characteristics and capabilities. The need for a strong technology has been advocated by a number of authors and investments in MIS should therefore be closely aligned with overall corporate strategy.

3. Other Factors

Customer Satisfaction : Development of MIS is affected by customer satisfaction. Customer of the services should be satisfied by the presented system.

Effective : Development should be effective in terms of organizational benefit & user satisfaction.

Efficient : Development should use all the resources, organization values efficiently.

2.5.5 Decision Support System (DSS)

The term Decision Support System (DSS) refers to a class of systems, which support the process of making decisions. The emphasis is on "support" rather than on automation of decision. Decision support systems allow the decision maker to retrieve data and test alternative solutions during the process of problem solving.

Definition of DSS

According to Scott Morton, "Decision Support System (DSS) as Interactive computer based systems, which help decision-makers utilize data and model to solve unstructured problems".

A decision support system is a way to model data and make quality decisions based upon it. Making the right decision in business is usually based on the quality of data and the ability to separate through and analyse the data to find trends in which one can create solutions and strategies for DSS.

2.5.5.1 Features of DSS

1. **Provide Rapid Access to Information :** Some DSSs provide fast and continuous access to information; for example, the gauges on the dashboard of a car or truck are used to see how the vehicle is running.
2. **Handle Large Amounts of Data from Different Sources :** For example, advanced database management systems and data warehouses have allowed decision makers to search for information with a DSS, even when some data resides in different databases on different computer systems or networks. Other sources of data can be accessed via the Internet or over a corporate intranet.

3. **Provide Report and Presentation Flexibility :** Managers can get the information they want, presented in a format that suits their needs. Furthermore, output can be displayed on computer screens or printed, depending on the needs and desires of the problem solvers.
4. **Offer both Textual and Graphical Orientation :** Today's DSSs can produce text, tables, line drawings, pie charts, trend lines, and more. By using their preferred orientation, managers can use a DSS to get a better understanding of a situation and to convey this understanding to others.
5. **Support Drill-Down Analysis :** A manager can get more levels of detail when needed by drilling down through data. For example, a manager can get more detailed information for a project – viewing the overall project cost or drilling down and seeing the cost for each phase, activity, and task.
6. **Perform Complex, Sophisticated Analysis and Comparisons Using Advanced Software Packages :** Marketing research surveys, **for example,** can be analysed in a variety of ways using programs that are part of a DSS. Many of the analytical programs associated with a DSS are actually stand-alone programs, and the DSS brings them together.

2.5.5.2 Functions/Activities of DSS

Using a decision support system involved four basic types of analytical modeling activities:

1. **What-if Analysis :** In what-if analysis, an end user makes changes to variables, or relationships among variables, and observes the resulting changes in the values of other variable. For example, what if we cut advertising by 10 percent? What would happen to sales?
2. **Goal Oriented :** It is process of determining the input values required to achieve a certain goal. For example, house buyers determine the monthly payment they can afford and calculate the number of such payments required to pay the desired house.
3. **Risk Analysis :** Risk is the important factor which affects the business enterprise. DSS allows managers to assess the risks associated with various alternatives. Decisions can be classified as low risk, medium risk and high risk. A DSS is particularly useful in medium risk and high risk environments.

4. **Model Building :** DSS allows decisions markets to identify the most appropriate model for solving the problems. It takes into account input variables; inter relationship among the variables problem assumptions and constraints. For example, a marketing manager of a television manufacturing company is charged with the responsibility of developing a sales forecasting model for colour TV sets.
5. **Graphical Analysis :** This helps managers to quickly digest large volumes of data and visualize the impacts of various courses of action. They recommend the use of graph when:
   i) Seeking a quick summary of data.
   ii) Forecasting activities.
   iii) Detecting trends over time.
   iv) Composing points and patterns at different variables.

2.5.5.3 Classification of DSS

On the basis of research of 56 decision support systems, Alter made the following classes of decision support systems based on the degree to which the system outputs can directly determine the decision.

1. **File Drawer Systems :** These allow immediate access to data item. They are basically online mechanized versions of manual filing systems. Examples are status inquiries for inventory information, airline reservations requests, and shop floor monitoring.
2. **Data Analysis Systems :** These allow the manipulation of data by means of either analysis operations tailored to the task or setting or general analysis operations. They are typically used by non-managerial personnel to analyze files containing current or historical data. Examples are a budget analysis system and a financial system for analyzing alternative investment opportunities.
3. **Analysis Information Systems :** These provide access to a series of data base and small models. An example is a marketing decision support system containing internal sales data, promotion and pricing data plus access to external database. Another example is a sales analysis system containing detailed sales data, customer information, forecast data, and models.
4. **Accounting Models :** These calculate the consequences of planned actions on the basis of accounting definitions. They typically generate estimates of income, balance sheets, etc., based on variation in input values to the definitional formulas. Examples are monthly budgeting systems for operational decision-making and short-term financial planning.

5. **Representational Models :** These estimate the consequences of actions on the basis of models that represent some non-definitional characteristics of the systems such as probabilities of occurrence. They include all simulation models that contain elements beyond accounting definitions. An example is a risk analysis models using estimated probability distributions for each of the key factors.
6. **Optimization Models :** These provide guidelines for action by generating the optimal solution consistent with a series of constraints. They are used for repetitive decision that can be described mathematically and where a specific objective, such as minimizing cost, is the goal. Examples are a system for scheduling training classes under a complex set of constraints and a material usage optimization system.
7. **Suggestion Models :** These compute a specific suggested decision for a fairly structured and repetitive decision. Their purpose is to bypass other (less efficient) procedures for 'generating the suggestion. Examples are an insurance renewal rate calculation system and models to price cardboard boxes based on a standard set of dimensions and decision rules.

2.5.5.4 Components of DSS

1. Data Management Sub-System

The data management sub-system includes a database that contains relevant data for the situation and is managed by software called the Database Management System (DBMS). The data management sub-system can be interconnected with the corporate data warehouse, a repository for corporate relevant decision-making data. Usually the data are stored or accessed via a database web server.

2. Model Management Sub-System

This is a software package that includes financial, statistical, management science, or other quantitative models that provide the system's analytical capabilities and appropriate software management. Modelling languages for building custom models are also included. This software is often called a Model Base Management System (MBMS). This component can be connected to corporate or external storage of models. Model solution methods and management systems are implemented in web development systems (like Java) to run on application servers.

The model management sub-system of the DSS is composed of the following elements:

i) Model base,

ii) Model base management system,

iii) Modelling language,

iv) Model directory, and

v) Model execution, integration, and command processor.

3. **User Interface Sub-System:** The user communicates with and commands the DSS through this sub-system. The user is considered part of the system. Researchers assert that some of the unique contributions of DSS are derived from the intensive interaction between the computer and the decision-maker. The web browser provides a familiar, consistent graphical user interface structure for most DSS.

4. **Knowledge-Based Management Sub-System :** This sub-system can support any of the other sub-systems or act as an independent component. It provides intelligence to augment the decision-maker's own. It can be interconnected with the organisation's knowledge repository (part of a knowledge management system), which is sometimes called the organisational knowledge base. Knowledge may be provided via web servers. Many artificial intelligence methods have been implemented in web development systems like Java, and are easy to integrate into the other DSS components.

2.5.5.5 Advantages of DSS

1. **Improving Personal Efficiency :** Many DSS do not do anything. A person could not do himself or herself. People prepared budgets for centuries before spreadsheet software came in to use. DSS help them do it faster and with less changes of error.

2. **Improving Problem Solving :** A DSS can make it possible for a person or a group to solve problem faster or better, than they could without it. There is a relationship between the two of course increased efficiency in a small task if properly applied. Hopefully contributes to solving the problem as a whole solving a problem faster is self-explanatory.

3. **Facilitating Communications :** After found that DSS facilitating interpersonal communication in several ways. In addition technology developments that have occurred since his/her research have opened up for DSS to provide this benefit.

One way in which DSS facilitate communication is when used as a tool for benefit. The system can indicate when a particular action should be taken in the future (offensive) or when a particular action was justified in the past (defensive use).

4. **Promoting Learning or Training :** Using a DSS can also help people learned more about using computers and about software package that are in the DSS although this is seldom a specific objective of developing the DSS it can be valuable by project.

5. **Increasing Organizational Control :** Some DSS can also control information about an individual's decision to his or her managers. This information can then be used to access the productivity of the individual questions in terms of how many decisions they make and how good their decisions turned out to be.

2.5.5.6 Disadvantages of DSS

1. **Limited Storage Capability :** Due to its small memories and limited storage capacities, DSS has definite computational constraints.

2. **Slow :** It is slow, compared to the speed of large mainframes.

3. **Limited Information Sharing :** Most DSSs are designed for individual use but they can be designed so that several computers can be linked for limited information sharing.

4. **Difficult :** It is difficult to know interdependencies of functions provided by system. It is difficult to keep track of consequences of DSS function usage with respect to decision scenario and integrity of database.

5. **Require Extensive Knowledge :** There are applications that require extensive knowledge of specific problem domain or technical knowledge.

6. **Translation Problems :** Users have to deal with several databases and models each with different data models and resulting translation problems.

7. **Confliction :** Users may have to work on several decision scenarios at same time. As a consequence they have to keep track of what they done for each of them.

2.5.5.7 Applications of DSS

The applications of DSS in different field are as below:

1. **Intelligence Report :** Decision support systems are computer networks that professionals use to gather and analyze intelligence that informs decisions they make. Unlike conventional databases, however, decision support systems are made up of a number of different computers that work together to pull data from a number of different sources. Systems then present data to users in formats that are easy to understand.

   The main application of decision support systems is management decision-making, especially when it comes to issues of long term growth. For example, before branching out into a new market, managers and executives might access intelligence reports that include data about competitor behaviors, economic outlook, and market projections.

2. **Medical Industry :** Medical professionals often find themselves having to quickly make medical diagnoses based on a number of different symptoms and medical histories. They can use decision support systems to rapidly draw data from a number of sources and present a diagnosis based on many factors. Without support systems, medical professionals would have to spend hours perusing conventional databases for diagnoses that make sense.

3. **Agricultural Industry :** Agricultural professionals, such as farmers, biologists, and other specialists also have found applications of decision support systems. These individuals might use systems to gather data related to growing seasons, climates, markets, and policies to make plans. Due to the high cost of decision support systems, however, agricultural professionals in some countries, who run relatively small operations, depend on government assistance for funding to use this technology.

4. **Air Traffic Control :** Air traffic professionals have discovered applications of decision support systems, too. They use complex computer networks to manage the number of planes traveling in certain areas. They also can monitor weather with these systems. Air traffic professionals quickly gather information regarding current status of weather, weather forecasts, and weather reports in nearby regions.

5. **Meeting :** Individuals who participate in meetings also use decision support systems. When this is the case, systems might be referred to as a group decision support system. These models enable participants at a meeting to enter their views into a program. A leader can organize perspectives of group members and discuss possible outcomes to problems.

6. **Voting :** Another of the applications of decision support systems is to facilitate voting. This is common in large organizations where board or committee members vote on policy. Each member might receive a micro-computer that he or she uses to place a vote. Votes can be anonymous or viewed by a group leader who oversees proceedings.

2.5.5.8 DSS Versus MIS

Basis	DSS	MIS
Problem Type	A DSS can handle unstructured problems that cannot be easily programmed.	An MIS is normally used only with structured problems.
Users	A DSS supports individuals, small groups, and the entire organization. In the short run, users typically have more control over a DSS.	An MIS supports primarily the organization. In the short run, users have less control over an MIS.
Support	A DSS supports all aspects and phases of decision making; it does not replace the decision maker—people still make the decisions.	This is not true of all MIS systems—some make automatic decisions and replace the decision maker.
Emphasis	A DSS emphasizes actual decisions and decision-making styles.	An MIS usually emphasizes information only.
Approach	A DSS is a direct support system that provides interactive reports on computer screens.	An MIS is typically an indirect support system that uses regularly produced reports.
System	The computer equipment that provides decision support is usually online (directly connected to the computer system and related to real time providing immediate results). Computer terminals and display screens are examples—these devices can provide immediate information and answers to questions.	An MIS, using printed reports that might be delivered to managers once per week, cannot provide immediate results.
Speed	Because a DSS is flexible and can be implemented by users, it usually takes less time to develop and is better able to respond to user requests.	An MIS's response time is usually longer.
Output	DSS reports are usually screen oriented, with the ability to generate reports on a printer.	An MIS, however, typically is oriented toward printed reports and documents.
Development	DSS users are usually more directly involved in its development. User involvement usually means better systems that provide superior support. For all systems, user involvement is the most important factor for the development of a successful system.	An MIS is frequently several years old and often was developed for people who are no longer performing the work supported by the MIS.

Table: Comparison between MIS and DSS

2.5.6 Other Systems

There are certain information systems, which can be either operation, management or strategic application, some of them are as below:

1. **Expert System (ES)**

   An expert system is the knowledge about a specific area to act as an expert consultant to the user. It is not the replacement of human being rather they help them in using their expertise more efficiently and effectively. It is a knowledge-based system that provides expert advice and act as expert consultants to users. For example, credit application advisor, process monitor, and diagnostic

maintenance systems. The components of an expert system are knowledge bases and software modules which help in giving answer to the various queries. Expert systems are used in field of medicine, physical science and business. They support either operation or managerial activities at a particular time.

2. Knowledge Management System (KMS)

It is knowledge-based systems that support the creation, organization, and dissemination of business knowledge within the enterprise. For example, intranet access to best business practices, sales proposal strategies, and customer problem resolution systems.

Knowledge management systems deal with information so they are a class of information system and may build on, or utilize other information sources. Knowledge management help the workers to create, organise and share important business knowledge when it is needed by some worker in the organisation. It is based on the assumption that the potential for sustained improvement exists in the knowledge derived from people, processes, designs and ideas within the organisation. Knowledge management also implies the creation of a culture and structure that promotes information sharing and learning.

3. Strategic Information System (SIS)

Support operations or management processes that provide a firm with strategic products, services, and capabilities for competitive advantage. For example, online stock trading, shipment tracking, and e-commerce Web systems.

The Strategic Information Systems (SIS) is concerned with systems which contribute significantly to the achievement of an organization's overall objectives.

4. Business Information System (BIS)

Support a variety of operational and managerial applications of the basic business functions of a company. For example, information systems that support applications in accounting, finance, marketing, operations management, and human resource management.

5. Office Automation System (OAS)

Office Automation system collects, processes, stores and transmits data and information in the form of electronic office communication. OAS could also be considered as computer-based information system that collects, process, store and transmit electronic message, document and other form of communication among individual, work group and organizations. For example, word processing, electronic mail, desktop publishing, telecommunication and document image processing.

SHORT NOTES

1. Information Systems

Information systems play an important role in the design, control, support, and improvement of business processes. IT enables new business processes and information systems can only be useful if they are "aware" of the operational business processes in an organization. Examples of organizations that heavily depend on information systems are multinationals, banks, insurance companies, governments, hospitals, travel agencies and web shops.

2. Data

Data becomes information when evaluated in a specific situation or applied to solving a particular problem. That is, data becomes information when used to make a decision. Since value derives solely from solving problems, it is meaningful to speak only of the value of information and not of the value of data. Information is formed when data and a problem come together; the supplier and the user of information both must contribute to the making of product. The supplier or supplying system cannot produce a complete product - information - without the user who had been faced with a problem.

3. Information

The information is usually categorized into data, information, knowledge, intelligence, and even wisdom and truth. This categorization seems to be useful when analysing the value of information.

4. Knowledge

Knowledge is the facts, feelings or experiences known by a person or a group of people. It is considered to be present in ideas, judgment, root causes, relationships, perspectives and concepts. Knowledge is the result of learning and is stored in an individual brain or encoded in documents, product, facilities and concepts.

5. Marketing Information System (MIS)

A marketing information system (MIS) is a set of procedures and methods designed to generate, analyze, disseminate, and store anticipated marketing decision information on a regular, continuous basis. An information system can be used operationally, managerially, and strategically for several aspects of marketing.

Marketing Information System, abbreviated as MIS, means to collect, analyze and supply marketing information to the marketing managers. The marketing managers use this information to take marketing decisions. MIS is a permanent and continuous process.

6. Management Information System (MIS)

A management information system (MIS) is a computer-based system that provides the information necessary to manage an organization effectively. An MIS should be designed to enhance communication among employees, provide an objective system for recording information and support the organization's strategic goals and direction.

7. Decision Support System (DSS)

The term Decision Support System (DSS) refers to a class of systems, which support the process of making decisions. The emphasis is on "support" rather than on automation of decision. Decision support systems allow the decision maker to retrieve data and test alternative solutions during the process of problem solving.

According to Scott Morton, "Decision Support System (DSS) as Interactive computer based systems, which help decision-makers utilize data and model to solve unstructured problems".

UNIT III

Multimedia Concepts : Definition of Multimedia- Multimedia - devices - Multimedia Formats - Audio formats- Video formats - Compression/ Decompression issues- Multimedia Storage, Business Applications of Multimedia- Education - Entertainment - Training - Business.

3.1 MULTIMEDIA

The word 'Multimedia' is a combination of two words, 'Multi' and 'Media'. Multi means many and media means material through which something can be transmitted or send. Multimedia combined all the media elements like text and graphics to make the information more effective and attractive.

3.1.1 Meaning & Definition of Multimedia

Meaning of Multimedia

Multimedia means that computer information can be represented through audio, video, and animation in addition to traditional media (i.e., text, graphics drawings, images).

Definition of Multimedia

Multimedia is the media that uses multiple forms of information content and information processing (e.g. text, audio, graphics, animation, video, interactivity) to inform or entertain the user. Multimedia also refers to the use of electronic media to store and experience multimedia content. Multimedia is similar to traditional mixed media in fine art, but with a broader scope. The term "rich media" is synonymous for interactive multimedia.

A good general definition is:

Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally.

A Multimedia Application is an Application which uses a collection of multiple media sources e.g. text, graphics, images, sound/audio, animation and/or video.

Hypermedia can be considered as one of the multimedia applications.

3.1.2 Categories of Multimedia

Multimedia may be broadly divided into linear and non-linear categories. Linear active content progresses without any navigation control for the viewer such as a cinema presentation. Non-linear content offers user interactivity to control progress as used with a computer game or used in self-paced computer based training. Non-linear content is also known as hypermedia content.

Multimedia presentations can be live or recorded. A recorded presentation may allow interactivity via a navigation system. A live multimedia presentation may allow interactivity via interaction with the presenter or performer.

3.1.3 Features of Multimedia

Multimedia presentations may be viewed in person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand.

Multimedia games and simulations may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator.

Enhanced levels of interactivity are made possible by combining multiple forms of media content But depending on what multimedia content you have it may vary Online multimedia is increasingly becoming object-oriented and data-driven, enabling applications with collaborative end-user innovation and personalization on multiple forms of content over time. Examples of these range from multiple forms of content on web sites like photo galleries with both images (pictures) and title (text) user-updated, to simulations whose co-efficient, events, illustrations, animations or videos are modifiable, allowing the multimedia "experience" to be altered without reprogramming.

3.1.4 Characteristics of Multimedia

Multimedia presentations may be viewed by person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand.

Multimedia games and simulations may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator.

The various formats of technological or digital multimedia may be intended to enhance the users' experience, for example to make it easier and faster to convey information. Or in entertainment or art, to transcend everyday experience.

3.1.5 Components / Elements of Multimedia

The following are the different fundamental elements of multimedia,

1. Text
2. Graphics
3. Audio
4. Video
5. Animation

3.1.5.1 Text

It forms the major and important element of multimedia system. It differs from traditional text (i.e., the text written using pen and paper). It is not only used for writing the content but also used for navigation, purpose in defining menus etc. It can be made attractive by applying effects (2D, direction, shapes, color, texture etc.,) animation, using font styles etc.

Text Formatting

Text can be formatted using the following,

(i) Text font

(ii) Text effects

(iii) Text animation.

(i) Text Font

Text font consists of the following three attributes,

- Type face - Arial, Courier, Times New Roman comes under type faces.
- Style - Bold and italics are the styles.
- Size - The length of the characters, such as 11, 12 etc.

Example of text font can be, Times New Roman 12 point bold.

(ii) Text Effects

Special effects such as 2D or 3D can be applied to the text font. Text effects can be applied using MS- words Word Art where in text is treated as a drawing object. The effects like depth, direction, shape, color and texture can be added to the text.

(iii) Text Animation

Animation makes the text to appear in motion. This can be done by using MS-Word or MS-Power Point

3.1.5.2 Graphics

Multimedia system uses still pictures for making the information self-explanatory or easier to understand. Hence, it is the most important element of multimedia. The picture used in multimedia system can be either in 2-dimensional or 3-dimensional form like text, pictures can also be animated.

Types of Digital Graphics

Graphics has been categorized into two types,

(i) Bitmap/digital graphics

(ii) Vector graphics

(i) Bitmap/Digital Graphics

The images that are represented in terms of pixels are referred to as bitmap graphics. Each pixel represents a particular color. Bitmap editors are used to create or edit the pictures. Adobe Photoshop, Flash, Corel Draw, Corel photo point, Lview pro, GIF 89a, Paint shop pro are some of the commonly used bitmap editors. Bitmapped file format is used to store the bitmap images. The formats GIF, JPEG, Bitmap (BMP), Post Script (PS), IRIS and Tagged Image File Format (TIFF) can store the bitmap graphics files.

(ii) Vector Graphics

Images on the pictures that are represented using mathematical tracks are referred to as vector graphics. Image attributes such as location, size, color fill, pattern fill are represented in terms of mathematical equations. The image that needs frequent resizing and repositioning should be represented using this technique vector graphics can be created or modified using vector editors. Most often vector editors are used to create or modify more complicated graphics like photographs. Computer Aided Design (CAD) program, 3-dimensional models and animated programs are vector based programs.

Requirements of Digital Image

1. Image capturing
2. Image resolution
3. Image coloring
4. Image file size
5. Image compression.

1. Image Capturing

Image can be loaded onto the computer by using the devices such as scanner, digital camera, digital video camera and clip arts. The images can be created within computer using editors. All the devices used for capturing the images digitize the image, which is then used by multimedia system.

2. Image Resolution

It is the measure of determining the number of pixel in the digital image with respect to the physical size of the actual image. It is measured in dots per inch (dpi) and is applied both to the images as well as the devices used for scanning and printing the image. Quality of the picture depends on the resolution i.e., if the resolution is high then a high quality image is viewed.

3. Image Coloring

The two models used for coloring of images include RGB (Red, Green and Blue) and HSL (Hue, Saturation and Lightness). The RGB model provides large spectrum of colors by just adding one color to the other. The HSL model helps in classifying the colors circle.

4. Image File Size

The size of digital graphic file is equal to the size of graphic files stored within the computer. Basically, the size of graphic files depends on the following three factors.

(i) Graphic dimensionality (i.e., physical size interms of height and width)

(ii) Bit depth (i.e., amount of color information present within each pixel)

(iii) Applied compression technique.

5. Image Compression

Images or the files of larger size need to be compressed so as to reduce the space and time required for downloading. It is necessary to ensure that compression techniques used does not effects the quality of the image. The commonly used techniques for compression are,

(i) JPEG

(ii) GIF.

(i) JPEG : This technique is applied for the images having 24-bit colors i.e., the images having many colors can be compressed using this technique, .jpg in the file format for JPEG files.

(ii) GIF : It is used for representing 8-bit color images such as, line drawing, images containing text, cartoons .gif is the file format used for GIF files.

3.1.5.3 Audio

Sounds heard by humans is referred to as audio. Multimedia projects uses sound in two ways.

A) To present the audio content

B) To play music as in a song.

Requirements of Digital Audio

(i) Quality audio selection

(ii) Audio compression

(iii) Use of audio file format

(iv) Audio sampling and digitization

(v) Audio editing

(vi) Hardware required for audio

(vii) Music and speech.

(i) Selection of Quality Audio

Web pages on the internet support compressed audio with low or medium sampling rates. Hence audio must be selected and modified according to the requirement.

(ii) Audio Compression

Audio files needs to be compressed so as to decrease the physical size of data, thereby resulting in,

(a) Less storage and memory requirement

(b) Easy and fast data transmission

(c) Less bandwidth utilization.

If audio files of larger size are being transmitted over network, then it is necessary to use certain standards (like CCITT, ISO, MPEG) so as to achieve compatibility. MPEG is the most commonly used audio compress technique wherein the audio is compressed by a factor of 12, without affecting the quality of the sound.

(iii) Use of Audio File Format

Some specific audio file formats are used to store the audio data with in the computer. The most commonly used file formats are,

Resource Interleave File Format (RIFF) with an extension (.wav), Motion Picture Expert Group (MPEG) with extensions (mpg, mp2, mp3) or MIDI with (.mid, midi).

(iv) Audio Sampling and Digitization

Sound digitization is the process of converting the analog sound signals to digital signals such that, they can be stored into the computer memory. This digitized signals are in the form of numeric data.

In order to digitize a signal we need to perform sampling for both time and amplitude of the signal.

The term sampling refers to the process of recording the values of sound signals at different time intervals. The frequency at which the samples of the sound signals are recorded refers to the sampling rate. The sampling rate for any given audio will be within the range of 8 kHz to 48 kHz.

(v) Audio Editing

Audio can be manipulated by using audio editors. Manipulation involves copying and pasting, concatenating appending or mixing two or more audio files. Audio editors also allows the user to apply sound effects to audio files. Cool edit, sound Forge XP, Audiocity and Wave Flow area. Some of the common audio editors used by Windows. The editors require a sound card to be installed on computer.

(vi) Hardware Required for Audio

The hardware used for audio are Microphone and speaker. These devices are connected to ADC and DAC respectively. The process involved is as follows. Initially, the microphone converts the sound wave into electrical signals which are then amplified, filtered and sent to ADC. The output of ADC is used by the computer. To convert this data again into sound waves, the digitized audio is forwarded to the speaker by passing through DAC and reconstruction filter producing a sound to which human can hear.

(vii) Music and Speech

Music and speech are used by the multimedia system. Music is developed by synthesizing the digital audio which involves directions/instructions to the hardware device about how and when to produce the sound. The instrument known as Musical Instrument Digital Interface (MIDI) is used to produce the synthesized sound. MIDI requires the information such as the keys that has been depressed, depressing time, depressing duration and the hardiness of the key structured etc. Speech is considered as a form of human communication. It is dynamic and transient in nature and depends on time.

3.1.5.4 Video

The process of electronically capturing, processing, storing, transmitting and reconstructing a set of still images to represent the moving (non-stationary) scenes. It forms an effective means of communication when it is combined with audio. Multimedia system utilizes the video in digital form which is used for making movies, games and applications in IT industry.

Advantages of Digital Video

Digital video enables us to store the video in the memory or digital devices. This stored video can then be processed and integrated into multimedia applications whenever required.

- Digital video simplifies non-linear video editing by providing random access to video files.
- Digital video can be easily encrypted.
- Multiple copies can be created without effecting the video quality. Use of video in multimedia system requires,

(i) Digitization of analog video

(ii) Video compression

(iii) Use of video file formats

(iv) Video editing.

(i) Digitization of Analog Video

Video capturing devices contain plug-in cards called video capture cards which performs the digitization of analog video.

It samples the video taken from an input device such as VCR or a video camera with the help of a cable attached to the sound card. The software of video capturing devices with the help of video card synchronize the channels of audio and video.

(ii) Video Compression

Video compression is required for the digital video files with large sizes since they occupy large amount of disk space and requires high data transfer rate to display the video from hard disk onto the screen. The compressed files are decompressed at the time of playing the video. For this purpose, some compression and decompression algorithms are used.

(iii) Use of Video File Format

In order to store the digital video file within the computer some specific file formats must be used. The file formats like AVI and Quick time are used in windows and Macintosh OS, respectively.

(iv) Video Editing

Sometimes video need to be edited. Video editing involves intersecting/removing frames, mixing audio with video, applying some special effects, superimposing clips, adjusting transparency and volume of audio. This can be done with help of video editors like Adobe premier, Adobe After Effects CS_4, Strata Avid video etc.

3.1.5.5 Animation

The process of applying motions to the series of still pictures or drawings is referred to as an animation. It is done by projecting or displaying the image as frames in some specified time limits. Generally, 30 frames per second are needed to make the still object, a moving object.

Design of Animation Sequences

The process of animation consists of the following sequence of steps.

1. Designing of storyboard
2. Defining the objects
3. Specifying the key frame
4. Producing the 'in-between' frames
5. Frame-by-frame animation.

1. Designing of Storyboard

The 'storyboard' refers to the profile of an anima-tion (outline). It can be available in the form of rough sketches or in a list containing the fundamental motion ideas for the objects.

2. Defining the Objects

Each member involved in an animation must have an object definition that describes the object's shape (i.e., a polygon or a spline) along with the associated movements.

3. Specifying the Key Frame

A key frame is a detailed sketch of the scene at any particular instant of time in the process of animation. Each object is then located depending on the time allocated to that frame. The time spacing between some key frames is very large, such key frames are kept at the extreme positions. Some key frames may have small time spacing.

4. Producing the 'in-between' Frames

In-between frames are the frames that exists between the key frames. The required number of in-between frames depends on the type of media used to display the animation. Usually, three to five in-between frames are used between the two key frames. The key frames can be duplicated depending on the motion speed.

The tasks such as motion verification, production, editing and synchronization of a sound track are also required.

5. **Frame-by-frame Animation**

Distinct scene frames are produced and stored which can then be recorded on a film and can be shown one after the other in a "real-time playback" mode.

Developing an Animated Image

Creation of animated image involves following processes,

(i) Looping

(ii) Morphing

(iii) Rendering.

(i) Looping

It gives continuous motion to a still picture.

Example

When a hop of a frog is represented (in two/three frames) using a loop, it appears as if the frog is jumping continuously.

(ii) Morphing

It is nothing but changing the shape of an object i.e., the transaction of an image to another. Changing the shape of an object require the shape that has to be changed. It is also used to apply other transformations like run, move, dance, etc.

(iii) Rendering

In this method images are created from a data file. An animation requires 30 frames per second to make an object appear in motion.

Hardware/Software Used for Animation

The hardware platforms for animation are SGI, PC, Macintosh and Amiga. Whereas the software includes 3D studio max, LightWave 3D, Adobe Photoshop and Adobe Premiere.

3.1.6 Applications of Multimedia

The applications of multimedia are as follows,

(i) Training

Multimedia has became a powerful tool for training the employees. This is because, a trainer can make use of different videos and graphics via which a trainer can easily understand the concept and effectively work upon it.

(ii) Entertainment

Entertainment is one of the major application of multimedia as it is extensively used in games, movies, cartoons. This is the reason for referring multimedia as home media.

(iii) Business

Multimedia is used in business for advertising, presentation, training, marketing, product demonstrations. In addition to this, it is also used in carrying out audio and video conferencing, email, voice mail.

(iv) Internet

Multimedia is applied to web pages for including audio, video, graphics in order to make the page interactive and more attractive.

(v) Education

Education is also one of the important application of multimedia. It is used for training teachers and teaching students. Teachers can provide presentations, gives lectures through the use of audio, video, graphics making learning more effective. In addition to this students can also attend online courses provided by different organizations.

(vi) Communication

Multimedia is also applied in communication. The different communication medium like email, voice mail, video conferencing, audio conferencing are employed in business, companies, organizations, institution, colleges, schools, universities and others. In business, communication is used for product promotion, obtaining customer information.

(vii) Publication

Multimedia is employed in publication for publishing books with or without using Internet. In addition to this multimedia is also useful for academicians, researchers and professionals.

(viii) Databases

Database is also a form of multimedia application wherein audio, video, text, image files are stored and retrieved by employing multimedia programs, these databases are used over the network.

(ix) Public Information

Multimedia is used in generating public information which can be rail way time tables, route maps, handout with pictures, images by different organization.

3.1.7 Stages of Multimedia Application Development

A Multimedia application is developed in stages as all other software are being developed. In multimedia application development a few stages have to complete before other stages being, and some stages may be skipped or combined with other stages.

Following are the four basic stages of multimedia project development :

1. Planning and Costing

This stage of multimedia application is the first stage which begins with an idea or need. This idea can be further refined by outlining its messages and objectives. Before starting to develop the multimedia project, it is necessary to plan what writing skills, graphic art, music, video and other multimedia expertise will be required. It is also necessary to estimate the time needed to prepare all elements of multimedia and prepare a budget accordingly. After preparing a budget, a prototype or proof of concept can be developed.

2. Designing and Producing

The next stage is to execute each of the planned tasks and create a finished product.

3. Testing

Testing a project ensure the product to be free from bugs. Apart from bug elimination another aspect of testing is to ensure that the multimedia application meets the objectives of the project. It is also necessary to test whether the multimedia project works properly on the intended deliver platforms and they meet the needs of the clients.

4. Delivering

The final stage of the multimedia application development is to pack the project and deliver the completed project to the end user. This stage has several steps such as implementation, maintenance, shipping and marketing the product.

3.1.8 Advantages of Multimedia

We have already mentioned various advantages of using multimedia. We can still specifically list out following points that explains the advantages of the multimedia.

1. It can be used to help students and teacher to teach as well as learn the given topics easily.
2. It can be used to spread the knowledge easily all over the world wide in the cheap cost.
3. It is easy to take the multimedia files from one to other places as it can be stored in the cheap and light storage devices like CD-ROM.
4. It can be used for any subject and for anyone.
5. It can be used in Television, Films Industries and for personal entertainments.
6. It is highly used to realize the concept of Open University, Distance Education System, and Video Conferencing.
7. It is also used in Internet to make up the interactive web-page contents.
8. We can give the everlasting impression to the intended audiences on a specific topic by the use of multimedia.
9. Colored pictures, Motion pictures and other graphics could be shown in monitors and other big screens so that many people could view it and make out the impression about it.
10. Multimedia systems are generally very interactive so it is interesting to use.

3.1.9 Disadvantages of Multimedia

In comparison to the enormous advantages we have very little disadvantages of multimedia. These disadvantages could be listed out as:

1. It is expensive to produce multimedia contents.
2. It is expensive to set up the multimedia systems.
3. It needs well trained manpower to create and use it.
4. Multimedia files are too large so, it is time consuming to transfer across the Internet and Intranet.

3.2 Multimedia Devices

A multimedia device allows a person to deal with a variety of these media while eliminating the need to have a separate device for each. There are numerous tasks that may be accomplished on these devices, such as creating, editing, and transferring files. Many of these devices are compatible with computers, which allows them to be easily dealt with in ways that may not otherwise be possible.

Multimedia is a mixture of different media — such as text, video, audio, graphics and data — that work together to provide you with all of the computing functions you need. To use multimedia, you rely on a team of input and output devices that are responsible for both transmitting and receiving information between you and the computer.

1. Monitor

Your monitor is either a separate component of your computer, like with a desktop version, or is attached to your keyboard, as on a laptop. All modern monitors have full-color capability, with some offering higher degrees of clarity than others. It is on the monitor that you are able to see the different functions available for your use and manipulate them as necessary.

2. Keyboard

Your keyboard is the primary instrument of information input that tells your computer what to do next, whether you're creating a word document, building a spreadsheet or playing a game. A standard keyboard has nearly 100 keys that send messages to your hard drive the moment you press them.

3. Camera

Nearly all laptops now come with a small camera embedded above the screen. If you have a desktop computer, you can purchase a camera attachment that sits on top of your monitor and is connected to the hard drive through a USB cord. You can use this camera for several functions, such as recording yourself for a podcast or speaking with people from around the world, as most include both audio and visual components.

4. Mouse

The mouse is a device that is manually operated and, in conjunction with commands from the keyboard, tell your computer what function you want it to perform. You use the mouse to click on icons, perform commands such as save,

edit and delete, and play computer games. Each mouse has either a roller ball or a laser on the bottom that, when moved manually, allows you to move the cursor on the screen.

5. Printer

One of the key output devices on your computer, the printer allows you to take information that is shown on the screen and re-create it on a piece of paper. You can print charts, diagrams, papers, pictures, photos and other documents. Printers come with different cartridges and, depending on the type of document you're printing, will either use black ink or multicolored ink cartridges.

6. Speakers

Anytime you want to listen to something or record something, your speakers are essential in completing these processes. They work as both input and output devices, translating the element of sound and recording it to use later on. The most common method for recording and saving sound is through .wav files; this standard format is recognized by virtually all computing devices. You can use speakers for listening and recording music, watching movies, playing games or speaking with people online through a telephonelike service.

3.2.1 Video Presentation Devices

The video presentation devices are as follows :

1. Multimedia Computer

It is used for displaying multimedia through the use of CD-ROM drive or network connection. Computer is also used to connect to a projector so as to provide information on large screen or on a wall for huge number of people.

2. Television Screens

These screens are used to display colour and motions and are not fit for text specially small size text. These screens need to use adapter cards so as to convert digital signal to the analog signal.

3. Cordless Mouse

This is the wireless mouse which is best for presentation. Its speciality is that it doesn't require flat surface to operate rather hand movement are enough to use it. Moreover as it is wireless mouse it can be taken any where with in the specific region.

4. Slide Projectors

This device in used to present multimedia shows, specially when there are more number of audience. This device is connected to the computer through a serial port. At a time 16 projectors can be connected to a computer.

5. Kiosks

This device is mostly use used in museums and other public places for presenting multimedia shows. It can be used by any one by touching on desired option, present on screen to see intended video.

3.3 Multimedia Format

Multimedia refers to the combination of the different types of media (texts, fixed or animated images, drawings and graphs, sounds, video) in a common numerical format, assembled together by a data-processing program, and made available to a reader allowing their exploitation.

Multimedia files need different plug-ins to be displayed. Depending on the user's PC configuration, the browser can prompt users to save the file to their hard drive or use a plug-in to display or execute the file within the browser window/environment.

Some multimedia file formats, such as Quicktime (MOV) and RealMedia (RM), are rather well-documented by their originators. Some, such as Microsoft's AVI and ASF, are loosely documented, if at all. This section has a collection of official and unofficial documentation. If official documentation exists, any unofficial documentation presented here will be supplemental and will focus on quirks and traps to be aware of when decoding such files.

3.3.1 Audio Formats

Audio formats (often referred to as PCM formats) are just as the name suggests — formats that use no compression. This means all the data is available, at the risk of large file sizes. A WAV audio file is an example of an Audio Formats can be broken down into three main categories. Uncompressed formats, lossless compression formats, and lossy compression.

1. **Uncompressed audio formats :** Uncompressed uncompressed audio file.
2. **Lossless compression :** Lossless compression applies compression to an uncompressed audio file, but it doesn't lose information or degrade the quality of the digital audio file. The WMA audio file format uses lossless compression.

3. **Lossy compression :** Lossy compression will result in some loss of data as the compression algorithm eliminates redundant or unnecessary information — basically it tosses what it sees as irrelevant information. Lossy compression has become popular online because of its small file size, it is easier to transmit over the Internet. MP3 and Real Audio files uses a lossy compression.

3.3.1.1 Common Windows-compatible Audio Formats

1. MP3

MP3 is the name of the file extension and also the name of the type of file for MPEG, audio layer 3. Layer 3 is one of three coding schemes (layer 1, layer 2 and layer 3) for the compression of audio signals. Layer 3 uses perceptual audio coding and psychoacoustic compression to remove all superfluous information (more specifically, the redundant and irrelevant parts of a sound signal. The stuff the human ear doesn't hear anyway). It also adds a MDCT (Modified Discrete Cosine Transform) that implements a filter bank, increasing the frequency resolution 18 times higher than that of layer 2. The result in real terms is layer 3 shrinks the original sound data from a CD (with a bit rate of 1411.2 kilobits per one second of stereo music) by a factor of 12 (down to 112-128kbps) without sacrificing sound quality.

2. WMA - Windows Media Audio

Short for Windows Media Audio, WMA is a Microsoft file format for encoding digital audio files similar to MP3 though can compress files at a higher rate than MP3. WMA files, which use the ".wma" file extension, can be of any size compressed to match many different connection speeds, or bandwidths.

3. WAV

WAV is the format used for storing sound in files developed jointly by Microsoft and IBM. Support for WAV files was built into Windows 95 making it the de facto standard for sound on PCs. WAV sound files end with a .wav extension and can be played by nearly all Windows applications that support sound.

4. Real Audio

Real Audio is a proprietary format, and is used for streaming audio that enables you to play digital audio files in real-time. To use this type of file you must have RealPlayer (for Windows or Mac), which you can download for free. Real Audio was developed by Real Networks.

5. MIDI - Musical Instrument Digital Interface

Short for musical instrument digital interface, MIDI is a standard adopted by the electronic music industry for controlling devices, such as synthesizers and sound cards, that emit music. At minimum, a MIDI representation of a sound includes values for the note's pitch, length, and volume. It can also include additional characteristics, such as attack and delay time.

6. Ogg

Ogg is an audio compression format, comparable to other formats used to store and play digital music, but differs in that it is free, open and unpatented. It uses Vorbis, a specific audio compression scheme that's designed to be contained in Ogg.

3.3.1.2 Preparing Digital Audio Files

Preparing digital audio files is fairly straight forward. If you have analog source materials – music or sound effects that you have recorded on analog media such as cassette tapes.

- The first step is to digitize the analog material and recording it onto a computer readable digital media.
- It is necessary to focus on two crucial aspects of preparing digital audio files:
  - Balancing the need for sound quality against your available RAM and Hard disk resources.
  - Setting proper recording levels to get a good, clean recording.

Remember that the sampling rate determines the frequency at which samples will be drawn for the recording. Sampling at higher rates more accurately captures the high frequency content of your sound. Audio resolution determines the accuracy with which a sound can be digitized.

3.3.1.3 Editing Digital Recordings

Once a recording has been made, it will almost certainly need to be edited. The basic sound editing operations that most multimedia procedures needed are described in the paragraphs that follow

1. **Multiple Tasks :** Able to edit and combine multiple tracks and then merge the tracks and export them in a final mix to a single audio file.
2. **Trimming :** Removing dead air or blank space from the front of a recording and an unnecessary extra time off the end is your first sound editing task.
3. **Splicing and Assembly :** Using the same tools mentioned for trimming, you will probably want to remove the extraneous noises that inevitably creep into recording.
4. **Volume Adjustments :** If you are trying to assemble ten different recordings into a single track there is a little chance that all the segments have the same volume.
5. **Format Conversion :** In some cases your digital audio editing software might read a format different from that read by your presentation or authoring program.
6. **Resampling or downsampling :** If you have recorded and edited your sounds at 16 bit sampling rates but are using lower rates you must resample or downsample the file.
7. **Equalization :** Some programs offer digital equalization capabilities that allow you to modify a recording frequency content so that it sounds brighter or darker.
8. **Digital Signal Processing :** Some programs allow you to process the signal with reverberation, multitap delay, and other special effects using DSP routines.
9. **Reversing Sounds :** Another simple manipulation is to reverse all or a portion of a digital audio recording. Sounds can produce a surreal, other wordly effect when played backward.
10. **Time Stretching :** Advanced programs let you alter the length of a sound file without changing its pitch. This feature can be very useful but watch out: most time stretching algorithms will severely degrade the audio quality.

3.3.1.4 Audio File Formats

A file format determines the application that is to be used for opening a file. Following is the list of different file formats and the software that can be used for opening a specific file.

1. *.AIF, *.SDII in Macintosh Systems
2. *.SND for Macintosh Systems
3. *.WAV for Windows Systems

4. MIDI files – used by north Macintosh and Windows
5. *.WMA –windows media player
6. *.MP3 – MP3 audio
7. *.RA – Real Player
8. *.VOC – VOC Sound
9. AIFF sound format for Macintosh sound files
10. *.OGG – Ogg Vorbis

3.3.2 Video Formats

The AVI Format

The AVI (Audio Video Interleave) format was created and released by Microsoft. Being a very common format, computers operating Windows and also most of the web browsers as Internet Explorer, Firefox or Safari support it. The video files encoded in AVI can be easily recognized by their extension:example “videofile.avi” .Systems running other operating systems than Windows may not support the avi format.

AVI was not built to support a standard procedure for encoding the aspect ratio information that is why the video players won’t automatically select the perfect ratio.

The Windows Media Format

This format is also a Microsoft release. First it was created for online streaming apps (WMV) and as a countermove to the RealVideo solutions. It is a very wide spread format on the online media but needs an additional free plugin to run on computers non operating under Windows. Latest Windows Media video files won’t play on computers running under a different operating system than Windows.

From Microsoft’s press releases they claim that WMV 9 offers two times better compression ratio than MPEG-4, and three times better than MPEG-2.

Video files encoded in the Windows Media format can be recognized by their specific extension: .wmv.

The MPEG Format

The Moving Pictures Expert Group format seems to be the most popular online format. This maybe because it is supported by the most of the web browsers and operating systems.

The huge plus of MPEG when comparing to the other audio/video formats is that files encoded are considerable smaller offering the same video quality.

You can read below a list of standards:

MPEG-1

Video CD's and MP3 technology are based on this standard;

MPEG-2

This is the version used by Digital Television STB (set top boxes) and DVD's

MPEG-4

Incorporates MPEG-1 and MPEG-2 features

MPEG-7

This is the standard for description and search of audio and visual content;

MPEG-21

The Multimedia Framework;

Video files extensions for MPEG are .mpg or .mpeg.

The QuickTime Format

Released by Apple, it is a very popular format on the Web. Movies need an additional plugin in order to play on a Windows based environment. QuickTime 10.0 is the latest release being available on MAC OS v.10.6. .mov. is the extension for QuickTime video files

The RealVideo Format

Real Media are the creators of this format which is offers and allows users to stream video with low bandwidth consumption. This thing brings usually a reduced video quality so if you need it just for the bandwidth advantage that will be a good option. Operating systems as Mac,Windows, Linux, and a lot of mobile phones support this format.

.rm or .ram are the extensions for RealVideo files.

The Shockwave (Flash) Format

The Shockwave format is a Macromedia solution. Even if at the first versions Shockwave was only able to offer vector-based objects, in time audio (with Flash version 3) and video (with Flash version 6) were available to the users.

Adobe Flash Player is the solution to play SWF files and it is available as a standalone player or a browser addon. It was developed as a continuous need of simplicity, extensibility, speed and file independence.

Video files encoded in the Shockwave format can be recognized by their extension:.swf.

3.3.2.1 Broadcast Video Standards

Four broadcast and video standards and recording formats are commonly in use around the world: NTSC, PAL, SECAM, and HDTV. Because these standards and formats are not easily interchangeable, it is important to know where your multimedia project will be used.

1. NTSC

The United States, Japan, and many other countries use a system for broadcasting and displaying video that is based upon the specifications set forth by the 1952 National Television Standards Committee. These standards define a method for encoding information into the electronic signal that ultimately creates a television picture. As specified by the NTSC standard, a single frame of video is made up of 525 horizontal scan lines drawn onto the inside face of a phosphor-coated picture tube every 1/30th of a second by a fast-moving electron beam.

2. PAL

The Phase Alternate Line (PAL) system is used in the United Kingdom, Europe, Australia, and South Africa. PAL is an integrated method of adding color to a black-and-white television signal that paints 625 lines at a frame rate 25 frames per second.

3. SECAM

The Sequential Color and Memory (SECAM) system is used in France, Russia, and few other countries. Although SECAM is a 625-line, 50 Hz system, it differs greatly from both the NTSC and the PAL color systems in its basic technology and broadcast method.

4. HDTV

High Definition Television (HDTV) provides high resolution in a 16:9 aspect ratio (see following Figure). This aspect ratio allows the viewing of Cinemascope and Panavision movies. There is contention between the broadcast and computer industries about whether to use interlacing or progressive-scan technologies.

3.3.2.2 Video File Formats

Video files are collections of images, audio and other data. The attributes of the video signal include the pixel dimensions, frame rate, audio channels, and more. In addition, there are many different ways to encode and save video data. This page outlines the key characteristics of the video signal, and the file formats used to capture, work with, and deliver that data.

Most videos files have at least two types of file formats. First there is the container, and then the codec which is used inside the container.

The container is what describes the whole structure of the file, and specifies which codec's are being used. The following is a list of some of the more common types of container formats:

1. Flash Video Format

Because of the cross-platform availability of Flash video players, the Flash video format has become increasingly popular. Flash video is playable within Flash movies files, which are supported by practically every browser on every platform. Flash video is compact, using compression from On2, and supports both progressive and streaming downloads.

2. AVI Format

The AVI format, which stands for audio video interleave, was developed by Microsoft.

It stores data that can be encoded in a number of different codec's and can contain both audio and video data. The AVI format usually uses less compression than some similar formats and is a very popular format amongst internet users.

AVI files most commonly contain M-JPEG, or DivX codec's, but can also contain almost any format.

The AVI format is supported by almost all computers using Windows, and can be played on various players.

Some of the most common players that support the avi format are:

- Apple QuickTime Player (windows & Mac)
- Microsoft Windows Media Player (Windows & Mac)
- VideoLAN VLC media player (Windows & Mac)
- Nullsoft Winamp

3. Quicktime Format

The QuickTime format was developed by Apple and is a very common one. It is often used on the internet, and for saving movie and video files.

The format contains one or more tracks storing video, audio, text or effects. . It is compatible with both Mac and Windows platforms, and can be played on an Apple Quicktime player.

4. MP4 Format

This format is mostly used to store audio and visual streams online, most commonly those defined by MPEG. It Expands MPEG-1 to support video/audio "objects", 3D content, low bit rate encoding and support for Digital Rights Management.

The MPEG-4 video format uses separate compression for audio and video tracks; video is compressed with MPEG-4 video encoding; audio is compressed using AAC compression, the same type of audio compression used in .AAC files.

The mp4 can most commonly be played on the Apple QuickTime Player or other movie players. Devices that play p4 are also known as mp4 players.

5. Mpg Format (.mpg)

Common video format standardized by the Moving Picture Experts Group (MPEG); typically incorporates MPEG-1 or MPEG-2 audio and video compression; often used for creating downloadable movies. It can be played using Apple QuickTime Player or Microsoft Windows Media Player.

6. Windows Media Video Format

WMV format, short for Windows Media Video was developed by Microsoft. It was originally designed for internet streaming applications, and can now cater to more specialized content. Windows Media is a common format on the Internet, but Windows Media movies cannot be played on non-Windows computer without an extra (free) component installed. Some later Windows Media movies cannot play at all on non-Windows computers because no player is available.

Videos stored in the Windows Media format have the extension .wmv.

7. 3GP File Extension

The 3gp format is both an audio and video format that was designed as a multimedia format for transmitting audio and video files between 3G cell phones and the internet. It is most commonly used to capture video from your cell phone and place it online.

This format supports both Mac and windows applications and can be commonly played in the following:

- Apple QuickTime Player
- RealNetworks RealPlayer
- VideoLAN VLC media player
- MPlayer
- MIKSOFT Mobile 3GP Converter (Windows)

8. Advances Streaming Format

ASF is a subset of the wmv format and was developed by Microsoft. It is intended for streaming and is used to support playback from digital media and HTTP servers, and to support storage devices such as hard disks. It can be compressed using a variety of video codecs.

The most common files types that are contained within an ASF file are Windows Media Audio, and Windows Media video.

9. Real Media Format

RealMedia is a format which was created my RealNetworks. It contains both audio and video data and typically used for streaming media files over the internet.

Realmedia can play on a wide variety of media players for both Mac and Windows platforms. The realplayer is the most compatible.

10. Flash Movie Format

The Flash movie format was developed my Macromedia.

This format can include text, graphics and animation. In order to play in Web Browsers, they must have the Flash Plug-In Installed. The flash plug in comes preinstalled in the latest version of many popular Web Browsers.

11. The RealVideo Format

The RealVideo format was developed for the Internet by Real Media. The format is used for streaming of video at low bandwidths. This sometimes causes the quality of the videos to be reduced.

3.3.3 Compression and Decompression Issues in Multimedia

Most people have downloaded large files, such as music or video, from the Internet. Because of the large size of these files, downloading them can take hours. To solve this problem, and make better use of disk space, large files are compressed, using various software. Once downloaded, they can then be decompressed, and viewed, using a decompression program.

1. How Compression Works

Compression software works by using mathematical equations to scan file data and look for repeating patterns. The software then replaces these repeating patterns with smaller pieces of data, or code, that take up less room. Once the compression software has identified a repeating pattern, it replaces that pattern with a smaller code that also shows the locations of the pattern. For example, in a picture, compression software replaces every instance of the color red with a code for red that also indicates everywhere in the picture red occurs.

2. Types of Compression

Compressed files usually end with .zip, .sit and .tar. These are called extensions, and they indicate different compression formats—different types of software used to compress files. For PCs, .zip is most common, .sit is used often with Macs and .tar used with Linux. When you see a file with one of these extensions, it may be either a single large file or a group of files bundled together.

3. Lossless Compression

Lossless compression is a way to compress files without losing any data. This method shoves the data closer together by replacing it with a type of shorthand. It can reduce file sizes by around half. The .zip format uses lossless compression. With this form, the file decompresss to provide an exact duplicate of the compressed file, with the same quality. However, it cannot compress files to a really small size, making it less useful for very large files.

4. Lossy Compression

To make files up to 80 percent smaller, lossy compression is used. Lossy compression software removes some redundant data from a file. Because data is removed, the quality of the decompressed file is less than the original. This method compresses graphic, audio and video files, and the slight damage to quality may not very noticeable. JPEG uses lossy compression, which is why files converted to JPEG lose some quality. MP3 also uses lossy compression to fit a great deal of music files in a small space, although the sound quality is lower than with WAV, which uses lossless compression.

5. Decompression

In order to use a compressed file, you must first decompress it. The software used to decompress depends on how the file was compressed in the first place. To decompress a .zip file you need software, such as WinZip. To decompress a .sit file, you need the Stuffit Expander program. WinZip does not decompress .sit files, but one version of StuffIt Expander can decompress both .zip and .sit files. Files ending in .sea or .exe are called self-extracting files. These are compressed files that do not require any special software to decompress. Just click on the file and it will automatically decompress and open.

3.3.4 Common Audio and Video File Formats

1. Audio

- **AAC :** Advanced Audio Coding (similar to MP3) is a digital audio format designed for high compression as well as high audio quality.
- **AVI :** Audio Video Interleaved is a Windows movie file with high video quality, but a large file size. Approximately 25 GB is required for 60 minutes of video.
- **MP3 :** MPEG 1 Audio Layer 3 is a digital audio format that is designed for high compression of audio files while maintaining high audio quality.
- **MP3 VBR :** MP3 using Variable Bit Rates that provides better quality and smaller files.
- **Audible 2, 3 and 4 :** Audio file format (.aa file extension) used for audio books or other voice recordings. Entire books can be stored in a single file.
- **Apple Lossless :** Uses the .m4a file extension, the same as AAC. Creates a larger file than AAC, but retains more information and quality.

- **AIFF :** Audio Interchange File Format similar to WAV. AIFF provides original sound quality and large file size.
- **WAV :** Wave provides the same file sound quality and large file size as the original CD.

2. Video

- **H.264 :** This is a digital video codec noted for high data compression while maintaining high quality.
- **MPEG-2 :** A combination of audio and video compression for storage of movies.
- **Mov :** QuickTime Movie Format
- **m4v :** A MPEG-4 Video file.
- **MP4 :** MPEG-4 is a versatile file format that can include audio, video, images and animations.
- **DAT :** Digital Data Storage. Data file format that can be used for text, graphics or binary data.

3.4 Multimedia Storage

A data storage device is a device for recording (storing) information (data). Recording can be done using virtually any form of energy. A storage device may hold information, process information, or both. A device that only holds information is a recording medium. Devices that process information (data storage equipment) may both access a separate portable (removable) recording medium or a permanent component to store and retrieve information.

Electronic data storage is storage which requires electrical power to store and retrieve that data. Most storage devices that do not require visual optics to read data fall into this category. Electronic data may be stored in either an analog or digital signal format. This type of data is considered to be electronically encoded data, whether or not it is electronically stored. Most electronic data storage media (including some forms of computer storage) are considered permanent (non-volatile) storage, that is, the data will remain stored when power is removed from the device. In contrast, *electronically stored* information is considered volatile memory.

3.4.1 Multimedia Storage Devices

The most common forms of multimedia storage devices include the hard disc, magnetic tape, video cassette recorder (VCR), CD-ROM, and digital video disk (DVD).

Special attention must be devoted to the evolution of the CD-ROM as a means of storage of multimedia information. The importance of the CD-ROM is attributed to the fact that it is convenient and inexpensive, 4.75-inch disc, and has a large storage capacity, up to 682 MB. A CD-ROM driver reads the information stored on the CD in pits of lengths of 0.834 microns on tracks spaced 1.6 microns through an infrared laser with a wavelength of 780 nm.

3.4.2 Memory and Storage Devices

By adding more memory and storage space to the computer, the computing needs and habits to keep pace, filling the new capacity.

To estimate the memory requirements of a multimedia project- the space required on a floppy disk, hard disk, or CD-ROM, not the random access sense of the project's content and scope. Color images, Sound bites, video clips, and the programming code that glues it all together require memory; if there are many of these elements, you will need even more. If you are making multimedia, you will also need to allocate memory for storing and archiving working files used during production, original audio and video clips, edited pieces, and final mixed pieces, production paperwork and correspondence, and at least one backup of your project files, with a second backup stored at another location.

3.4.3 Multimedia Storage – Optical Devices

Optical storage devices have become the order of the day. The high storage capacity available in the optical storage devices has influenced it as storage for multimedia content. Apart from the high storage capacity the optical storage devices have higher data transfer rate.

1) CD-ROM

A Compact Disc or CD is an optical disc used to store digital data, originally developed for storing digital audio. The CD, available on the market since late 1982, remains the standard playback medium for commercial audio recordings to the present day, though it has lost ground in recent years to MP3 players.

An audio CD consists of one or more stereo tracks stored using 16-bit PCM coding at a sampling rate of 44.1 kHz. Standard CDs have a diameter of 120 mm and can hold approximately 80 minutes of audio. There are also 80 mm discs, sometimes used for CD singles, which hold approximately 20 minutes of audio. The technology was later adapted for use as a data storage device, known as a CD-ROM, and to include record once and re-writable media (CD-R and CD-RW respectively). CD-ROMs and CD-Rs remain widely used technologies in the computer industry as of 2007. The CD and its extensions have been extremely successful: in 2004, the worldwide sales of CD audio, CD-ROM, and CD-R reached about 30 billion discs. By 2007, 200 billion CDs had been sold worldwide.

2) DVD

DVD (also known as "Digital Versatile Disc" or "Digital Video Disc") is a popular optical disc storage media format. Its main uses are video and data storage. Most DVDs are of the same dimensions as compact discs (CDs) but store more than 6 times the data.

Variations of the term DVD often describe the way data is stored on the discs: DVD-ROM has data which can only be read and not written, DVD-R can be written once and then functions as a DVD-ROM, and DVD-RAM or DVD-RW holds data that can be re-written multiple times.

DVD-Video and DVD-Audio discs respectively refer to properly formatted and structured video and audio content. Other types of DVD discs, including those with video content, may be referred to as DVD-Data discs. The term "DVD" is commonly misused to refer to high density optical disc formats in general, such as Blu-ray and HD DVD.

"DVD" was originally used as an initialism for the unofficial term "digital video disc". It was reported in 1995, at the time of the specification finalization, that the letters officially stood for "digital versatile disc" (due to non-video applications), however, the text of the press release announcing the specification finalization only refers to the technology as "DVD", making no mention of what (if anything) the letters stood for. Usage in the present day varies, with "DVD", "Digital Video Disc", and "Digital Versatile Disc" all being common.

3.5 Business Applications of Multimedia

3.5.1 Multimedia in Education

Multimedia combines several media in a one obviously it has more sources of information. So it is extensively used in the field of education and training. Even in conventional method we use audio visual for imparting education, where charts, models etc. were used. Now a days the classroom need is not limited to that conventional method rather it needs audio and visual media. The multimedia integrates all of them in one system. For the use of multimedia as an education aid the PC contains a high quality display. This all has promoted the development of a wide range of computer based training . The software package named computer aided instruction is available that provides a friendly interactive method of learning.

Use of Multimedia Content in Education

Presenting materials by using both words and pictures and those that integrate sound, voice, and animation, is one definition of multimedia. Examples of multimedia technologies are YouTube, Flickr, Wikipedia, blog, PowerPoint presentations, cameras, videos, and DVDs. These are just a few of the more common multimedia tools. When using multimedia to communicate information to students, multimedia learning happens. Multimedia in education is important; it allows students to learn skills that are important to life in the 21st century. Students are immersed in media, so providing them an opportunity to learn from the material enhances their educational experience.

Advantages to Multimedia

A higher level of learning is achieved when students are able to see the value and importance of the information that the teacher is presenting. Multimedia tools can offer a stimulating and interactive environment. In this environment learning and retention of materials improve. Learners are able to experience their subjects in a vicarious manner.

How does multimedia affect education

Multimedia provides a better way of learning. Example is that it neglects the nonlinear way of processing of information because, with its hyper linking capability, it presents the content in a way that allows the learner to jump from idea to idea into such non linear way. Because multimedia applications are user-controlled, students can proceed at their own pace and focus on those areas that are most interesting and helpful to them. Multimedia can be extremely motivating by allowing the user to take charge of his/her learning experience. In addition, it can provide immediate feedback, adjust the level of difficulty and evaluate skills.

Technologies Impact on Teachers

Throughout the 21st century, technology has impacted many occupations that you don't even know. One of those, is Education. In the 20th century, students only have textbooks, notebooks, and pens. Instead, students now use eBooks, interactive online textbooks, and online notebooks. Teachers are able to use projectors, computers, iPad's, and more! Because of this new technology, high school teachers able are to teach their students in a new, positive way in which students actually excited to learn. Technological developments have had an impact on high school teachers and people's lives.

Did you know that in between the years 1997 and 2007, computers were brought into the school? Teachers that have computers in the classroom not only benefit the students, but the teachers too. The teachers can show students tutorials, graphics, or even find lesson plans to help the teacher teach. Also, computers in schools are very engaging to students. When a child sees a computer, they want to go up to it and play games.

3.5.2 Multimedia in Entertainment

Multimedia entertainment applications aim at diverting users, engaging them in amazing experiences such as reading a book, listening to music, enjoying videos, and playing a game.

(i) Entertainment: This area attracts most of the attention of the general public as a lot of telecommunication and media companies expect that the entertainment market will be the one with the largest audience and, also, the market which is best suited for the employment of multimedia techniques. The following list presents just a short excerpt of the projects planned and worked on:

(ii) Digital television: Originally, digital television started out as a technology to deliver television broadcasts that were to be of substantially higher quality and size than current, analog technology based broadcasting services (the term *high-definition television* (HDTV) was coined to describe these new broadcasting services). However, the service providers that are implementing those services are already looking at other uses of the digital television technology: Data transmission, paging systems, wireless telephony, and multiple television programs within one channel are just a few of the uses in consideration, thereby pushing the original HDTV goal aside

(iii) **Video–on-demand:** Cable companies want to distribute a *customized* program to each viewer—that is, the *user* instead of the cable company shall have the authority to decide what kind of program the cable company delivers; additionally, all the features which the user has come to know from her video-cassette—recorder shall also be available with video—on-demand

(iv) **widely distributed interactive games:** Companies like Sega or Nintendo are working on creating networks of game-boy machines, that will interconnect using the existing telephone network or future networks.

(v) **interactive television:** This kind of application is especially attractive for television companies and multimedia "evangelists". The *interactive* part refers to the user's ability to partake in televised voting or game shows. The attractive aspect of interactive television stems from the fact, that the necessary technological infrastructure is already installed: Cable television and telephony services are available almost everywhere. Hence, startup-costs are low; *set-top boxes* link the television set, the telephone, and the user.

Entertainment and Multimedia Applications for Mobile Phones

The world is in love with smartphones! With the exceptional growth in on-demand internet access and the ability to perform multiple tasks with ease, these ubiquitous smartphones are now far removed from their humble beginnings as a mobile telephone.

Voice telephony, as we know it, is now just a commodity, as the real money comes through by providing reliable, high-quality entertainment apps and multimedia applications which leverage fast internet speeds (4G and LTE). These apps - varying from instant messaging apps to social networking ones, or even content consumption apps, are now setting the golden standard for connecting billions of smartphone users across the globe.

Some common entertainment and multimedia applications include -

(i) **Music and Video Entertainment Apps:** These include video and audio players which play a variety of formats - such as remote control applications which play music tracks on your computer, apps that let you buy and sync music from the online stores and other devices, compose and record songs, personalized radio, digital TV, streaming of live scores and so on. Music and video apps are perhaps the most glaring example of the rise of multimedia in entertainment, and include notable examples such as Spotify, TuneIn Radio, Apple Music, Play Music, Groove Music, Pandora, etc.

(ii) **GPS and Navigation Based Apps:** These include maps and/or provide location-based services such as, searching for nearby attractions and restaurants, marine navigation and so on. Some common examples include Google Maps, Apple Maps, Garmin Navigation Suite, Yelp, Zomato, etc.

(iii) **Social Networking Apps:** These apps allow users to sign-in directly to their favorite social networking sites and share photos/videos and updates, amongst other things. Notable examples include Facebook, Twitter, Path, LinkedIn, etc.

(iv) **News and Weather Apps:** Consumers now have access to the latest news on a regular basis on their phone or check the weather forecast. Many top news networks and papers give access to latest news on-the-go, including live streaming access. Most popular news channels and content aggregators are now available readily on multiple mobile platforms, including BBC, Reuters, Flipboard, etc.

(v) **Audiobooks and e-Book Readers:** It's the dream of every avid reader to be able to carry a book without the excess load. Audiobook apps and e-book reader apps on the mobile phone let the user do just that, and include features which allow them to translate, annotate, etc. on the go! Notable apps include Google Play Books, Amazon Kindle, Nook, etc.

(vi) **m-Learning Apps:** Mobile learning or m-Learning applications are similar to e-Learning applications, and allow learners unrestricted access to learning-on-the-go, while using the benefits of mobile technology. Popular mobile learning apps include Tutorials, Atlases, Student Organizers (letting you plan and schedule classes and assignments), Mini-Encyclopedias, Quiz-based applications, Converters, Calculators and Dictionaries to name a few. Khan Academy and Duolingo are but just two of the many mobile learning apps available out there.

3.5.3 Multimedia in Training

There various systems and intelligent tutoring systems available to train the students in many areas starting from the mathematics of a primary sudden to a difficult surgical process for a medical student. As there enough audio clips added t these tutorials and an action can be seen from all perspective and repeatedly so obviously as far as practical skills is concerned it gives a lot of far that. These packages are just like expert

systems s and are fully equipped with decision making utilities to impact training after judging the proficiency of a student in the respective field. These tutorials contains enough number of videos sequences clarify.

Using Multimedia Applications to Train Employees

Training is a large cost in any corporation. Enormous amounts of training need to be done in any company, particularly large ones. The costs associated with training are not only financial-they are the time devoted to training, and perhaps equally important, the time and money wasted if a company *doesn't* properly train its employees.

Training needs to be done to orient new employees to the corporation itself-things such as teaching about corporate procedures, where to find information, how to fill out forms, rules that managers must follow, and other similar orientation issues.

Another level of training has to do with how to use particular pieces of software at the corporation-for example, how to use the accounting system or a database.

The most complex level of training incorporates not just how to use software or how to follow procedures, but how to actually do business at the company. For example, many companies put new sales employees through a substantial amount of training that encompasses teaching about the industry in which the salesperson is selling, information about the product to be sold, as well as specific sales techniques to be used.

Training is not just for new employees-it needs to be an ongoing process. New products and goods to sell mean people need to be taught about them. New software and business procedures require that people be taught how to use them.

An intranet can help with all these kinds of training. It can cut costs, save time, and ensure that people get better training. On the simplest level, Web pages can be built to train people. The Web can be used as a multimedia training tool by including pictures, video, audio, with the text. It can be interactive as well-people can answer questions, take tests, and try out procedures.

More revolutionary will be intranet-based multimedia applications. Videoconferencing will allow trainers to teach people across the entire intranet. People won't have to be physically in the same room; instead, they can be seated at their PCs. And they'll be able to interact and ask questions using the technology as well.

With whiteboard applications (in which people can see what is on each other's computer screens), a teacher can demonstrate how to use a particular piece of software, and everyone connected can see on their computer screen what the instructor is doing, and can ask questions by doing things such as circling a portion of the screen, and asking questions about it.

Streaming video and audio technologies (which allow people to watch videos or listen to audios without having to wait for them to completely download) can be used for training as well. The ultimate training tool, however, may be virtual reality. A virtual world is built that someone can walk through and interact with in the same way as with the real world. Virtual reality has been used by the airlines and the military, for example, to train pilots.

Training employees is a major cost to many corporations. All employees require training on an ongoing basis-training for mundane things such as how to fill out new forms and procedures, to more sophisticated things, such as being given information about new goods and services the company sells.

3.5.4 Multimedia in Business

The business application of multimedia includes, product demos, instant messaging. One the excellent applications is voice and live conferencing. A multimedia can make a audience come live. It is widely used in programs. Such a program can be used by a mechanic and peoples. There are a number of easy to use authoring programs and tools that can even let workers to create their own program. There are a number of applications available that slow to run more smoothly and effectively.

Business applications in multimedia are presentation, training, marketing, advertising, product demos, catalogues, networked communication and voicemail. The presentation is very useful in many aspects of work and life. Because these are important in business to sales, training, teaching, lecturing and generally entertaining an audience. Presentation allows us to lecture in front of audiences and to present our product or project. Presentation can be use in oral, multimedia, power point presentations, educational or training sessions to giving simply a talk on a subject to group a voluntary basis for pleasure. In this is to facilitate small business and your employees, customers and potential customers of communication. We have use the multimedia in business marketing is easy to persuade the customers to buy us products. In business have different customers they have teenage, elderly people and many. So we can use the multimedia because that can make them easy to understanding it. These are the most common photo sharing marketing strategies.

Role of multi media in business

The role of multimedia in business can include:

1. Promoting sales to external clients/customers, through a multimedia based presentations;
2. Staff training through a multimedia based training/learning media;
3. Shareholders meetings, where the company (for examples, board members) make presentation to their stakeholders and shareholders;
4. Internal meetings on various subject matters.

Some specific role of MultiMedia includes–Public Relation, Human Development, Enhancing value of brand equity, Publicity, Interaction with people, Surveys, influencing public opinion, Launching new product etc.

3.5.5 Advantages of Multimedia Application

- One can communicate with people in remote locations just like all sitting in a single drawing room.
- Multimedia applications allow the computer user to communicate with the computer system in a variety of ways (speaking, writing, moving objects etc.).
- Multimedia applications give a real world impression while using a computer.
- You do not need to convert data into computer acceptable form. Data is acceptable in the form of voice, moving pictures, and images etc.
- Naturally people get attraction toward computer learning.
- Usage of computer products increases in business environments.
- Students and trainees find it easy to understand what is being taught to them.
- Disable persons can also use computer systems.
- Computer system can be connected to other machines and electronic devices.

SHORT NOTES

1. Multimedia

Multimedia means that computer information can be represented through audio, video, and animation in addition to traditional media (i.e., text, graphics drawings, images).

Multimedia is the media that uses multiple forms of information content and information processing (e.g. text, audio, graphics, animation, video, interactivity) to inform or entertain the user. Multimedia also refers to the use of electronic media to store and experience multimedia content. Multimedia is similar to traditional mixed media in fine art, but with a broader scope. The term "rich media" is synonymous for interactive multimedia.

2. Animation

The process of applying motions to the series of still pictures or drawings is referred to as an animation. It is done by projecting or displaying the image as frames in some specified time limits. Generally, 30 frames per second are needed to make the still object, a moving object.

3. Multimedia Devices

A multimedia device allows a person to deal with a variety of these media while eliminating the need to have a separate device for each. There are numerous tasks that may be accomplished on these devices, such as creating, editing, and transferring files. Many of these devices are compatible with computers, which allows them to be easily dealt with in ways that may not otherwise be possible.

4. Multimedia Format

Multimedia refers to the combination of the different types of media (texts, fixed or animated images, drawings and graphs, sounds, video) in a common numerical format, assembled together by a data-processing program, and made available to a reader allowing their exploitation.

Multimedia files need different plug-ins to be displayed. Depending on the user's PC configuration, the browser can prompt users to save the file to their hard drive or use a plug-in to display or execute the file within the browser window/ environment.

5. Audio Formats

Audio formats (often referred to as PCM formats) are just as the name suggests– formats that use no compression. This means all the data is available, at the risk of large file sizes. A WAV audio file is an example of an Audio Formats can be broken down into three main categories. Uncompressed formats, lossless compression formats, and lossy compression.

6. Video Formats

The AVI (Audio Video Interleave) format was created and released by Microsoft. Being a very common format, computers operating Windows and also most of the web browsers as Internet Explorer, Firefox or Safari support it. The video files encoded in AVI can be easily recognized by their extension:example "videofile.avi" .Systems running other operating systems than Windows may not support the avi format.

AVI was not built to support a standard procedure for encoding the aspect ratio information that is why the video players won't automatically select the perfect ratio.

7. Multimedia Storage

A data storage device is a device for recording (storing) information (data). Recording can be done using virtually any form of energy. A storage device may hold information, process information, or both. A device that only holds information is a recording medium. Devices that process information (data storage equipment) may both access a separate portable (removable) recording medium or a permanent component to store and retrieve information.

UNIT IV

Internet & Security Issues. Internet - History- Internet Addressing and architecture-WWW - Architecture- browsers-Servers-Search engines-Internet Services- Email- FTP- Remote Login- Chatting- Messaging- Groups- Social Networking-Internet in Business- e-commerce definition- types of online business-Security Issues in Internet-Security Threats-Measures to control them-Passwords-Smart cards-encryption/decryption-firewall-different types of firewall.

4.1 INTERNET

Internet is a communication network which bridges all the small computer networks worldwide as a whole. Internet is based upon Internet technology, in particular World Wide Web (WWW), to build Information System within organization or enterprise to accomplish standardization and automation. Fundamentally, it means network computing environments which let the users share the information through the Internet and Web browsers. Ultimately, it allows a certain organization to build a Groupware within Web environment at low cost on top of existing network infrastructure. By doing this, closed organization network would be interconnected with existing worldwide Internet, which results in diverse information that strengthens competitive advantages of the organization. Basically, it runs on top TCP/IP and HTTP and filters out any illegal access through firewall.

Where the Internet connects people and organizations and information sources by using common protocols to link computers on a public and open – to – all basis, an Internet uses the same common protocols for internal company or group purposes. Instead of adopting a common proprietary standard for its communications, information storage and presentation, etc., the company (or any group of people or companies) decides to use Internet standards and methods.

4.1.1 History of Internet

The birth of the interne takes place in 1969 when Advanced Research Projects Agency Network (ARPANet) is commissioned by the department of defense (DOD) for research in networking. The ARPANET is a success from the very beginning. Although originally designed to allow scientists to share data and access remote computers,

e mail quickly becomes the most popular application. The ARPANET becomes a high speed digital post office as people use it to collaborate on research projects and discuss topics of various interests.

The InterNetworking Working Group becomes the first of several standards setting entities to govern the growing network [10]. Vinton Cerf is elected the first chairman of the INWG, and later becomes known as a "Father of the Internet." [10] In the 1980s, Bob Kahn and Vinton Cerf are key members of a team that create TCP/IP, the common language of all Internet computers. For the first time the loose collection of networks which made up the ARPANET is seen as an "Internet", and the Internet as we know it today is born. The mid 80s marks a boom in the personal computer and super minicomputer industries. The combination of inexpensive desktop machines and powerful, network ready servers allows many companies to join the Internet for the first time.

Corporations begin to use the Internet to communicate with each other and with their customers. In the 1990s, the internet began to become available to the public. The World Wide Web was born. Netscape and Microsoft were both competing on developing a browser for the internet. Internet continues to grow and surfing the internet has become equivalent to TV viewing for many users.

4.1.2 Characteristics of Internet

1. **Complex Network :** With the simplified definition as a "network of networks" it comprises of over 150 million computers.
2. **Disorganized :** The internet can be cumbersome and confusing, even for experienced users.
3. **Decentralized System :** Millions of individual networks and over 140 million individual computers connected throughout the world.
4. **Composed of Billions of Files :** Files pertaining to thousands of subjects, disciplines, and professions are available in a numerous forms of file formats.
5. **Wide Usage :** More than 147 million people use the Internet, over 40 million of whom use it every day.
6. **International Scope :** This global network is accessed by people in approximately 140 countries; people in over 155 countries use Internet e-mail, a facility for immediate messaging.

7. **Dynamic :** Changing every minute of every day. On average, a new network is connected to the Internet every 30 minutes, presently.
8. **Exponential Expansion :** The Internet is growing at a rate of 12% per month; it doubles in size every 18 months. This is enormous growth of a facility available almost free.

4.1.3 Internet Protocols

The communication among different types of computers connected via network is possible by using a protocol that offers a standard format and method for communication. A **protocol** is a formal set of rules and conventions that governs how computers exchange information over a network medium. There are large numbers of protocols that can be used in a network depending upon the need they fulfil. Some of the protocols used on the Internet are given below:

- **TCP/IP (Transmission Control Protocol/Internet Protocol):** It is the suite of communication protocols which is used as a standard for transmitting data over networks. TCP/IP consists of two protocols, namely, TCP and IP The TCP (Transmission Control Protocol) is responsible for di-viding the message or file into small packets at the source computer that are transmitted over the network. Then at the destination computer, it reassembles the packets into the original message or file. On the other hand, the IP (Internet Protocol) handles the address part of each packet so that it reaches the right destination. Any computer or other device connected to the Internet must support TCP/IP.
- **SMTP (Simple Mail Transfer Protocol):** It is a mail protocol used for sending e-mail messages from one computer to another on a network.
- **HTTP (HyperText Transfer Protocol):** It is the Internet protocol responsible for transferring and displaying web pages. It provides a way for web clients and web servers to communicate with each other by sending messages.
- **FTP (File Transfer Protocol):** It is used for transferring files and folders between computers on the Internet. It allows you to access the files stored in the remote computer connected to the Internet. It is the fastest way of transferring digital information from one computer to another.
- **NNTP (Network News Transfer Protocol):** It is used to transfer news messages over the Internet. The NNTP server is a computer that collects a copy of news messages from the newsgroups and allows users to read these messages. It also allows users to send their messages to the same groups.

4.1.4 Internet Software

To connect to the Internet, a computer requires mainly three different kinds of software :

1. **TCP/IP :** TCP/IP, or Transmission Control Protocol / Internet Protocol, is the basic communication protocol of the Internet. It allows programs on user's computer to communicate properly over the internet. Usually, when you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program. Similarly, every other computer that you may send messages to or get information from also has a copy of TCP/IP.
2. **Dialer Software :** This software is provided by the ISP to instruct the modem to dial the phone number, and identify the user's machine to the access provider's system for access to the network.
3. **Browser :** To use the Internet, a web browser is essential. This program allows the user to view the information available on the world wide web.

4.1.5 Advantages of Internet

- **E-mail:** Email is an essential communication tools in todays world. With e-mail one can send and receive instant electronic messages, which works like writing letters. Messages are delivered instantly to people anywhere in the world, unlike traditional mail that takes a lot of time. Email is free, fast and very cheap when compared to telephone, fax and postal services.
- **24 hours a day -** 7 days a week: Internet is available, 24x7 days for usage.
- **'Information:** There is a huge amount of information available on the internet for just about every subject, ranging from government law and services, trade fairs and conferences, market information, new ideas and technical support. One can find any type of data on almost any kind of subject by using search engines like google, yahoo, msn, etc.
- **Online Chat:** Chat facility can be used to meet new people, make new friends, as well as to stay in touch with friends. Commonly used chat messangers are MSN, gmail and yahoo websites.
- **Services:** Many services are provided on the internet like net banking, job searching, purchasing tickets, hotel reservations, guidance services on array of topics engulfing the every aspect of life.

- **Communities:** Communities of all types have sprung up on the internet. Its a great way to meet up with people of similar interest and discuss common issues.
- **Shopping:** There are many online stores and sites that can be used to look for products as well as buy them using credit card. Through internet all shopping could be done sitting conveniently @ your home.
- **Entertainment:** Internet provides facility to access wide range of Audio/ Video songs, plays films. Many of which can be downloaded. One such popular website is YouTube.
- **Software Downloads:** You can freely download innumerable, softwares like utilities, games, music, videos, movies, etc from the Internet.

4.1.6 Disadvantages of Internet

1. **Theft of Personal Information.** With the use of Internet there are chances that personal information such as name, address, credit card, bank details and other information can be accessed by unauthorized persons. If you use a credit card or internet banking for online shopping, then your details can also be 'stolen'.
2. **Most parents do not realize the dangers involved when their children log onto the Internet.** When children talk to others online, they do not realize they could actually be talking to a harmful person. Moreover, pornography is also a very serious issue concerning the Internet, especially when it comes to young children.
3. **Virus threat.** Virus is a program created to disrupts the normal functioning of computer systems. Computers attached to internet are more prone to virus attacks and they can end up into crashing your whole hard disk.
4. **Spamming.** It is often viewed as the act of sending unsolicited email. This multiple or vast emailing is often compared to mass junk mailings.
5. **Phishing.** Phishing attack refers to sending a convincing mail to targetted user with an embedded url in the same. When the user clicks the url it directs the user to the phishing website. And when the person enters there personal details , the same is utilized by phisher to transfer money.

4.1.7 Internet Addressing

A way to locate people, computers, and Internet resources. It can be

1. IP (Internet Protocol) addresses and domain names
2. Electronic mail addresses
3. URLs

In general, Internet addressing is a systematic way to identify people, computers and Internet resources. On the Internet, the term "address" is used loosely. Address can mean many different things from an electronic mail address to a URL.

1. IP Address

An IP address is a unique number that identifies computers on the Internet; every computer directly connected to the Internet has one. Every client, server and network device must have a unique IP address for each network connection (network interface).

IP addresses are conceptually similar to phone numbers, except they are used in LANs (Local Area Network), WANs (Wide Area Network), and the Internet. Because the numbers are not easy for humans to remember, the Domain Name System provides a service analogous to an address book lookup called "domain name resolution" or "name resolution". Special DNS servers on the internet are dedicated to performing the translation from a domain name to an IP address and v.v.

An IP address consists of four numbers separated by periods. Each number must be between 0 and 255.

An example is: 204.81.205.32

The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.

Within an isolated network, you can assign IP addresses at random as long as each one is unique. However, connecting a private network to the Internet requires using registered IP addresses (called Internet addresses) to avoid duplicates.

(Internet Protocol address) The address of a device attached to an IP network (TCP/IP network). Every client, server and network device must have a unique IP

address for each network connection (network interface). Every IP packet contains a source IP address and a destination IP address.

The Internet Protocol (IP) knows each logical host interface by a number, the IP address. On any given network, this number must be unique among all the host interfaces that communicate through this network. Users of the Internet are sometimes given a host name in addition to their numerical IP address by their Internet service provider.

The IP addresses of users browsing the World Wide Web are used to enable communications with the server of the web site. Also, it is usually in the header of email messages one sends. In fact, for all programs that utilize the TCP/IP protocol, the sender IP address and destination IP address are required in order to establish communications and send data.

Internet addresses are needed not only for unique enumeration of hosted interfaces, but also for routing purposes, therefore a high fraction of them are always unused or reserved.

2. Electronic Mail Address

An Internet electronic mail, or e-mail, address is used to identify a person (or persons) and a computer for purposes of exchanging electronic mail messages.

An example Internet e-mail address is: abc123@columbia.edu

Internet e-mail addresses are read from left to right :

- "abc123" is the name of the person receiving or sending the message; this is referred to as the username.
- "columbia" is part of the domain name of the organization.
- "edu" is also part of the domain name and indicates that "columbia" is an educational institution.

Electronic Mail Address

Other networks may use different electronic mail addressing schemes within their own networks. To be used in Internet e-mail, these addresses often need to be modified.

For example, within CompuServe an e-mail address consists only of two numbers separated by a comma: 36547,891.

- To convert this to an address that can be used on the Internet, the comma is changed to a period and the number serves as the username.

- The domain name is compuserve.com, so the Internet address would be: 36547.891@compuserve.com

3. URLs

URL stands for Uniform Resource Locator. URLs are used to identify specific sites and files available on the World Wide Web.

The structure of a URL is: protocol://server.subdomain.top-level-domain/directory/filename

Not all URLs will have the directory and filename.

Two examples :

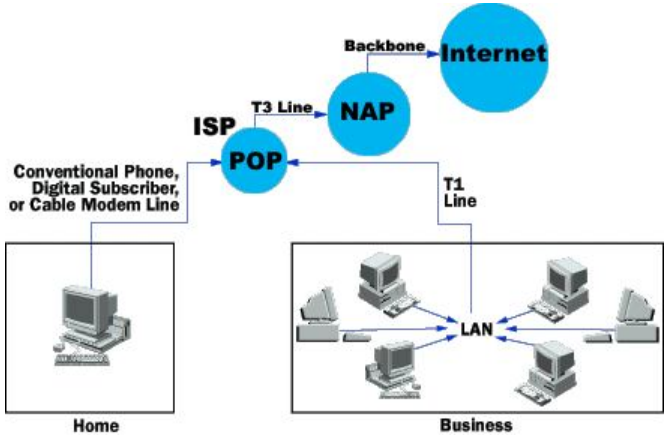
URLs

Similar to an e-mail address, a URL is read like a sentence. For example the URL is read as "http colon forward slash forward slash www dot healthy way dot com".

4.2 Internet and Architecture

In the field of computer networking there are different types of technologies that are used for the sake of information which is used for the sake of the benefit of the humanity. One of these technologies is the internet technology. It is that type of technology that is required to search any kind of information at any place is called as internet technology. Internet technology is operates with the help of networks such as wired networks and wireless networks also. But if we compare the wired technology with the wireless technology, then wired internet technology has more reliable and the faster networking as compared to wireless internet technology.

The process of assembling the parts of the computer hardware in computer networking is called as computer architecture. But when those architectural techniques are used in the field of internet networking technology, it is referred as internet network architecture. It is defined as the arrangement of different types of parts of computer or the network hardware to configure or setup the internet technology is known as internet network architecture. Different types of devices or the hardware is required to setup up the internet network architecture. It can operate with the both networks such as wired or either wirelessly.



4.2.1 Components of Internet Network Architecture

There are lots of components that are involved in maintaining the architecture of the internet technology. Some important parts that are used to configure the networking of the internet technology are as follows :

1. Satellite

A major part of the internet network architecture is the satellite. Satellite plays a vital role in catching and distributing the signals over the network and the users use the internet network to search different types of information at any time.

2 Network Adapters

There are different types of network adapters that are used to configure or setup the internet technology on your operating system. First install the network adapters in the system then install its software for the sake of its proper working or compatibility. Some common network adapters that are used for access of the internet are LAN cards or modems etc.

3. Routers

As we know that this technology is also operates wirelessly so some components that are used to configure the internet network technology wireless router plays an important role and it is also the main part of the architecture. It is defined as the device that is used to transmit data from one place to another in the form of

packets that are called as data packets is known as router. These data packets are also called data gram.

4. Access Points

A special type of routing device that is used to transmit the data between wired and wireless networking device is called as AP. It is often connected with the help of wired devices such as Ethernet. It only transmits or transfers the data between wireless internet technology and wired internet network technology by using infra structure mode of network. One access point can only support a small group of networks and works more efficiently. It is operated less than hundred feet. It is denoted by AP.

5. Clients

Any kind of device such as personal computers, Note books, or any kind of mobile devices which are inter linked with wireless network area referred as a client of internet network architecture.

6. Bridges

A special type of connectors which is used to establish connections between wired network devices such as Ethernet and different wireless networks such as wireless LAN. It is called as bridge. It acts as a point of control in internet network architecture.

Two components are also some time play an important role in internet network architecture

1. Basic Service Set (BSS)
2. Extended Service Set (ESS).

4.3 World Wide Web (WWW)

World Wide Web, also called Web, is the part of the Internet that supports multimedia and consists of a collection of linked documents.

Web, is a system of interlinked hypertext documents accessed via the Internet. Web commonly known as "World Wide Web" abbreviated as WWW.

Web is an application that uses the Internet for communications, with TCP/IP as the underlying transport mechanism. Many companies' set-up internet websites. A Website, like a brochure, is a collection of web pages. These pages on a Website are stored digitally on the Web-server.

Web is a huge collection of "pages" of information linked to each other around the globe. With a web browser, one can view web pages. Web uses the HTTP protocol, one of the languages, spoken over the Internet, to transmit data. Web services, which use HTTP to allow applications to communicate in order to exchange business logic, use the web to share information.

Web utilizes browsers, such as Internet Explorer or Netscape, to access web pages. It is a text file coded in HTML, which may also contain JavaScript code or other commands. Each page can be a combination of text, pictures, audio clips, animations and other electronically presentable material. On web each web page navigates using hyperlinks.

Web pages are stored on web server and send them to a client computer as and when it requests for them. Internally, a webpage is a computer file stored on the disk of the server. The file contains tags written in a codified form. These tags decide how the file would look when displayed on a computer screen. The Website address is called as Uniform Resource Locator (URL).

World Wide Web is non-linear. There is no top, there is no bottom. Non-linear means user do not have to follow a hierarchical path to information resources. Thus:

1) User can jump from one link (resource) to another
2) User can go directly to a resource if you know the URL i.e. its address
3) User can even jump to specific parts of a document.

Since the Web is not hierarchical and can handle graphics, it offers a great deal of flexibility in organizing, presenting, and describing the information resources.

4.3.1 WWW Architecture

The WWW is a distributed client/server service, in which a client using a browser can access a service using a server. However, the service provided is distributed over many locations called sites, as shown in figure :

Each site holds one or more documents, referred to as web pages. Each web page can contain a link to other pages in the same site or at other sites. The pages can be retrieved and viewed by using browsers.

The client needs to see some information that it knows belongs to site A. It sends a request through its browser, a program that is designed to fetch web documents. The request, among other information, includes the address of the site and the web page, called the URL (Uniform Resource Locator).

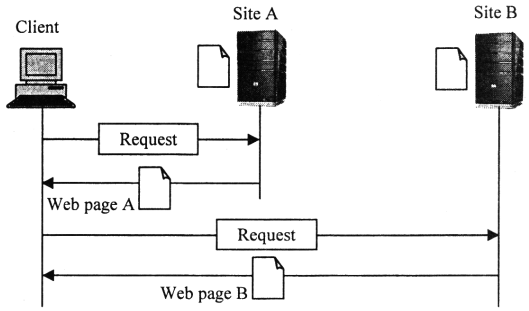


Fig. : Architecture of WWW

The server at site A finds the document and sends it to the client. When the user views the document, the user finds some references to other documents, including a web page at site B. The reference has the URL for the new site. The user is also interested in seeing this document. The client sends another request to the new site, and the new page is retrieved.

4.3.2 Components of World Wide Web

The basic web architecture is two-tiered and characterized by a web client that displays information content and a web server that transfers information to the client. The web architecture forms the basis for electronic commerce applications that involve building software in which the functions are distributed among application servers (where applications reside), data servers (where most of the data resides), and a group of client computers that are usually networked PCs (where the information users work).

This architecture depends on four key components :

1) **Hypertext Markup Language (HTML):** Short for Hyper Text Markup Language, the authoring language used to create documents on the World Wide Web. HTML is similar to SGML, although it is not a strict subset.HTML defines the structure and layout of a Web document by using a variety of tags and attributes. The correct structure for an HTML document starts with <HTML><HEAD> (Enter here what document is about)<BODY> and ends with </BODY></HTML>. All the information you'd like to include in Web page fits in between the <BODY> and </BODY> tags.

2) **Uniform Resource Locater (URL):** An addressing protocol for objects in the WWW. There are two types of URLs :

i) **Universal Resource Names (URN):** A URN is the name of a document (or other object) that may be available from several at different URLs. When a Web user clicks on an anchor that contains a URN. The browser must look up the URN to obtain a list of URLs that point to the location(s) of the document. The browser then retrieves the document using one of the URLs.

ii) **Universal Resource Locators (URL):** A Universal Resource Locator is a unique address for website or webpage. URL is entered in the address bar of a browser window.

3) **Hypertext Transfer Language (HTTP):** Short for Hyper Text Transfer Protocol, the underlying protocol used by the World Wide Web. HTTP defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands. For example, when anyone enter a URL in browser, this actually sends an HTTP command to the Web server directing it to fetch and transmit the requested Web page. Sending and receiving messages can be done through HTTP.

4) **CGI (Common Gateway Interface):** The common gateway interface (CGI) is a standard way for a Web server to pass a Web user's request to an application program and to receive data back to forward to the user. When the user requests a Web page (for example, by clicking on a highlighted word or entering a Web site address), the server sends back the requested page. However, when a user fills out a form on a Web page and sends it in, it usually needs to be processed by an application program,

Web server typically passes the form information to a small application program that processes the data and may send back a confirmation message. This method or convention for passing data back and forth between the server and the application is called the common gateway interface (CGI). It is part of the Web's Hypertext Transfer Protocol (HTTP).

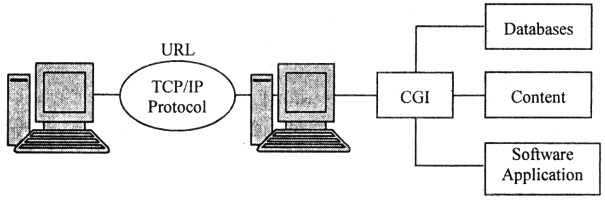


Fig. : Components of Web

4.3.3 Advantages of World Wide Web

1) **Establish a Presence:** Over seven Million people have access to the World Wide Web with more and more added every day. Modern companies can easily and inexpensively expand with a new store.

2) **Networking:** Develop lines of communication that promote contact with potential clients and organizations.

3) **Provide Business Information:** Like any printed form of advertising, the web site can post business services, hours, location, phone and e-mail for the public to view, but unlike the traditional advertising mediums, web site can have instant communication with information about your company that changes regularly. Information on how and why people should use company, frequently asked questions, and more can all be just a few mouse clicks away.

4) **Service to Customers:** Customers can have access to business information and services that may not be available any other way. Clients can be from anywhere in the world and shop in your store like never before and from the comfort of their homes.

5) **Conduct Business:** A web site does not have to make money to be considered a successful endeavor, but it does not hurt to generate some type of income. The web site can provide customers with the tools needed to locate the exact product that they are looking for and the forms needed to purchase any item or sen ice online. This can occur automatically without draining human resources 24 hours a day

6) **Provide Files to Download:** All pamphlets, brochures, advertisements, and even a demonstration video of product or service can be downloaded from web site.

7) **Remote Employee/Office Access:** Employees on the road or in satellite offices may need up-to-the-minute information to properly accomplish their tasks. Sensitive information can be protected with a password for employee access only. For the cost of a local phone call an employee can log into the "office" from anywhere in the world at any time.

4.3.4 Disadvantages of World Wide Web

1) **Time Consuming:** It may separate and isolate people as the person may spend all their time on Internet instead of interacting people face to face.

2) **Unreliable:** It may distribute unreliable and unchecked information.

3) **Security Problem:** It may threat national security. Most of the security problems encountered on the web are due to human mistakes.

4) **Fraud:** It may enable frauds. Fraud over the web is popular because of its anonymity and ease of promotion, and its lack of borders.

4.3.5 Web Browsers

A web browser (or simply browser) is a software application, which provides a graphical user interface (GUI) so that the user can navigate the Internet easily by clicking on menus, icons, or buttons instead of learning difficult keyboard commands. A web browser uses the HTTP protocol to request web pages from the web server. These pages contain special instructions (written in HTML) that tell the browser how to display the web contents on the user's screen.

The instructions may include hyperlinks to other web pages, information about text formatting and colour, position information for images contained in the document, and other such things. Most browsers natively support a variety of formats in addi-tion to HTML, such as the JPEG, PNG, and GIF image formats, and can be extended to support more through the use of plug-ins (an add-on piece of software that extends the features or functionality of a larger application). The two most popular web browsers are Netscape Navigator and Microsoft Internet Explorer.

Features of Web Browser

There are many web browsers available having different features. However, every browser shares some of the basic features mentioned below :

- A browser handles requests for HTML files, interprets links, and deals with embedded images, audio, and video elements.
- A browser keeps the history of the websites visited.
- A browser lets a user to save a collection of pages, allowing for later retrieval.
- A browser provides a row of buttons at the top of the browser window for browsing the Internet conveniently.

- A browser connects to an e-mail program for importing favourites/bookmarks and sending and receiving e-mails from the most commonly used applications and formats.
- A browser supports web standards currently in use such as HTML, HTTP, JavaScript, and Unicode.
- A browser supports multimedia data in three ways.
  - **Native Support :** A browser supports some of the image formats natively. In other words, a browser presents the image as a part of the web page in the browser window.
  - **Plugins :** A plug-in is a program that adds functions to the web browser, such as an audio player or a compression utility. A plug-in is a set-up within the browser through which it functions properly and correctly.
  - **Helper Programs:** Helper programs are external applications launched by a web browser or Internet client program to view non-native file formats and data types. These programs are not integrated with the browser.

Note: In this book, we have used Internet Explorer 6.0 (IE 6.0) for explaining web browser concepts. Internet Explorer 6.0 is freely available from Microsoft (www. microsoft.com). It is also bundled with the Windows XP operating system.

1. Opening Internet Explorer

To open Internet Explorer, perform any one of the following steps :

- Double-click the Internet Explorer icon located on the desktop,
- Click the Internet Explorer icon from Quick Launch,
- Click Start, and select Internet Explorer.
- Click Start, select All Programs, and then select Internet Explorer.

2. Address Bar

This bar displays the Internet address (URL) of the page currently being displayed. You can access a site by typing its URL into the Address box and clicking on Go or by pressing Enter. Click the down arrow (v) to the right of the Address box to view site addresses that you have previously entered here.

3. Link Bar

This bar contains shortcuts to useful Internet websites. A web site can be accessed quickly by clicking the Links button.

4. Content Area or Document View

The content area is the portion of the window that holds the document page or other resources as the browser presents it. Any text, images, animation, links, or any other application files is shown in this area. The scroll bars located on the right side and on the bottom of this window allow the user to view the page even when the page is too large to fit in the screen. Sometimes the content area is divided into or consists of several independent portions called frames. Each frame has its own scroll bar, and the user can move through one frame while staying in the same position in others.

5. Status Bar

This bar displays the current state of activity of the web pages. Apart from this, other information that appears on the status bar includes the size of the web page, percentage of the web page that has been downloaded, error in the web page being downloaded, and whether the user is working online or offline.

4.3.6 Search Engines

The Internet provides access to a wealth of information on countless topics contributed by people throughout the world. However, the Internet is not a library in which all its available items are identified and can be retrieved by a single catalogue. In fact, no one knows how many individual files (could be in billions) reside on the Internet. Hence, to conduct a search on the Internet, a special search tool known as search engines is used. A search engine searches a database of Internet files collected by a computer program called a wanderer, crawler, or spider. It allows the user to enter keywords relating to particu-lar topics and retrieve information about the Internet sites containing those keywords. As such, a search engine consists of four components.

Components of Search Engines

- **Spider:** Program that traverses the Web from link to link, identifying and reading pages.
- **Indexing Software:** Program that analyses web pages that are downloaded by spiders.
- **Database:** Warehouse of the web pages downloaded and processed.
- **Search Engine Mechanism:** Software that enables users to query the index and that usually returns results in term relevancy ranked order.

A search engine does not really search the Web directly. To find information on the millions of web pages, a search engine employs special software, called spiders. After spiders find pages, they pass them on to another computer program for indexing. This program identifies the text, links, and other content in the page and stores it in the search engine database's files so that the database can be searched by keyword. Note that creating index and updating search database is a never-ending process because of the constantly changing nature of the Web. As a result, the spiders are always 'crawling'.

Step 1 : Web spider gathes information about what is available on the internet. it sends the addresses of the document back to search engine's indexing software.

Step 2 : Indexing software extracts information from the documents and organises it into a database.

Step 3 : When users visit the search engine's web page, they launch a search of its database by typing the keywords that describe the information they are looking for.

Step 4 : Search engine looks for the keyword(s) in the index for the databse. It creates a new web page displaying the URLs and titles of the documents.

Step 5 : To get the actual page, the user just have to click on the link.

When users search the Web using a search engine, they are provided with the links of all the searched web pages. On clicking on the links provided in a search engine's search results, the current versions of the web pages are retrieved from the server.

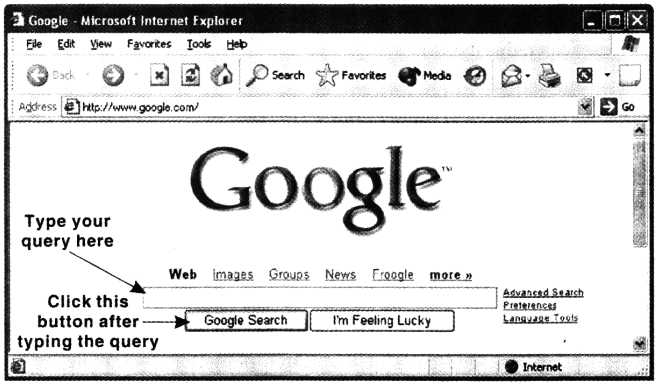


Fig.: Google Service Engine

Searching the Internet

With most search engines, you fill out a form with your search terms and then ask the search engine to find web pages relevant to the search terms. Some of the well-known search engines are www.google. com. www.hotbot.com,www.lycos.com, and www.altavista.com.

Let us assume that you want to search the Web to get information regarding computer generations. To do this, first open the search engine's website (such as www.google.com). Now type your keyword(s) in the search box and click the Google Search button or press Enter.

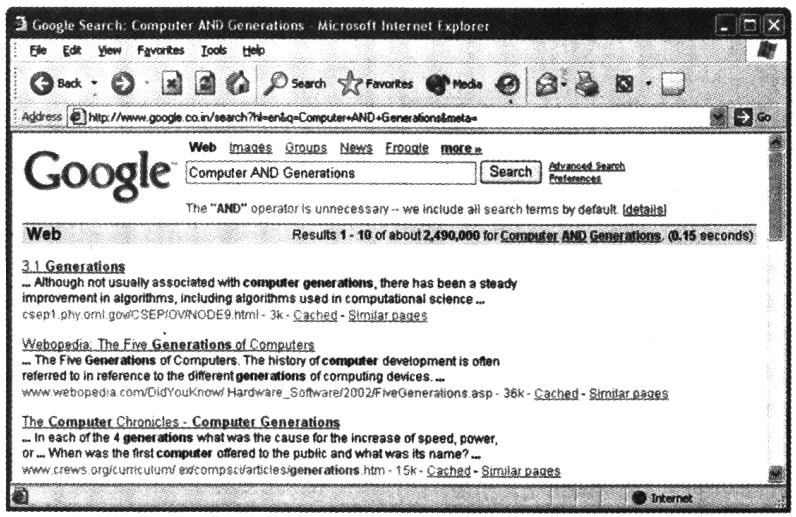
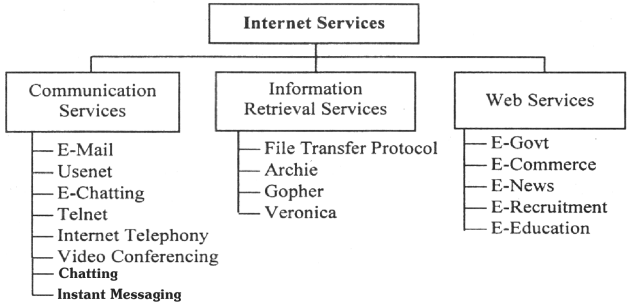


Fig.: Search Result page

The engine searches its index and generates a page with links to those resources containing some or all of the search terms. Clicking on any link opens a website or web page in which the searched keyword appears.

4.4 INTERNET SERVICES

The important and popular services of Internet are shown in figure below :



1. Communication Services

Internet communication tools facilitate written communication. These tools include :

i) E-Mail: E-mail, which refers to sending messages electronically, was one of the first Internet tools. With the help of E-mail one can send and receive any information and message.

ii) Usenet: Usenet is a network that provides users with discussion groups. A user ports an article to a chosen newsgroup on the Usenet where each newsgroup is devoted to a particular topic such as politics, environment, surfing and so on.

iii) E-Chatting: Chatting on the Internet has become a popular way for people to connect online in a group to share similar interests. "Chatting" is like talking, except that one type words rather than speak. Typically, more than one "conversation" goes on simultaneously at a given time on chat room.

iv) Telnet: Telnet is a command that connects the user to a remote machine which may be located anywhere on the Internet and the user can then type and execute commands on the remote machine. For example, to change directories in search of certain files, the services that telnet provides depends on the services provided by the host machine, which may include much more than simple file transfers.

v) Internet Telephony: Internet telephony is the use of the Internet rather than the traditional telephone company infrastructure, to exchange spoken

or other telephonic information. It consists of hardware and software that enable people to use the Internet as a transmission medium for telephone calls. There are many Internet telephony applications available.

vi) Video Conferencing: Video conferencing is an emerging service on the Internet that allows a group of users located around the globe to talk and interact with each other as they were sitting and discussing in a single room. The parties interacting can see each other talking on their computer screens and can hear each other's voice through a special audio-device fixed in their computers.

vii) Chatting

It is the third-most-used internet application, which allows two or more people to carry out live and interactive written conversation through internet. The internet's general chat program is called 'Internet Realy Chat'. The chat groups age divided into several channels and each channel has a different topic of conversation.

viii) Instant Messaging

This service allows two or more people who are connected to internet to have an on-line real-time communication. When a user sends an instant text message to one or more users who are also logged on, a window containing that message appears on the screens of each user. This window displays the real-time messages. Moreover, a user on the internet can send a message on a person's cell phone, anywhere in the world, using the instant messaging service.

2. Information Retrieval Services

This category of information retrieval tools include :

i) File Transfer Protocol (FTP): It is one of the first tools on the Internet which allows users to move files, such as text, graphics, sound and so on, from one computer to another. It is a command that activates a type of client-server relationship. Hence, anything that can be stored on a computer can be moved with FTP service.

ii) Archie: Archie tool, one of the first information search tools developed on the Internet, periodically searches anonymous FTP servers that participate in the Archie database and identifies all files on these servers. It then creates

a central database that users can access to locate information. Users who have the Archie software, or who can use the Telnet command to connect to an Archie server, can access this database.

iii) **Gopher:** The other type of information retrieval tool available on the Internet is Gopher, a menu based interface that provides easy access to information residing on special servers, called Gopher sites. Although Gopher performs primarily the same tasks as the FTP command, its interface is much more user friendly and it provides additional functions, such as links to other Internet services. By selecting an item on the Gopher menu users can move, retrieve, or display files from remote sites.

iv) **Veronica:** It is a tool for searching the items on gopher menus throughout the Internet. With the help of Veronica, user can get necessary information very rapidly. Any user can easily access any database with the help of Veronica server.

3. Web Services

The next step in software evolution will have software applications provided in the form of services delivered over the internet. It is the ability to deliver applications to users at much lower costs.

Web services includes:

i) **E-Govt:** E-government (e-govt) describes the use of technologies to facilitate the operation of government and the dispersement of government information and services. E-government deals heavily with Internet and non-internet applications to aid in governments.

E-government is digital interactions between a government and citizens (G2C), government and businesses (G2B), government and employees (G2E), and also between government and governments /agencies (G2G).

ii) **E-Commerce:** Internet has also facilitated the introduction of a new market concept that consists of virtual shops. These shops remain open 24 hours all the year round and are accessible to purchasers all around the world.

E-commerce is the buying and selling of product or service over electronic systems such as Internet and other computer networks.

iii) **E-News:** Internet now has literally thousands of electronic form of news that can be found both for free and low cost.

iv) **E-Recruitment:** E-recruitment, also known as online recruitment, is the practice of using technology and in particular Web-based resources for tasks involved with finding, attracting, assessing, interviewing and hiring new personnel.

The purpose of e-recruitment is to make the processes involved more efficient and effective, as well as less expensive. Online recruitment can reach a larger pool of potential employees and facilitate the selection process.

v) **E-Education:** The term "e-education" refers to the application of Internet to the delivery of learning experiences. E-education takes place in formal electronic classrooms, on corporate intranets used for just-in-time trainings audio and video teleconferencing and in a variety of other technology mediated learning spaces.

4.4.1 E-mail

E-mail or Electronic mail is a paperless method of sending messages, notes or letters from one person to another or even many people at the same time via Internet. E-mail is very fast compared to the normal post. E-mail messages usually take only few seconds to arrive at their destination. One can send messages anytime of the day or night, and, it will get delivered immediately. You need not to wait for the post office to open and you don't have to get worried about holidays. It works 24 hours a day and seven days a week. What's more, the copy of the message you have sent will be available whenever you want to look at it even in the middle of the night. You have the privilege of sending something extra such as a file, graphics, images etc. along with your e-mail.

The biggest advantage of using e-mail is that it is cheap, especially when sending messages to other states or countries and at the same time it can be delivered to a number of people around the world.

It allows you to compose note, get the address of the recipient and send it. Once the mail is received and read, it can be forwarded replied. One can even store it for later use, or delete. In e-mail even the sender can request for delivery receipt and read receipt from the recipient.

Features of E-mail

- One-to-one or one-to-many communications
- Instant communications

- Physical presence of recipient is not required
- Most inexpensive mail services, 24-hours a day and seven days a week
- Encourages informal communications

Components of an E-mail Address

As in the case of normal mail system, e-mail is also based upon the concept of a recipient address. The email address provides all of the information required to get a message to the recipient from any where in the world. Consider the e-mail ID.

abc@hotmail.com

In the above example john is the username of the person who will be sending/ receiving the email. Hotmail is the mail server where the username john has been registered and com is the type of organization on the internet which is hosting the mail/ server.

Advantages of E-mail

The benefits of e-mail are huge in number.

- **Easy to use :** E-mail frees us from the tedious task of managing data of daily use. It helps us to manage our contacts, send mails quickly, maintain our mail history, store the required information.
- **Speed :** The e-mail is delivered instantly, anywhere across the globe. No other service matches the e-mail in terms of speed.
- **Easy to prioritize :** Since the mails have subject lines, it is easy to prioritize them and ignore unwanted mails.
- **Reliable and secure :** Constant efforts are being taken to improve the security in electronic mails. Thus making it one of the secured ways of communication.
- **Informal and conversational :** The language used in e-mails is generally simple and thus makes the communication informal. Sending and receiving e-mails takes less time, so it can be used as a tool for interaction.
- **Automated e-mails :** It is possible to send automated e-mails using special programs like the autoresponders. The autoresponders reply back to the sender with generalized pre-written text messages.
- **Use of graphics :** Colorful greeting cards and interesting pictures can be sent through e-mails. This adds value to the e-mail service.

- **Advertising tool :** Many individuals and companies are using e-mails to advertise their products, services, etc.

Disadvantages of E-mail

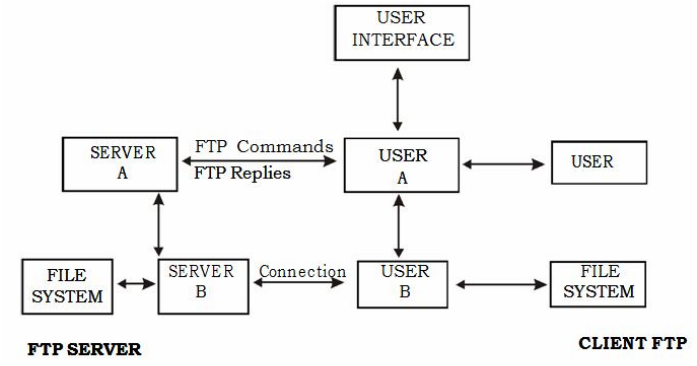
E-mail can lead to some well-known problems :

- **Viruses :** These are computer programs having the potential to harm a computer system. These programs copy themselves and further infect the computer. The recipient needs to scan the mails, as viruses are transmitted through them and have the potential to harm computer systems.
- **Loss of Context :** which means that the context is lost forever, there is no way to get the text back.
- **Inconsistency :** E-mails can duplicate information. This can be a problem when a large team is working on documents and information while not in constant contact with the other members of their team.
- **Spam :** E-mails when used to send unsolicited messages and unwanted advertisements create nuisance and is termed as Spam.
- **Hacking :** The act of breaking into computer security is termed as hacking. After the e-mail is sent and before it is received by the desired recipient, it "bounces" between servers located in different parts of the world. Hence, the e-mail can be hacked by a professional hacker.

4.4.2 FTP

File Transfer Protocol, is an Internet utility software used to uploaded and download files. It gives access to directories or folders on remote computers and allows software, data and text files to be transfer between different kinds of computers. FTP works on the basis of same principle as that of Client/ Server. FTP "Client" is a program running on your computer that enables you to communicate with remote computers.

The FTP client takes FTP command and sends these as requests for information from the remote computer known as FTP servers. To access remote FTP server it is required, but not necessary to have an account in the FTP server. When the FTP client gets connected, FTP server asks for the identification in terms of User Login name and password of the FTP client (Fig.). If one does not have an account in the remote FTP server, still he can connect to the server using anonymous login.



Using anonymous login anyone can login in to a FTP server and can access public archives; anywhere in the world, without having an account. One can easily Login to the FTP site with the username anonymous and e-mail address as password.

Objectives of FTP

- Provide flexibility and promote sharing of computer programs, files and data
- Transfer data reliably and more efficiently over network
- Encourage implicit or indirect use of remote computers using Internet
- Shield a user from variations in storage systems among hosts.

Advantagesof FTP

1. FTP is the fast and efficient way of tranferring bulks of data across the internet.
2. It has an automatic backup .Whenever you edit your files in your local system you can update the same by copying it to the host system in your site. So in cases where your site has crashed and all the data is lost you have a copy of it in your own local system. It also works the other way round.
3. FTP gives you control over transfer. That is, you can choose the mode in which the data is transferred over the network. The data can be transferred either in the ASCII mode (for text files) or in the Binary mode(for executables or compressed files).

4. You can work with the directories on the remote systems, delete or rename the remote files while transferring data between 2 hosts.
5. While using FTP, tools like macros can also be used to make your work more efficient and easier.

Disadvantages of FTP

1. FTP was not designed to be a secure protocol.
2. FTP causes the following attacks during the transfer of data.
   a. Bounce Attacks
   b. Spoof Attacks
   c. Brute Force Attacks
   d. Packet Sniffing
   e. User name protection
   f. Port sealing
3. Encryption of data is not done in FTP.

4.4.3 Remote Login / Telnet

The word "telnet" is derived from telecommuni-cations and network and is a protocol that allows a user to log on to a remote computer. Telnet is also known as **remote login,** which means con-necting one machine to another in such a way that a person may interact with another machine as if it is being used locally. It means that some-one in New Delhi could connect to a computer in the New York City Public Library and search the card catalogue the same way as someone located at a terminal in the library. Once connected, the user's computer emulates the remote computer. When the user types in commands, they are executed on the remote computer. The user's monitor displays what is taking place on the remote com-puter during the telnet session.

The user's computer, which initiates the connection, is referred to as the local computer or telnet client, and the machine being connected to, which accepts the connection, is referred to as the remote computer or telnet server.

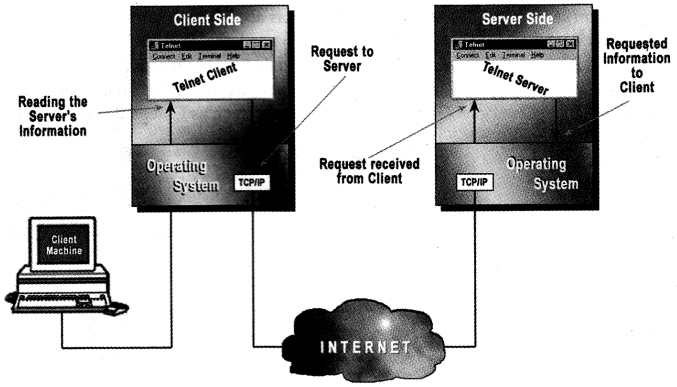


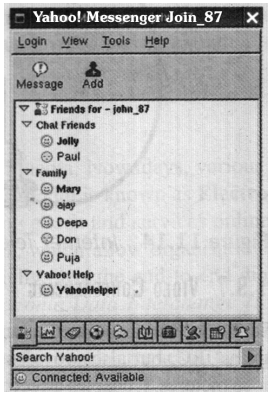
Figure : Remote Login through Telnet

4.4.4 Chatting and Instant Messaging

Chat programs allow users on the Internet to communicate with each other by typing in real time. They are sometimes included as a feature of a website, where users can log into chat rooms to exchange comments and information about the topics addressed on the site.

For example, America Online is well known for sponsor-ing a number of topical chat rooms. Chatting has become one of the "killer applications" of Internet and has become quite popular with all kinds of Internet users. It is quite cheap to chat online. Although e-mail is also a cheap source of communication but it is not done on "real time" and the response to the message solely de-pends on the recipient. -Note that even though chatting is based on standardised IRC system, but unlike IRC, the user does not need to have any special software to connect to any chat rooms.

A variation of chat is instant messaging where a user on the web can contact another user currently logged in and type a conversation. To avail this Internet service, the user must have software called instant messenger installed on the system. Instant messaging is just as if making a text-only phone call over the Internet, that is, the user is "talking" to the other person (possibly more) instantly. There are various products out there for instant messaging such as MSN Messenger and Yahoo Messenger.



Advantages of Instant Messaging

- You don't have to wait for a response like email text – the person you are communicating with is normally connected to the site
- It's free you don't have to pay for it
- You can monitor who talk to means you an make sure that only friends you except
- You can control what information you wish to share with people

Disadvantages of Instant Messaging

- Saying one thing and meaning another when you can be misunderstood
- Distractive- like when you are trying to get work done and chat to friend instead
- Can be addictive and when you are with others rather than focusing on what they are saying you could be IMS on the phone or ITouch for example you can't see or hear the person voice, no emotional contact.

Threats of Instant Messaging

- Viruses you could open a link and allow something to get into the computer
- *Hacking* - Someone could break into your computer and find things out things about you
- *Impersonating* - someone could make account and pretend that it's someone else than who you think it is.
- Very dangerous for young people who will trust others easily and be taken advantage off.

4.4.5 News Groups

A **newsgroup** is a repository of electronic messages posted by users and managed by the Usenet system. This is a worldwide Internet discussion system that is separate from the World Wide Web. Usenet was established in 1980, a little more than 10 years before the creation of the World Wide Web. Newsgroups on Usenet were one of the first opportunities for general computer users to share and post information on the emerging Internet.

A **newsgroup** is a discussion group. People on computers all over the Internet connect to each other to ask questions and discuss specific topics. Anyone is allowed to participate. Some newsgroups have completely free and open discussions and some are moderated by a person who reviews and posts the articles for discussion. Newsgroup discussions may continue over weeks. One does not have to be on line every minute.

A chatgroup is a real-time conversation between anyone who is on line at the same time. People come and go and the topics tend to be social rather than academic.

Newsgroups and chat groups are different from E-mail in that newsgroup and chatgroup postings are sent to one central newsserver, which sends them out to thousands of other servers for anyone to read and discuss. E-mail is sent from one person to another, just like a letter.

Newsgroups can be useful for research. If you find a group related to your research topic, you can post questions and get answers. Posting a question to a group may result in a lot of new information.

There are newsgroups related to almost any imaginable topic. Newsgroups' names indicate the topic. For example, biology groups include BIO and computer groups include COM in their names.

Benefits of Using News groups

- **Establish yourself as an expert.** Establish yourself as an expert of your chosen field. People will prefer doing business with you if they know that you are an expert in your field. Post important and relevant information in your chosen Newsgroup, answer to the questions posted. Very soon, people from the Newsgroup will start considering you as an expert and you will be amazed to see quantity of new visitors checking out your site.
- **Conduct market survey.** Newsgroups can be a great source of marketing information. By asking questions in relevant Newsgroups you can find a way of figuring out what people think about your product, your website, etc.

- **Get new clients.** There are Newsgroups, which are formed with the sole purpose of various announcements and promotions. Prudent use of these Newsgroups along with your relevant Newsgroups will definitely increase your site traffic and get new clients.
- **Promote your site.** In relevant groups you can post announcements about your site launch, press releases, product information, etc. Participation in the discussions in your subject matter with your signature file, which should include your website address, will help getting new visitors and increase the quantity of backward links to your website.
- **Get answers to your questions.** You can't be an expert in every thing! Often, you will need answers to various questions. Ask them in relevant Newsgroups along with your signature file. Not only you will have answers to your questions, along with this you will also promote your site.
- **Make friends.** Newsgroups can be a great place to find like-minded friends and partners.

4.4.6 Social Networking

A social networking service is an online service, platform, or site that focuses on facilitating the building of social networks or social relations among people who, for example, share interests, activities, backgrounds, or real-life connections. A social network service consists of a representation of each user (often a profile), his/her social links, and a variety of additional services.

Most social network services are web-based and provide means for users to interact over the Internet, such as e-mail and instant messaging. Online community services are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, activities, events, and interests within their individual networks.

Advantages of Social Networking

1. Staying Connected

The main purpose of social media is to be able to stay connected to friends and families in today's fast paced and ever changing worlds. You are able to rekindle old friendships, share family photos, and special events in your life with just about everyone you know, at the same time.

2. Finding People With Common Interests

Social networking is also a great way to meet entirely new people. You can seek out groups that are focused towards your special interests and hobbies and connect with local people that share the same interests. Online and social media dating is almost more common than traditional dating is in today's world.

3. Invaluable Promotional Tool

Companies, artists, and musicians can reach an impossibly large and diverse amount of people using social media sites. This allows them to promote and market themselves and their products in a way that has never been seen before.

4. Information Spreads Incredibly Fast

Breaking news and other important information can spread like wildfire on social media sites. Important things like recalls, storm information, or missing children are all communicated and taken seriously very quickly.

5. Helps to Catch and Convict Criminals

People often do not think of the consequences of what they post of these social sites. Pictures of themselves doing illegal things, or even bragging posts about crimes they have committed are all things that law enforcement use to persecute these criminals. They also use these sites to identify and solve existing cases.

Disadvantages of Social Networking

1. Perpetuates False and Unreliable Information

Just like stated above, anything can spread to millions of people within hours or days on social media. This also, unfortunately, includes things that are false or made up. This information can cause panic and severe misinformation in society.

2. Causing Major Relationship Problems

Online social interactions with social networking have not only been starting new relationships, but ending many others. It is very simple to communicate and share pictures or plans with a person on social media and keep it completely under wraps. This new temptation has been driving wedges into people's real life, offline relationships, often time ending them for good. Social networking puts trust to the limit.

3. Cyber Bullying is a Growing Problem

Having access to people's lives at all times is not always a good thing. A new trend of cyber bullying is wreaking havoc all across the world. This is especially true with young kids. They are publicly harassing one another, and posting mean or slanderous things which are broadcast-ed to the entire cyber world.

4. Used to Profile and Discriminate in the Job World

Just about everyone has a social media account the shows what they look like, the type of life that they live, and how old they are. Employers are using this to their advantages is some very unsettling ways. Jobs that are looking for a certain criteria of person, but cannot legally express these criteria, are using social media to prescreen their applicants.

5. The Addiction is Real

One of the biggest problems with the social media craze is that people are becoming more and more addicted to using it. It is the number one time waster at work, in school, and at home. All of this has caused people to have literal withdraws from their social networks. Crazy!

Important Facts About Social Networking

- In 2013, a study showed that 79% of all adults in the United States had at least one social network profile.
- 2.1 billion people in the world have social media accounts.
- Mobile phones now make up 72% of internet traffic to these sites.
- 70 million photos and videos are uploaded to Instagram every single day, and that is a number that is steadily rising.
- Nearly 50% of all Twitter users have never sent a tweet.

4.5 Internet in Business

Uses of the Internet in Business

Everywhere in the world, business companies are constantly looking for effective ways to save money, either by using their existing resources to be more productive or by cutting down costs, but without possibly losing any services that they rely on.

Most business companies of today are pretty much depending on the internet and broadband services to market their business online to worldwide customers, website hosting and telecommunication.

A business company who chooses the right broadband package will not only improve their business potential, but it also helps them to cut cost as well. Digging out more of what you already have such as broadband connection is one of the best ways to gain productivity. Below is a list of things that you can do with your broadband Internet connection to maximize its usage :

1. Virtual Private Network (VPN)

VPN can be setup even if you are subscribing to the cheapest broadband package. Basically, user can access into a remote network through a secure tunnel when they are on the same connection called the Local Area Network (LAN). This can be really convenient especially when you are not in your office or are on a meeting with a client because you can access into your company's server, mail and files whenever you need it.

2. Voice over Internet Protocol (VoIP)

Like what it is named after, VoIP is a communication service available for free as long as you have an Internet connection. This is a great saving way for both micro and macro businesses. But you have to remember that only VoIP-to-VoIP calls are free of charges. For VOIP calls to any regular phone line, you may need to make a subscription or you simply need to pay a fee for the call.

3. Online Shopping and Banking

It is still very surprising as many people still do not use the internet connection that they have on their house to do shopping or banking online. You can save

petrol costs, avoid traffic jams and forget about the lack of parking spaces altogether using the internet. Besides that, items that you buy on the web are usually cheaper and are more comfortable without all the marketing gimmicks distraction.

There are more things that you can do using the high speed Internet broadband connection, and they are waiting for you to explore. Business companies are becoming more competitive, thus if you can find ways to aid you in running your company, it'll be right ahead of most of your competitors. Nowadays, we just have to work smarter not harder.

Benefits of the Internet to Business

The Internet has revolutionized the way the world does business on both a local and global level. From recruiting employees to gathering data on the competition, the ways businesses utilize the Internet are numerous, as are the benefits of the Internet to the business community.

1. Globalization

While computers have been blamed for decreased activity and interaction in the local community, the Internet has been credited with providing a window into the global world. It allows anyone with a computer to think globally and has allowed the business world to forge international relationships with new vendors (to lower costs) and new customers (to increase sales).

2. Communication

100 years ago it might have taken over a month to get a letter to a friend in another country. Today, communication is as easy as a mouse click, and much cheaper too. Anyone in the world can communicate with another person through text messages, emails, and even live video. For business, this means higher efficiency and quicker processing of sales.

3. Cost Effectiveness

Perhaps the most obvious benefit of the Internet is cost savings. Information at faster speeds saves time, which either saves or makes money. Many functions in the business process, i.e. bookkeeper, have been automated, which has helped to streamline processes and reduce the cost of labor.

4.6 E-COMMERCE

Electronic commerce is the process of searching, choosing, buying and selling of product or service on the electronic network; it uses the computer and communication networks for promoting products, selling, delivery, collection and delivery service**.**

4.6.1 Features Of E-commerce

E-Commerce has the following general features :

a) It is a business strategy to cut down costs, while improving quality and increasing the speed of delivery of goods/services.

b) It has ability to sell and purchase products/services/information on computer networks.

c) It is a solution for office automation and quick business transactions.

d) It is a tool to improve intra business functioning like business re-engineering.

e) It is tools to improve inter business communication through easy and accurate interaction and information interchange.

4.6.2 Importance Of E-commerce

E-Commerce becomes inevitable because of the following :

a) Low setup cost : Any body can easily set up a website. In fact there are many organizations and training institutes who help customers in developing and launching websites. To market a product large retail showrooms are not required, just a web site showing the characteristics of the product including cost details are sufficient.

b) Global Free Market : Nobody can dominate the global market as presence on the internet is easy not only for global giants, but even small organisations can participate actively at low costs and compete with stiff competition.

c) Global Access : Since more than 200 countries are hooked onto the Internet, anybody who can afford a TV and a telephone can fully access the Internet and gain the information required.

d) Availability of Technology : Since the same technology like web servers, browsers, engines, internet, etc., is used throughout the world therefore business can be easily conducted.

e) Multiple Opportunities : By using E-Commerce multiple activities like selling, renting, purchasing etc. can be performed. In fact a whole variety of transactions can be provided all under one roof.

f) Others : E-commerce systems are being established for automating and enhancing many aspects of communications, publishing, marketing, sales and customer service such as :

- Customer Research;
- Pre-Sales Enquiries;
- Information Publishing and Dissemination;
- Sales;
- Advertising;
- Promotions;
- Public Relations;
- Purchasing;
- Transactions;
- Funds Transfer;
- Production; ‘ Delivery;
- After-Sales Service;
- Ongoing Relationship Management; and
- Customer Support.

The benefits of electronic commerce are not just available to large corporations and government departments, and many small to medium businesses are discovering new cost - effective opportunities to use Internet-related technology to help their business operations locally and internationally

4.6.3 Types Of Electronic Commerce

Based on the parties involved in electronic transactions, the e-commerce can be classified into the following types.

a) Business-to-Business (B2B)

b) Business-to-Consumer (B2C)

c) Consumer-to-Consumer (C2C)

a) Business-to-Business E-Commerce

This is done between business firms. For example, electronic transactions between a manufacturing firm and its supplier firms are B2B transactions. This segment is the largest and the fastest growing one in electronic, commerce. Here firm use the electronic network for purchasing products, consulting services and paying for them.

b) Business-to-Consumer E-Commerce

Consumers check electronic catalogues to learn about products and compare prices of products sold. They purchase products at the firm's website and may pay electronic cash or other means like credit card.

c) Consumer-to-Consumer E-Commerce

Some sites offer consumers to deal directly with each other. Auction sites are examples. At these auction sites consumers can buy and sell products. Electronic commerce is useful to both producers and consumers as it helps them overcome the traditional barriers of distance from markets and lack of information about market opportunities. Producers and traders no longer need to maintain physical establishments requiring large capital outlays. Virtual shops and contact points on the Internet may enable storage close to the production site and distribution can be made directly to the consumer.

Increased advertising possibilities world wide may help small and medium industries and businesses that traditionally find it difficult to reach the consumer abroad. E- Commerce may also enable such firms to eliminate middlemen while trying to sell their products abroad.

4.6.4 Advantages of E-Commerce

A) E-Commerce Advantages for Customers

1. **Convenience.** Every product is at the tip of your fingers on the internet, literally. Type in the product you are looking for into your favorite search engine and every option will appear in a well organized list in a matter of seconds.

2. **Time saving.** With e-commerce there is no driving in circles while looking and digging in hopes of finding what you need. Stores online offer their full line as well as use warehouses instead of store fronts—products are easy to locate and can be delivered to your door in just days.
3. **Options, options, options!** Without driving from store to store the consumer can easily compare and contrast products. See who offers the best pricing and have more options to choose from. While a physical store has limited space, the same store on the internet will have full stock.
4. **Easy to compare.** Side by side comparisons are readily available and easy to do. When products are placed online, they come with all the specifics, and they *want* you to compare them with others, know they have the best options and come back for more!
5. **Easy to find reviews.** Because the competition is high, companies online want you to look at other consumer reviews. Good and bad reviews are on every site, not only can you see if the product is liked, you can also see the reasons behind the thumbs up or down.
6. **Coupons and deals.** With every online business wanting you, more and more coupons and deals can't be avoided, which are totally great for customers. With major sites that act as department store, you may find items up to 80% off! Take advantage of the competition and find the best price available.

B) Commerce Advantages for Businesses

1. **Increasing customer base.** The customer base is every business's main concern, online or off. When online, a business doesn't have to worry about getting the best property in town, people from around the world have access to their products and can come back at anytime.
2. **Rise in sales.** By not managing a storefront, any business will have more sales online with a higher profit margin. They can redistribute money to make the consumer shopping experience faster and more efficient. While being available to international markets, more products will sell.
3. **24/7, 365 days.** If it's snowing and the roads are closed, or it's too hot and humid to even step outside in the summer, or a holiday that every store in town closes, your online business is open for consumers 24/7 every day of the year. The doors never close and profits will keep rising.

4. **Expand business reach.** A great tool on the internet is…translation! A business online does not have to make a site for every language. With the right marketing, every consumer around the globe can find the business site, products and information without leaving home.
5. **Recurring payments made easy.** With a little research, every business can set up recurring payments. Find the provider that best suits your needs and billing will be done in a consistent manner; payments will be received in the same way.
6. **Instant transactions.** With e-commerce there is no more waiting for the check to clear, or a 30-day wait for certain other types of payment. Transactions are cleared immediately or at most two to three days for the money to clear through the banking system.

4.6.5 Disadvantages of E-Commerce

A) E-Commerce Disadvantages for Customers

1. **Privacy and security.** Before making instant transactions online, be sure to check the sites certificates of security. While it may be easy and convenient to shop, no one wants their personal information to be stolen. While many sites are reputable, always do your research for those with less than sufficient security.
2. **Quality.** While e-commerce makes everything easily accessible, a consumer cannot actually touch products until they are delivered to the door. It is important to view the return policy before buying. Always make sure returning goods is an option.
3. **Hidden costs.** When making purchases, the consumer is aware of the product cost, shipping, handling and possible taxes. Be advised: there may be hidden fees that won't show up on your purchasing bill but will show up on your form of payment. Extra handling fees may occur, especially with international purchases.
4. **Delay in receiving goods.** Although delivery of products is often quicker than expected, be prepared for delays. A snow storm in one place may throw off the shipping system across the board. There is also a chance that your product may be lost or delivered to the wrong address.

5. **Need access to internet.** Internet access is not free, and if you are using free wifi, there is the chance of information theft over an unsecure site. If you are wearing of your public library, or cannot afford the internet or computer at home, it may be best to shop locally.
6. **Lack of personal interaction.** While the rules and regulations of each e-commerce business is laid out for you to read, there is a lot to read and it may be confusing when it comes to the legalities. With large or important orders, there is no one you can talk to face to face when you have questions and concerns.

B) E-Commerce Disadvantages for Businesses

1. **Security issues.** While businesses make great efforts to keep themselves and the consumer safe, there are people out there that will break every firewall possible to get the information they want. We have all seen recently how the biggest and most renown business can be hacked online.
2. **Credit card issues.** Many credit card businesses will take the side of the consumer when there is dispute about billing—they want to keep their clients, too. This can lead to a loss for e-commerce business when goods have already been delivered and the payment is refunded back to the consumer.
3. **Extra expense and expertise for e-commerce infrastructure.** To be sure an online business is running correctly, money will have to be invested. As an owner, you need to know transactions are being handled properly and products are represented in the most truthful way. To make sure you get what you need, you will have to hire a professional to tie up any loose ends.
4. **Needs for expanded reverse logistics.** The infrastructure of an online business must be on point. This will be another cost to the business because money will need to be invested to ensure proper handling of all aspects of buying and selling, especially with disgruntled consumers that want more than a refund.
5. **Sufficient internet service.** Although it seems that everyone is now on the internet all the time, there are still areas in which network bandwidth can cause issues. Before setting up an e-commerce business, be sure your area can handle the telecommunication bandwidth you will need to run effectively.

6. **Constant upkeep.** When a business has started as e-commerce, they must be ready to make changes to stay compatible. While technology grows, the systems that support your business must be kept up to date or replaced if needed. There may be additional overhead in order to keep data bases and applications running.

4.7 Security Issues in Internet

4.7.1 Internet Security

Internet security is a branch of computer security that deals specifically with Internet-based threats. These include hacking, where unauthorized users gain access to computer systems, email accounts or websites; viruses and other malicious software (malware), which can damage data or make systems vulnerable to other threats; and identity theft, where hackers steal personal details such as credit card numbers and bank account information. You can protect yourself from these threats with strong Internet security.

Network security has become more important to personal computer users, organizations, and the military. With the advent of the internet, security became a major concern and the history of security allows a better understanding of the emergence of security technology. The internet structure itself allowed for many security threats to occur.

The architecture of the internet, when modified can reduce the possible attacks that can be sent across the network. Knowing the attack methods, allows for the appropriate security to emerge. Many businesses secure themselves from the internet by means of firewalls and encryption mechanisms. The businesses create an "intranet" to remain connected to the internet but secured from possible threats.

4.7.2 Computer Network Security Issues

Network security deals with the requirements needed for a company, organization or a network administrator to help in protecting the network, computer systems and the resources that are network accessible. They are protected from any unauthorized entry, malicious components as well as monitoring continuously, consistently and measuring the effectiveness or lack of effectiveness of the network.

Network security is a major concern of every company that has a computer and is connected to a network. A network security that has been compromised means that

a competitor or any hacker can gain entry to the sensitive or critical data and they may delete or make off with the information resulting in data loss or complete system destruction. The terms information security and network security are most of the time used to represent the same meaning. Network security, though, is more specifically taken as the provision protection from outside intruders.

The process of network security begins from the authentication of any user who logs in with the appropriate password and user name which is 'one factor authentication'. There is another method of authentication known as 'two factor' where when one is using an item like an ATM card or mobile phone and another three factor authentication can also be used where a body part is used like a retinal scan or fingerprint.

When authentication has been verified, there is a firewall that decides, which programs or services are allowed for network users to access. This component may be effective in the ability to prevent any unauthorized access but it fails to check harmful contents like computer worms that are transmitted across the network. An IPS or intrusion prevention system is able to detect and stop the activities of this sort of malware. The firewall and IPS settings are created by the network's System Administrator who also installs a viable antivirus system, which is up-to-date.

4.7.3 Security Issues of IP Protocol IPv6

From a security point of view, IPv6 is a considerable advancement over the IPv4 internet protocol. Despite the IPv6's great security mechanisms, it still continues to be vulnerable to threats. Some areas of the IPv6 protocol still pose a potential security issue.

The new internet protocol does not protect against misconfigured servers, poorly designed applications, or poorly protected sites. The possible security problems emerge due to the following :

1. Header manipulation issues
2. Flooding issues
3. Mobility issues

Header manipulation issues arise due to the IPsec's embedded functionality. Extension headers deter some common sources of attacks because of header manipulation. The problem is that extension headers need to be processed by all stacks,

and this can lead to a long chain of extension headers. The large number of extension headers can overwhelm a certain node and is a form of attack if it is deliberate. Spoofing continues to be a security threat on IPv6 protocol.

A type of attack called port scanning occurs when a whole section of a network is scanned to find potential targets with open services. The address space of the IPv6 protocol is large but the protocol is still not invulnerable to this type of attack.

Mobility is a new feature that is incorporated into the internet protocol IPv6. The feature requires special security measures. Network administrators need to be aware of these security needs when using IPv6's mobility feature.

4.7.4 Internet Security Threats

Technology has become an inevitable part of our lives. And while Internet offers a mass amount of useful information, makes communication easier and faster than ever, it presents some threats too along the way.

1. Virus

Virus is a program designed to copy itself and propagate, usually attaching itself to applications. It can be spread by downloading files, exchanging CD/DVDs and USB sticks, copying files from servers, or by opening infected email attachments.

2. Worms

A worm can be injected into a network by any types of means, like an USB stick or an email attachment. Email worm tends to send itself to all email addresses it finds on the infected PC. The email then appears to originate from the infected user, who may be on your trusted senders' list, and catch you off guard.

3. Trojan

It might appear harmless and even useful at first, but it leaves your PC unprotected, enabling hackers to steal sensitive information.

4. Spyware

Spyware is often secretly installed without users consent when a file is downloaded or a commercial pop-up is clicked. Spyware can reset your auto signature, monitor your keystrokes, scan, read and delete your files, access your applications and even reformat your hard drive. It constantly streams information back to the person that controls spyware.

5. Adware

This malware launches advertisements, mostly in the form of pop-ups. These are customized to you as a user, based on your behavior on the Internet, which may be monitored by spyware.

6. Spam

Spam may be defined as unwanted emails. Most users are exposed to scam, which is more than 50% of all Internet emails. Though spam is not a direct threat, it can be used to send different kinds of malware.

7. Phishing

This is the fraudulent acquiring of sensitive personal information such as passwords and credit card details. This is accomplished by sending official-looking emails impersonating a trustworthy sender. Users of online banking and auction sites are most likely to become a target.

8. Pharming

A more sophisticated form of phishing. By exploiting the DNS system, pharmers can create a fake website that looks like a real one for instance web bank page, and then collect the information users think they are giving to their real bank.

9. Keyloggers

Designed to record the user's keystrokes. Keylogging allows criminals to look for particular bits of information that can be used for identity or intellectual property theft.

10. Rogue security software

A special type of threat is software that claims to be security software. It tricks users that have installed it to pay a sum of money to be really protected (which they will not be). Most often it pretends to be antivirus and antispyware programs

4.7.5 Measures to Internet Security Threats

Internet threats will continue to be a major issue in the global world as long as information is accessible and transferred across the Internet. Different defense and detection mechanisms were developed to deal with these attacks.

1. Cryptographic systems

Cryptography is a useful and widely used tool in security engineering today. It involved the use of codes and ciphers to transform information into unintelligible data.

2. Firewall

A firewall is a typical border control mechanism or perimeter defense. The purpose of a firewall is to block traffic from the outside, but it could also be used to block traffic from the inside. A firewall is the front line defense mechanism against intruders. It is a system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both.

3. Intrusion Detection Systems

An Intrusion Detection System (IDS) is an additional protection measure that helps ward off computer intrusions. IDS systems can be software and hardware devices used to detect an attack. IDS products are used to monitor connection in determining whether attacks are been launched. Some IDS systems just monitor and alert of an attack, whereas others try to block the attack.

4. Anti Malware Software and scanners

Viruses, worms and Trojan horses are all examples of malicious software, or Malware for short. Special so called anti Malware tools are used to detect them and cure an infected system.

5. Secure Socket Layer (SSL)

The Secure Socket Layer (SSL) is a suite of protocols that is a standard way to achieve a good level of security between a web browser and a website. SSL is designed to create a secure channel, or tunnel, between a web browser and the web server, so that any information exchanged is protected within the secured tunnel. SSL provides authentication of clients to server through the use of certificates. Clients present a certificate to the server to prove their identity.

Tips for securing the system attack

- Install and Use Anti-Virus Programs
- Use Care When Reading Email with Attachments
- Install and Use a Firewall Program
- Make Backups of Important Files and Folders

- Use Strong Passwords
- Use Care When Downloading and Installing Programs
- Install and Use a Hardware Firewall
- Install and Use a File Encryption Program and Access Controls
- Safeguard your Data
- Real-World Warnings keep you safe online.
- Keeping Children Safe Online

4.7.5.1 Passwords

Passwords are used commonly to gain entry to networks and into various Internet accounts in order to authenticate the user accessing the website. Password protection policies should be in place at organizations so that personnel know how to create a password, how to store their password and how often to change it.

1. **Strong password** - Term used to describe a password that is an effective password that would be difficult to break. Often a strong password has between six and ten characters (the more the better), numbers, other characters, and both upper and lowercase characters
2. **Weak password** - A password that is not an effective password because it's easy to remember. Names, birth dates, phone numbers, and easily guessable words are considered weak passwords

Password Generator

Alternatively referred to as a security token, apassword generator is a hardware device used for online services, such as banking, to increase security. The device generates a random, one-time password that is used to log into a secure website. The image is that of a USB security token; an example of a password generator. This specific model creates a random six digit password that is to be entered with a user's security credentials to access their account.

Today, many companies are moving from a physical password generator to a digital password generator that run on a smartphone. For example, Blizzard Entertainment uses its Battle.net Mobile Authenticator to validate users of their services and games to help prevent hackersfrom gaining unauthorized access.

Password Manager

A **password manager** is a software utility used to store and manage the passwords you use to log into online services such as your banking account. A password manager encrypts login in information and requires a password to un-encrypt so that it can be viewed. Unlike keeping a record of your passwords in a text file or writing it on paper where anyone could read. In the image to right is an example of the KeePass login page to access all stored passwords.

Disadvantages of Password Authentication Protocol

Password authentication protocol, or PAP, is a method used to authenticate a user to a network. Basically, the PAP works when a network requests a user name and password combination from a user. The user supplies this combination and sends it to the network's authentication server. If the combination is found to be legitimate, the server returns the user's computer an "authentication-ack" that allows the user to access resources allowed by his privileges. If the combination is not successful, an "authentication-nak" is returned and no access is allowed.

While PAP is a standard for most networks, it does, however, have its disadvantages.

1. Shoulder Surfing

Passwords are only secure if they are kept secret. If someone wishes to gain access to a user's account, one way to do this is to look over the shoulder of the person as she enters her login credentials. This technique, known as shoulder surfing, allows the attacker to physically view the password as it is typed so he can remember it for later use.

Another common mistake made by users is to write their password down on a piece of paper and keep it in plain view of others. Someone wishing to falsely log on to a network needs only look to these sheets of paper for a password to use.

2. Password Strength

Another disadvantage to PAP is related to password strength. Reports have shown that people still commonly use passwords like 1234 and abcd. Passwords like this are easily cracked using special software that can be downloaded for free.

Weak passwords are a common problem in many organizations; however, this can be mitigated by training staff about the importance of strong passwords. Another avenue many network administrators take is to force the use of strong passwords by setting parameters in the authentication software.

3. Lack of Identity Check

Supplying a correct password does not prove an individual is who she says she is. In the previous two examples, it was shown how someone can easily falsify his identity to gain access to a network. Because PAP does not have any other identity checks, it is at a disadvantage compared to other authentication methods.

Biometric authentication is becoming more popular as it relies on a physical characteristic unique to the person trying to authenticate. Biometrics have an advantage over PAP as it is much harder to fake.

4.7.5.2 Smart Cards

A smart card is a plastic card with a small, built in microcomputer chip and integrated circuit that can store and process a lot of data. It is considered to be a secure, time saving device that can access information without use of a PC or the Internet. However, smart cards have both advantages and disadvantages.

1. Flexibility

Smart cards have a lot of flexibility. They can store multiple types of information including identification, credit cards, business and family contacts.

2. Cost and Availability

Smart card readers are expensive to produce. These readers are not available in all locations and may have compatibility issues due to the differences of each smart card brand.

3. Security

Smart cards are individually encrypted and can only be accessed by pin number. However, there is concern about privacy and whether or not information on the card could be accessed or used illegally by the government or other third-party sources.

4. Data Integrity

Information on a smart card cannot be erased or removed accidentally by any electrical or magnetic means.

5. Smart Card Uses

Smart cards are useful for setting limits on expenses, customizing customer loyalty programs and accessing critical health care information. Smart cards save users from having to remember multiple usernames and passwords.

4.7.5.3 Encryption / Decryption

To encrypt a file or other information stored in a computer means to convert it into a secret code so that it can't be used or understood until it is decoded or decrypted. You might want to encrypt a file if it contained a secret formula for a new invention, or some financial plans that your competitors would love to know about in advance. When you encrypt something, the computer will ask you to set up a password. After that, no one will be able to make sense of the information unless they have the same password.

Encryption hides your data from curious eyes. This is a process of encoding data to prevent unauthorized person from viewing or modifying it. The main features of data encryption are :

1. Prevents unwanted access to documents and e-mail messages
2. Strongest levels of encryption are very difficult to break.

Process and Types of Encryption

The process of data encryption consists of certain steps. The data passes through a mathematical formula called an algorithm, which converts it into encrypted data called ciphertext. These algorithms create a key and then encapsulate the message with this key.

There are two types of encryptions :

– asymmetric

– symmetric.

1. Asymmetric Encryption

In public key (asymmetric) encryption, two mathematically-related keys are used: one to encrypt the message and the other to decrypt it. These two keys combine to form a key pair. Asymmetric encryption provides both data encryption and validation of the communicating parties' identities and is considered more secure than symmetric encryption, but is computationally slower.

A public key encryption scheme has six major parts :

a. Plaintext - This is the text message to which an algorithm is applied.

b. Encryption Algorithm - It performs mathematical operations to conduct substitutions and transformations to the plaintext.

c. Public and Private Keys - This is a pair of keys where one is used for encryption and the other for decryption.

d. Cipher text - This is the encrypted or scrambled message produced by applying the algorithm to the plaintext message using key.

e. Decryption Algorithm - This algorithm generates the ciphertext and the matching key to produce the plaintext.

The Encryption Process

The asymmetric data encryption process has the following steps :

a. The process of encryption begins by converting the text to a pre-hash code. This code is generated using a mathematical formula.

b. This pre-hash code is encrypted by the software using the sender's private key.

c. The private key would be generated using the algorithm used by the software.

d. The encrypted pre-hash code and the message are encrypted again using the sender's private key.

e. The next step is for the sender of the message to retrieve the public key of the person this information is intended for.

f. The sender encrypts the secret key with the recipient's public key, so only the recipient can decrypt it with his/her private key, thus concluding the encryption process.

The Decryption Process

The asymmetric data decryption process has the following steps :

1. The recipient uses his/her private key to decrypt the secret key.
2. The recipient uses their private key along with the secret key to decipher the encrypted pre-hash code and the encrypted message.
3. The recipient then retrieves the sender's public key. This public key is used to decrypt the pre-hash code and to verify the sender's identity.
4. The recipient generates a post-hash code from the message. If the pos~- hash code equals the pre-hash code, then this verifies that the message has not been changed enroute.

2. Symmetric Encryption

Private Key encryption (Symmetric), also referred to as conventional or single-key encryption is based on secret key that is shared by both communicating parties. It enquires all parties that are communicating to share a common key. The sending party uses the secret key as part of the mathematical operation to encrypt (or encipher) plain text to cipher text. The receiving party uses the same secret key to decrypt (or decipher) the cipher text to plain text.

Examples of symmetric encryption schemes are the RSA RC4 algorithm (which provides the basis for Microsoft Point-to-Point Encryption (MPPE), Data Encryption Standard (DES), the International Data Encryption Algorithm (IDEA), and the Skipjack encryption technology proposed by the United S12;tesgovernment (and implemented in the Clipper chip).

An encryption scheme has five major parts :

1. **Plaintext -** This is the text message to which an algorithm is applied.
2. **Encryption Algorithm -** Iperforms mathematical operations to conduct substitutions and transformations to the plaintext.
3. **Secret Key -** This is the input for the algorithm as the key dictates the encrypted outcome.
4. **Cipher text -**This is the encrypted or scrambled message produced by applying the algorithm to the plaintext message using the secret key.
5. **Decryption Algorithm -** This is the encryption algorithm in reverse. It uses the ciphertext, and the secret key to derive the plaintext message.

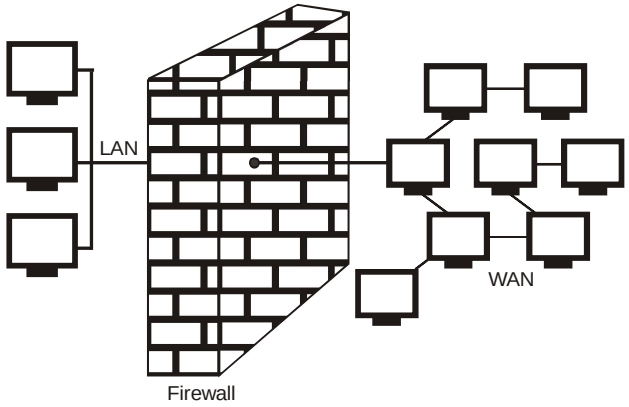
When using this form of encryption, it is essential that the sender and receiver have a way to exchange secret keys in a secure manner. If someone knows the secret key and can figure out the algorithm, communications will be insecure. There is also the need for a strong encryption algorithm. What this means is that if someone were to have a ciphertext and a corresponding plaintext message, they would be unable to determine the encryption algorithm. There are two methods of attacking conventional encryption - brute force and cryptanalysis.

Brute force is just as it sounds; using a method (computer) to find all possible combinations and eventually determine the plaintext message. Cryptanalysis is a form of attack that attacks the characteristics of the algorithm to deduce a specific plaintext or the key used. One would then be able to figure out the plaintext for all past and future messages that continue to use this compromised setup.

4.7.5.4 Firewall

A firewall can either be software based or hardware based and is used to help keep a network secure. A system designed to prevent unauthorized access to or from a private network. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especiallyintranets. Its primary objective is to control the incoming and outgoing network traffic by analyzing the data packets and determining whether it should be allowed through or not, based on a predetermined rule set.

A network's firewall builds a bridge between an internal network that is assumed to be secure and trusted, and another network, usually an external network, such as the Internet, that is not assumed to be secure and trusted.



Types of Firewall

A firewall is a hardware or software installed to provide security to the private networks connected to the internet. They can be implemented in both hardware and software, or a combination of both. All data entering or leaving the Intranet passes through the firewall which allows only the data meeting the administrators' rules to pass through it.

1. **Packet Filtering Firewall.** This type of Firewall detects packets and block unnecessary packets and makes network traffic release.

2. **Screening Router Firewalls.** It's a software base firewall available in Router provides only light filtering.
3. **Computer-based Firewall.** It's a firewall stored in server with an existing Operating System like Windows and UNIX.
4. **Hardware base Firewall.** Its device like box allows strong security from public network. Mostly used by big networks.
5. **Proxy Server.** Proxy server allows all clients to access Internet with different access limits. Proxy server has its own firewall which filters the all packet from web server.

SHORT NOTES

1. Internet

Internet is a communication network which bridges all the small computer networks worldwide as a whole. Internet is based upon Internet technology, in particular World Wide Web (WWW), to build Information System within organization or enterprise to accomplish standardization and automation. Fundamentally, it means network computing environments which let the users share the information through the Internet and Web browsers.

Ultimately, it allows a certain organization to build a Groupware within Web environment at low cost on top of existing network infrastructure. By doing this, closed organization network would be interconnected with existing worldwide Internet, which results in diverse information that strengthens competitive advantages of the organization. Basically, it runs on top TCP/IP and HTTP and filters out any illegal access through firewall.

2. Internet Protocols

The communication among different types of computers connected via network is possible by using a protocol that offers a standard format and method for communication. A **protocol** is a formal set of rules and conventions that governs how computers exchange information over a network medium. There are large numbers of protocols that can be used in a network depending upon the need they fulfil.

3. Internet Software

To connect to the Internet, a computer requires mainly three different kinds of software :

a. **TCP/IP :** TCP/IP, or Transmission Control Protocol / Internet Protocol, is the basic communication protocol of the Internet. It allows programs on user's computer to communicate properly over the internet. Usually, when you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program. Similarly, every other computer that you may send messages to or get information from also has a copy of TCP/IP.

b. Dialer Software : This software is provided by the ISP to instruct the modem to dial the phone number, and identify the user's machine to the access provider's system for access to the network.

c. Browser : To use the Internet, a web browser is essential. This program allows the user to view the information available on the world wide web.

4. Internet Addressing

A way to locate people, computers, and Internet resources. It can be

1. IP (Internet Protocol) addresses and domain names
2. Electronic mail addresses
3. URLs

In general, Internet addressing is a systematic way to identify people, computers and Internet resources. On the Internet, the term "address" is used loosely. Address can mean many different things from an electronic mail address to a URL.

5. World Wide Web (WWW)

World Wide Web, also called Web, is the part of the Internet that supports multimedia and consists of a collection of linked documents.

Web, is a system of interlinked hypertext documents accessed via the Internet. Web commonly known as "World Wide Web" abbreviated as WWW.

Web is an application that uses the Internet for communications, with TCP/IP as the underlying transport mechanism. Many companies' set-up internet websites. A Website, like a brochure, is a collection of web pages. These pages on a Website are stored digitally on the Web-server.

6. Web Browsers

A web browser (or simply browser) is a software application, which provides a graphical user interface (GUI) so that the user can navigate the Internet easily by clicking on menus, icons, or buttons instead of learning difficult keyboard commands. A web browser uses the HTTP protocol to request web pages from the web server. These pages contain special instructions (written in HTML) that tell the browser how to display the web contents on the user's screen.

The instructions may include hyperlinks to other web pages, information about text formatting and colour, position information for images contained in the document, and other such things. Most browsers natively support a variety of formats in addi-tion to HTML, such as the JPEG, PNG, and GIF image formats, and can be extended to support more through the use of plug-ins (an add-on piece of software that extends the features or functionality of a larger application). The two most popular web browsers are Netscape Navigator and Microsoft Internet Explorer.

7. Search Engines

The Internet provides access to a wealth of information on countless topics contributed by people throughout the world. However, the Internet is not a library in which all its available items are identified and can be retrieved by a single catalogue. In fact, no one knows how many individual files (could be in billions) reside on the Internet. Hence, to conduct a search on the Internet, a special search tool known as search engines is used. A search engine searches a database of Internet files collected by a computer program called a wanderer, crawler, or spider. It allows the user to enter keywords relating to particu-lar topics and retrieve information about the Internet sites containing those keywords.

8. E-mail

E-mail or Electronic mail is a paperless method of sending messages, notes or letters from one person to another or even many people at the same time via Internet. E-mail is very fast compared to the normal post. E-mail messages usually take only few seconds to arrive at their destination. One can send messages anytime of the day or night, and, it will get delivered immediately. You need not to wait for the post office to open and you don't have to get worried about holidays. It works 24 hours a day and seven days a week. What's more, the copy of the message you have sent will be available whenever you want to look at it even in the middle of the night. You have the privilege of sending something extra such as a file, graphics, images etc. along with your e-mail.

9. FTP

File Transfer Protocol, is an Internet utility software used to uploaded and download files. It gives access to directories or folders on remote computers and allows software, data and text files to be transfer between different kinds of computers. FTP works on the basis of same principle as that of Client/ Server. FTP "Client" is a program running on your computer that enables you to communicate with remote computers.

10. Remote Login / Telnet

The word "telnet" is derived from telecommuni-cations and network and is a protocol that allows a user to log on to a remote computer. Telnet is also known as **remote login,** which means con-necting one machine to another in such a way that a person may interact with another machine as if it is being used locally. It means that some-one in New Delhi could connect to a computer in the New York City Public Library and search the card catalogue the same way as someone located at a terminal in the library. Once connected, the user's computer emulates the remote computer. When the user types in commands, they are executed on the remote computer. The user's monitor displays what is taking place on the remote com-puter during the telnet session.

11. Chatting

Chat programs allow users on the Internet to communicate with each other by typing in real time. They are sometimes included as a feature of a website, where users can log into chat rooms to exchange comments and information about the topics addressed on the site.

12. News Groups

A **newsgroup** is a repository of electronic messages posted by users and managed by the Usenet system. This is a worldwide Internet discussion system that is separate from the World Wide Web. Usenet was established in 1980, a little more than 10 years before the creation of the World Wide Web. Newsgroups on Usenet were one of the first opportunities for general computer users to share and post information on the emerging Internet.

13. Social Networking

A social networking service is an online service, platform, or site that focuses on facilitating the building of social networks or social relations among people who, for example, share interests, activities, backgrounds, or real-life connections. A social network service consists of a representation of each user (often a profile), his/her social links, and a variety of additional services.

Most social network services are web-based and provide means for users to interact over the Internet, such as e-mail and instant messaging. Online community services are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, activities, events, and interests within their individual networks.

14. E-commerce

Electronic commerce is the process of searching, choosing, buying and selling of product or service on the electronic network; it uses the computer and communication networks for promoting products, selling, delivery, collection and delivery service**.**

15. Passwords

Passwords are used commonly to gain entry to networks and into various Internet accounts in order to authenticate the user accessing the website. Password protection policies should be in place at organizations so that personnel know how to create a password, how to store their password and how often to change it.

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UNIT V

Office Management Applications. Intranets, Extranets, VPN- Internet Telephony-Use of Spreadsheets for office-spread sheet applications-Use of Databases for the Office-Database applications-Group ware- audio and video Conferencing.

5.1 INTRANETS

An intranet is a private computer network that uses Internet protocols and network connectivity to securely share any part of an organization's information or operational systems with its employees. Sometimes, the term refers only to the organization's internal website, but often it is a more extensive part of the organization's computer infrastructure and private websites are an important component and focal point of internal communication and collaboration.

Intranets are becoming popular, particularly in the commercial field, because :

1. The growth of the Internet has spawned sophisticated Web clients and authoring tools;
2. Web browsers provide a familiar and consistent interface for different types of information;
3. The client-server model enables effective integration of different systems and information across a wide range of platforms;
4. It is very easy to publish information generated for Intranets on the Internet (as the same technology and file formats are being used).

An organization's intranet does not necessarily have to provide access to the Internet. When such access is provided, it is usually through a network gateway with a firewall, shielding the intranet from unauthorized external access. The gateway often also implements user authentication, encryption of messages connectivity for off-site employees to access company information, computing resources, and internal communications.

Increasingly, intranets are being used to deliver tools and applications, e.g., collaboration (to facilitate working in groups and teleconferencing) or sophisticated corporate directories, sales and customer relationship management tools, project management, etc., to advance productivity.

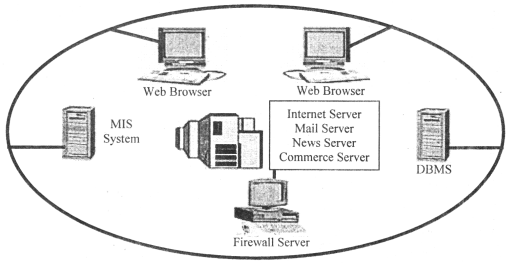


Figure : Intranet

Figure : Intranet

5.1.1 Characteristics of Intranets

Following are the characteristics of intranets :

1. Controlled Access

Intranet should be password protected. It should allow different levels of access. Controlled access makes intranet more flexible and greatly widens the range of uses.

2. Shared Access to Documents

If intranet does not provide shared access to documents to the users, it is really not intranet.

3. Centralized Scheduling System

A centralized scheduling system ensures that everyone stays on the sane page. It allows meeting and events to be scheduled from a company, department, and team level.

4. Individualization

Intranets should ideally conform to the individual user. The idea is that intranets should be comfortable and convenient for a variety of employees with a varying range of responsibilities.

5. Scalable

Web-based intranets are fully scalable. From 10 documents to 10 million, intranet can serve its constituents truly, as long as network bandwidth suffices to meet user demands.

6. Open

Web is platform neutral and global, and web browsers function as universal clients. Web technology is based on open standards and is available for almost all leading operating systems and hardware platforms, and can leverage legacy database systems.

7. Standard-Based

Internet and web technologies are based on Open Systems technology standards and have two basic promises - ensure the viability of internet network and be scalable on a global basic.

5.1.2 Intranet Architecture

Competitive pressures lead to an intense challenge for companies to improve their business while reducing the strain on corporate information systems. Intranets take on increasing importance as well as new role in the development, deployment, and management of application and resources.

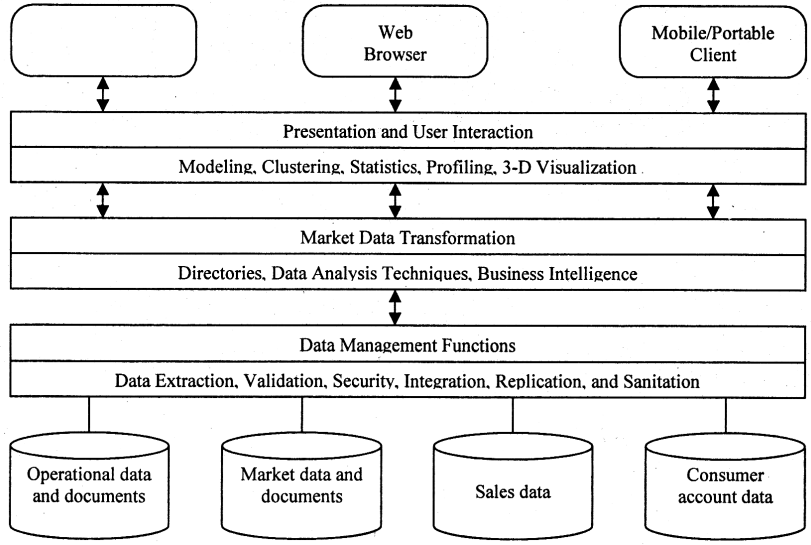
Intranet applications rest on several layers of infrastructure. Layered architecture allows companies to combine applications, tools, and databases in a coordinated approach. The layered approach also allows companies to offer application enhancements at each layer.

Information systems managers and developers today often have to manage incompatible systems, brought in at various times to do very different tasks. Data formats usually differ, and the connectivity issues involved are inherently complex.

Achieving a high level of integration requires the capabilities of multiple software products to communicate and cooperate in data exchange and process hand-offs. These demands require Intranets to go beyond their traditional "lowest common denominator" role of electronic mail to more complex functions such as:

1. Simplify access to the multiple databases, applications, platforms, and objects common in today's organizations.
2. Integrate existing systems easily with new technology as it emerges.
3. Improve the scalability, performance, and reliability of today's client/ server applications.

4. Provide the flexibility to partition applications between different computers and platforms.
5. Simplify administration of the distributed environment by supporting proprietary as well as industry standard management solutions,



Remote Servers Providing Operation and Historical Information

Figure : Internet Architecture for Marketing Decision Support

Intranet interface adds value to the customer interchange by automating the process of qualifying leads from an external Web home page. Used in conjunction with other applications, the Intranet enables the integration of the Web as an interactive marketing forum to become an input to the sales and marketing processes within the company.

Intranets enable access to the central database, thereby providing salespeople and direct marketers with information to improve the quality of the contact, whether it is by mail, by telephone, or in person. Many financial services firms use the Web to handle account inquiries. While responding to a customer's request or query, the system updates the customer's profile information and attempts to cross-sell other financial products.

Table : Lists the requirements that are being met with Intranet-based applications

Table : Coordination Requirements
Provide individualized lead and contact management through automatically updated to-do lists, ticklers, and follow-up lists.
Drive leads to closure while tracking all the decision makers, even if they are distributed over multiple sites.
Automatically escalate action requests and notify appropriate people when deal status changes.
Generate forecasts, including product, territory, regional, national, and worldwide reports.
Generate lost business reports to support analysis of product/market needs.

5.1.3 Advantages of Intranets

1. **Workforce Productivity :** Intranets can help users to locate and view information faster and use applications relevant to their roles and responsibilities. With the help of a web browser interface, users can access data held in any database the organization wants to make available, anytime and - subject to security provisions - from anywhere within the company workstations, increasing employees' ability to perform their jobs faster, more accurately, and with confidence that they have the right information. It also helps to improve the services provided to the users.
2. **Time :** With intranets, organizations can make more information available to employees on a "pull" basis (i.e., employees can link to relevant information at a time which suits them) rather than being deluged indiscriminately by e-mails.
3. **Communication :** Intranets can serve as powerful tools for communication within an organization, vertically and horizontally. From a communications standpoint, intranets are useful to communicate strategic initiatives that have a global reach throughout the organization. The type of information that can easily be conveyed is the purpose of the initiative and what the initiative is aiming to achieve, who is driving the initiative, results achieved to date, and who to speak to for more information. By providing this information on the intranet, staff have the opportunity to keep up-to-date with the strategic focus of the organization.

4. **Document Handling :** Web publishing allows 'cumbersome' corporate knowledge to be maintained and easily accessed throughout the company using hypermedia and Web technologies. For examples, employee manuals, benefits documents, company policies, business standards, newsfeeds, and even training, can be accessed using common Internet standards (Acrobat files, Flash files, CGI applications). Because each business unit can update the online copy of a document, the most recent version is always available to employees using the intranet.
5. **Business Operations and Management :** Intranets are also being used as a platform for developing and deploying applications to support business operations and decisions across the internetworked enterprise.
6. **Cost-Effective :** Users can view information and data via web-browser rather than maintaining physical documents such as procedure manuals, internal phone list and requisition forms.
7. **Promote Common Corporate Culture :** Every user is viewing the same information within the Intranet.
8. **Enhance Collaboration :** With information easily accessible by all authorised users, teamwork is enabled.
9. **Cross-Platform Capability :** Standards-compliant web browsers are available for Windows, Mac and UNIX.

5.1.4 Disadvantages of Intranets

1. **Performance Limitations :** Some applications that have been well optimized for conventional and proprietary systems create a heavy system workload when migrating them to an Internet platform or merging them with Intranet presentation; this problem will reduce with enhanced Internet technologies and continuing improvements in hardware price-performance.
2. **Presentational Issues :** Some people whose experience is rooted in paper presentation want web pages (for example) to look like printed equivalents, and burden the systems and their users with unnecessary and sometimes tedious "graphics", which often get in the way of the information rather than making it more accessible and attractive. This is really a learning curve matter; at some stage the users' real needs tend to come to the fore.

3. **The "me too" Syndrome :** The Internet world spawns innovations on a daily or even an hourly basis. It is very difficult when a novelty first appears to know whether it is a genuine advance or a passing fad, but some systems people cannot resist the urge to use the newest capabilities. There is also a tendency for suppliers to promote new application function that will only optimize with next generation technologies, and that can cripple the two, three or four-year old systems that most people use at any particular time.

5.2 EXTRANET

An Extranet is a private network that uses the internet protocol and the public telecommunication system to securely share part of business information or operations with - suppliers, vendors, partners, customers, or other businesses.

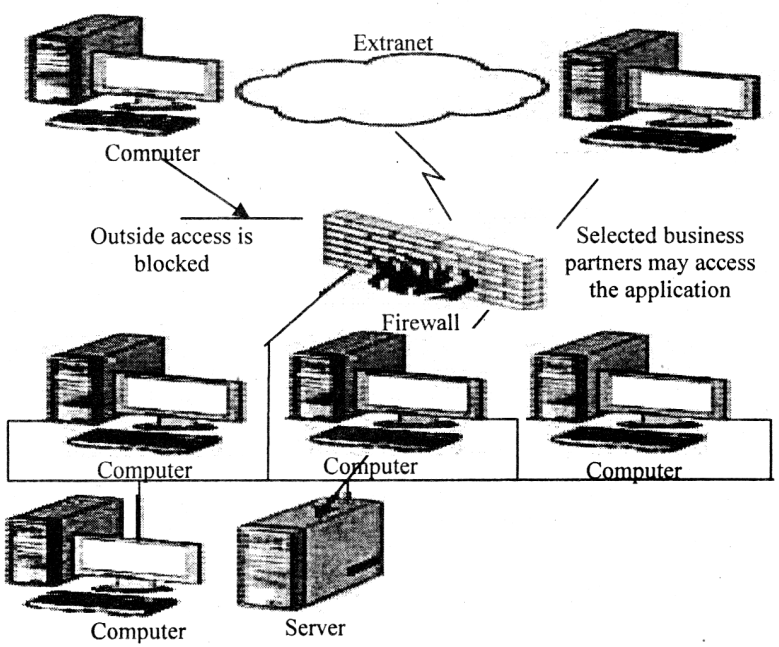
Through e-mail, documents are prepared and sent electronically. The recipients need not be present at the other end to send the message. The message gets stored in the electronic mailbox of the addressee. The recipient can open the mailbox whenever he is free and can read or print the message.

An Extranet can be viewed a-part of a company's intranet that is extended to users outside the company. It has also been described as a "state of mind" in which the internet is perceived as a way to do business with other companies as well as to sell products to customers. Extranet extends the intranet from one location to another across the internet by securing data flow, to another intranet to a business partner. In these way intranets of business partners, suppliers, creditors, distributors, customers, and the like are connected to extranets by agreements.

An Extranet requires security and privacy. These require firewall server management, issuance and use of digital certificate or similar means of user authentication, encryption of messages, and the use of virtual private networks that tunnel through the public network.

5.2.1 Architecture of Extranets

An extranet uses the TCP/IP protocol to link intranets in different locations (figure) Extranet transmissions are usually conducted over the internet, which offers little privacy or transmission security. Therefore, it is necessary to add security features. This is done by creating tunnels of secured data flows, using cryptography and authorisation algorithms, to provide secure transport of private communications. An internet with tunnelling technology is known as a Virtual Private Network (VPN).



Figure

Extranets provide secured connectivity between a corporation's intranets and the intranets of its business partners, materials suppliers, financial services, government, and customers. Access to an extranet is usually limited by agreements of the collaborating parties, is strictly controlled, and is available only to authorised personnel. The protected environment of an extranet allows partners to collaborate and share information and to perform these activities securely.

Because an extranet allows connectivity between businesses through the internet, it is an open and flexible platform suitable for supply chain activities. To further increase security, many companies replicate the portions of their databases that they are willing to share with their business partners and separate them physically from their regular intranets.

5.2.2 Advantages of Extranet

1. **High Efficiency and Less Mistakes :** Extranet helps in improve company efficiency and output by automating procedures that were done manually in the past. Automation can also decrease the scope of mistake.
2. **Quick Working :** Work is done quickly as compared to past manual systems.
3. **Cutting down Meeting Time :** Extranets permit company information to be analyzed at period suitable for business customers, partners, suppliers, employees, and other stakeholders. This helps in cutting down the conference/meeting times and is also helpful when doing multinational business having with partners located in different countries and in different time zones.
4. **Updated Information Immediately :** Information can be modified, updated and changed immediately on an extranet. All approved members thus have instant access to the most advanced information.
5. **Provide Improved Relationship :** Extranets can help in improving relationships with main or potential customers by giving them correct, precise and efficient information.

5.2.3 Disadvantages of Extranet

1. **Expensive :** Extranets can be expensive to implement and maintain within an organization (e.g., hardware, software, employee training costs) - if hosted internally instead of via an ASP.
2. **Low Security :** Security of extranets can be a big concern when dealing with valuable information. System access needs to be carefully controlled to avoid sensitive information falling into the wrong hands.
3. **Lack of Communication :** Extranets can reduce personal contact (face-to-face meetings) with customers and business partners. This could cause a lack of connections made between people and a company, which hurts the business when it comes to loyalty of its business partners and customers.

5.2.4 Difference Between Intranet and Extranet

Attribute	Intranet	Extranet
Geographical Distance	within an organization	Between an organization and a supplier
Communication	Infra-Firm.	Inter-Firm.
Accessibility	Corporate usert,	Corporate users and suppliers.
Entities	Employees.	Suppliers, customers or other external business partners.
Linkage	Intranet is corporate LAN that uses Internet technology and is secured behind company's firewall. Links various servers, clients, databases and applications.	An Extranet (extended Intranet) uses TCP/IP protocol to link Intranets over the public Internet.
Use	Used to host databases, content management systems, staff information, time clocks and book-keeping applications, offer trainig modules, facilitate communication with discussion boards and serve as a central calendar for the entire company.	Used to host price lists that can be easily updated, take orders from customers, maintain technical documents and facilitate collaborations among multiple firms without giving any one of them access to the others entire secure network.
Security Level	Internal risks	Risks from suppliers
	Few applications of Intranets are:	Few applications of Extranets are:
	i) Banks	i) IT services
	ii) IT companies	ii) Computer companies (hardware)
	iii) Manufacturing companies	iii) Financial services PP
	iv) Large retail companies	iv) Travel
	v) Service companies (i.e., travel, hotel)	v) Manufacturing
	vi) Publication houses	vi) Professional services
	vii) Consultancy firms	vii) Real estate

Table : Intranet Vs. Extranet

5.3 VPN

A VPN is a private connection between two machines or networks over a shared or public network. VPN technology lets an organization securely extend its network services over the Internet to remote users, branch offices, and partner companies. VPN turn the Internet into a simulated private WAN.

VPN allows users working at home or office to connect in a secure fashion to a remote corporate server using the routing infrastructure provided by a public inter-network (such as the Internet). From the user's perspective, the VPN is a point-to-point connection between the user's computer and a corporate server. The nature of the intermediate inter-network is irrelevant to the user because it appears as if the data is being sent over a dedicated private link.

Data sent across the public Internet is generally not protected from curious eyes, but you can make your Internet communications secure and extend your private network with a virtual private network (VPN) connection. VPN uses a technique known as tunneling to transfer data securely on the Internet to a remote access.

The Internet connection over the VPN is encrypted and secure. New authentication and encryption protocols are enforced by the remote access server. Sensitive data is hidden from the public, but it is securely accessible to appropriate users through a VPN.

5.3.1 Ways to Create a VPN Connection

There are following two ways to create a VPN connection:

1. By dialing an Internet Service Provider (ISP)

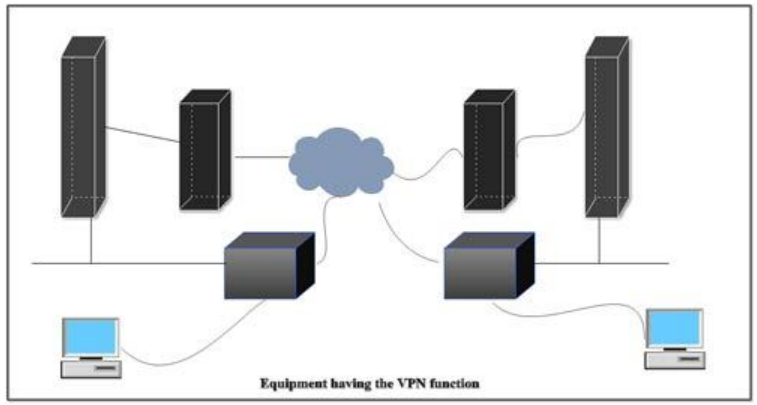
If you dial-in to an ISP, your ISP then makes another call to the private network's remote access server to establish the PPTP or L2TP tunnel After authentication, you can access the private network.

2. By connecting directly to the Internet

If you are already connected to an Internet, on a local area network, a cable modem, or a digital subscriber line (DSL), you can make a tunnel through the Internet and connects directly to the remote access server. After authentication, you can access the corporate network.

5.3.2 Equipment of VPN

Equipment having the VPN function includes routers and firewalls. Basically, communication is made via VPN equipment. Information is encrypted by the transmission VPN equipment before transmission and decoded by the receiving VPN equipment after receipt of information. The key for encrypt the data is set in VPN equipment in advance. The VPN equipment at receiving side decodes encrypted data before sending it to the receiving computer.



Equipment having the VPN function

The advantages of encryption by way of cryptography may be looked into other services, such as

1. Assuring integrity check

This ensures that undesirable person has not tampered data delivered to the destination during transmission.

2. Providing authentication

Authentication authorizes the sender identity.

5.3.3 Features of a Typical VPN solution

When the remote offices connect each other to share vital resources and secret information, the VPN solution must ensure the privacy and integrity of the data as it traverses the Internet. Therefore, a VPN solution must provide at least all of the following:

1. Keep data confidential (encryption)
2. Data carried on the public network must be rendered unreadable to unauthorized clients on the network.
3. Ensure the identities of two parties communicating (authentication)
4. The solution must verify the user's identity and restrict VPN access to authorized users only. It must also provide audit and accounting records to show who accessed what information and when.
5. Safeguard the identities of communicating parties (tunneling)
6. Guard against packets being sent over and over (replay prevention)
7. Ensure data is accurate and in its original form (non-repudiation)

5.3.4 Advantages of using VPN

It's obvious that because of people's security need and especially because of the need of sending encrypted data over a network, the VPN technology has been developed. But beside the role of creating a "private scope of computer communications", VPN technology has many other advantages:

1. **Enhanced Security :** When you connect to the network through a VPN, the data is kept secured and encrypted. In this way the information is away from hackers' eyes.
2. **Remote Control :** In case of a company, the great advantage of having a VPN is that the information can be accessed remotely even from home or from any other place. That's why a VPN can increase productivity within a company.
3. **Share Files :** A VPN service can be used if you have a group that needs to share files for a long period of time.
4. **Online Anonymity :** Through a VPN you can browse the web in complete anonymity. Compared to hide IP software or web proxies, the advantage of a VPN service is that it allows you to access both web applications and websites in complete anonymity.
5. **Unblock Websites and Bypass Filters :** VPNs are great for accessing blocked websites or for bypassing Internet filters. This is why there is an increased number of VPN services used in countries where Internet censorship is applied.

6. **Change IP address :** If you need an IP address from another country, then a VPN can provide you this.
7. **Better performance :** Bandwidth and efficiency of the network can be generally increased once a VPN solution is implemented.
8. **Reduce costs :** Once a VPN network is created, the maintenance cost is very low. More than that, if you opt for a service provider, the network setup and surveillance is no more a concern.

5.4 INTERNET TELEPHONY

Telephony is the technology associated with the electronic transmission of voice, fax, or other information between distant parties using systems historically associated with the telephone, a handheld device containing both a speaker or transmitter and a receiver. With the arrival of computers and the transmittal of digital information over telephone systems and the use of radio to transmit telephone signals, the distinction between telephony and telecommunication has become difficult to make.

Internet telephony is the use of the Internet rather than the traditional telephone company infrastructure and rate structure to exchange spoken or other telephone information. Since access to the Internet is available at local phone connection rates, an international or other long-distance call will be much less expensive than through the traditional call arrangement.

An Internet telephony service provider (ITSP) offers digital telecommunications services based on Voice over Internet Protocol (VoIP) that are provisioned via the Internet. ITSPs provide services to end-users directly or as wholesale suppliers to other ITSPs.

5.4.1 How Internet Telephony Works

Internet telephony is the transmission of telephone calls over computer networks. One of the most common applications involves computer-to-traditional telephone communications. This process uses a special Internet phone service provider and typically involves four steps.

1. **Request**

   Using the software provided by the Internet phone service provider, the caller enters a telephone number and requests a connection.

2. **Relay**

   The request is relayed to the provider's Internet server that is located closest to the requested number.

3. **Connect**

   Using traditional local telephone communication lines, the server connects to the requested telephone.

4. **Talk**

   The requested telephone rings, the party answers, and communication begins using the local telephone communication line and the Internet.

   To learn more about how Internet Telephony works, view the animation in the next slide - How Internet Telephony Works.

5.4.2 Ways / Types of Internet Telephony Applications

There are three ways of Internet telephony.

1. **Phone to Phone :** This is the process that involves a telephone to another telephone routed over the Internet.
   - Place a call from a regular phone
   - The sound is compressed into data
   - The compressed packets are sent over the Internet
   - Packets arrive to the other computer
   - The call is then decompressed back to sound.
2. **PC to Phone :** These are calls that go from a computer to a phone.
   - The PC gets the voice and compresses the information
   - The compressed packets are sent over the Internet
   - The other computer receives the packets
   - The packets are received and decompressed to voice
3. **PC to PC :** These calls are from computer to computer.
   - Both users use specific software to communicate to each other
   - Download needed software
   - Connect to the software
   - Use the data voice to communicate through the software

5.4.3 Advantages of Internet Telephony

1. Low Cost

The main benefit of internet telephony is the low cost. PC-to-PC calls are generally free, and PC-to-Phone connections are generally a fraction of the cost of a traditional phone line.

2. Portability

One only needs a laptop and an internet connection to use Internet telephony, whether in an airport, a library, or a fast-food restaurant.

3. Internet Telephony

Internet telephony also offers a wide range of features and services that are not found on traditional landline phone. Just a few of these amazing features are text voice mail, video voicemail, and voicemail to email, call parking, and the busy line feature.

4. Scalable

The software oriented nature of IP telephony makes it easily scalable, making it possible to integrate other services and applications as well. Adding a new phone to the already running system of IP telephony doesn't require an additional new line. It can be directly incorporated in the system, within the existing infrastructure, which is not in the case of traditional phones.

5. Toll-Free Access

While US toll-free numbers are generally not accessible from outside the US, Internet calling enables users to reach toll-free numbers from anywhere in the world.

5.4.4 Disadvantages of Internet Telephony

1. Unreliability

Traditional phone services functions with or without electricity. Not so with Internet telephony. If the power goes out, taking the Internet connection with it, no phone service is available.

2. Emergency calls

When traditional 911 calls are made, the emergency dispatch operator is able to see the exact location of the caller due to the direct relationship between the number and an address. However, there is no such fixed relationship with Internet telephony and location.IP addresses generally cannot be pinpointed with the accuracy needed for 911 calls.

3. Compatibility

VoIP connections have been known to have issues with devices such as satellite television receivers and conventional modems that need to dial an outgoing number.

5.5 SPREADSHEETS

A spreadsheet is an interactive computer application program for organization, analysis and storage of data in tabular form. Spreadsheets are developed as computerized simulations of paper accounting worksheets. The program operates on data represented as cells of an array, organized in rows and columns.

5.5.1 Ways Spreadsheets are Used in Business

Spreadsheets are used in varied ways within business contexts. In general, spreadsheets store data sets, but they also provide a range of utilities to manage and process the data sets. This makes them particularly useful to businesses. Through preset and user-defined formulas, spreadsheets can perform mathematical, statistical, financial and organizational transformations on sets of data. Spreadsheets help to present data in organized ways and to inform future planning decisions. Businesses use spreadsheets in ways that are suited to their own services, but these uses tend to fall into a few general categories.

1. Storing Data

The primary purpose of a spreadsheet is to store data in a structured way. Data values are entered into cells in a worksheet. These data values can be formatted using various categories of data types, including numerical and textual types. The cells in a worksheet can refer to other cells, using the location of a cell within the rows and columns in the sheet. Individual parts of a worksheet can be contained within tables, with a single worksheet potentially holding a range of information sets. Spreadsheet programs such as Excel provide templates for common business tasks, such as expenses recording.

2. Analyzing Data

Once a spreadsheet has some data values in it, you can perform various analytical tasks on this data. This includes mathematical functions, such as adding or counting values. By entering a formula or choosing from one of many preset functions, you can analyze your data sets. This allows business users to sort data, filter it and process it. For financial data, you can calculate profits and losses. In a general sense, spreadsheet formulas and functions allow you to carry out performance measurements for many aspects of your business.

3. Presentation

Spreadsheet applications such as Excel include tools for data visualization. You can take an existing data set within a spreadsheet and present it within a chart, with various types of graph and chart options to choose from. The resulting charts let business managers gain insight into the data by presenting it in graphical ways. These charts can also be used in corporate contexts, such as within presentations. You can manually control all aspects of a chart display, including chart type, labeling and colors. You can also print spreadsheet tables and charts for use within reports and other publications.

4. Future Planning

Spreadsheets facilitate future planning in two ways. First, being able to analyze and visualize data gives you an insight into how well your business is currently performing, highlighting areas for growth or reconsideration. Second, you can use a spreadsheet to calculate the potential effects of changes to your business model. For example, if you use existing information together with a potential change, such as a sales fluctuation in a retail context, you can determine the impact of this change. Spreadsheets also use conditional formulas, in which you can carry out conditional tests on data values, filtering or manipulating the values as a result of these tests.

5.5.2 Types of Spread Sheet

Spreadsheets, also called worksheets, allow for the creation and organization of tables and data. Most spreadsheet editing is now performed using computer software, such as Microsoft Excel or Apple Numbers. While you could feasibly create a spreadsheet for anything, there are certain types of spreadsheets commonly used to provide such versatility.

1. Two-Dimensional Spreadsheets

Two-dimension spreadsheets consist of "cells"-a box holding one piece of data-arranged in rows and columns like a table.

2. Three-Dimensional Spreadsheets

Modern spreadsheet applications allow for more than one two-dimensional "sheet," effectively stacking related spreadsheets on top of each other and introducing a third dimension.

3. Arithmetic Spreadsheets

Spreadsheets often utilize arithmetic functions, such as automatically adding up all the values of one particular column. These functions are necessary for budget and invoice spreadsheets, for example.

4. Logical Spreadsheets

Some spreadsheets utilize logic functions, rather than arithmetic functions, to allow for deductive reasoning.

5. Object-Oriented Spreadsheets

Instead of using two-dimensional cells, some spreadsheets are organized by objects, which are variables with a number of attributes attached. This allows the data to be viewed, analyzed and mapped in a number of different ways.

5.5.3 Determine the Necessary Level of Controls for the Spreadsheet

The level of controls should be relative to the spreadsheet's use, complexity and the required reliability of the information. The appropriate combination of controls and processes, such as those described below, should be considered to mitigate the risks associated with spreadsheets.

(a) Change Control

Maintaining a controlled process for making changes to a spreadsheet, including testing and formal sign-off that the change is functioning as intended.

(b) Version Control

Ensuring only current and approved versions of spreadsheets are being used by creating naming conventions and directory structures.

(c) Access Control

Limiting access at the file level to spreadsheets on a central server and assigning property rights. Spreadsheets can also be password protected to restrict access.

(d) Input Control

Ensuring that reconciliations or reviews occur to make sure that data is inputted completely and accurately.

(e) Security and Integrity of Data

Using a process to ensure that data embedded in spreadsheets is current and secure, such as "locking" or protecting cells to prevent inadvertent or intentional changes to standing data.

(f) Documentation

Ensuring that the appropriate level of spreadsheet documentation is maintained and kept up-to-date to understand the objective and specific functions of the spreadsheet.

(g) Development Lifecycle

For critical and complex spreadsheets, the use of a standard development process, including requirements, design, building, testing and maintenance.

(h) Back-ups

Implementing a process to back up spreadsheets on a regular basis.

(i) Archiving

Maintaining historical files no longer available for update in a segregated drive and locking them as "read only".

(j) Logic Inspection

Reviewing the logic in critical spreadsheets by someone other than the user or creator of the spreadsheet.

(k) Segregation of Duties

Defining and implementing roles, authorities, and procedures for issues such as ownership, sign-off, and usage.

(l) Analysis

Implementing analysis to find errors in spreadsheets used for calculations.

For more significant amounts and/or spreadsheets with higher complexity, migration to an application system with a more formalized information technology controls environment may be necessary to achieve an adequate level of control.

5.5.4 The Advantages of Using Spreadsheets

Spreadsheets offer a range of advantages, particularly to business users. Popular spreadsheet programs such as Microsoft Excel provide the tools to analyze and visualize data sets in accessible ways. If you have a set of data related to numerical, financial, statistical or other information, you can use a spreadsheet not only to store this data but also to manage it, perform analytical processing on it and present it. Spreadsheets provide complex processing in ways that even people with little technical experience can access.

1. Editing

When you build a spreadsheet, you enter data into a worksheet. Each data item is stored within a single cell. Cells can also contain formulas, either written by yourself or chosen from a predefined set designed for common tasks. For example, you could have a cell in a spreadsheet that performs a calculation using the values from other cells. If you then update the values in these other cells, the result in the formula cell updates as well. For this reason, spreadsheets offer a way to carry out continual analyses and calculations on your data sets automatically.

2. Formulas

The ability to enter mathematical formulas is key to the usefulness of spreadsheets. The following example formula carries out a calculation on a numerical data item:

This cell will multiply the value in the cell B9 by two. Formulas can express a variety of processes on sets of data. Common processes include looking up values within a specified range, testing whether values meet certain conditions, carrying out arithmetic operations, counting and transforming data items.

3. Preset Functions

Formulas are among the most useful aspects of a spreadsheet, but one of the reasons for their success is that you do not need to enter every formula manually. Spreadsheet programs provide a range of preset functions that encapsulate common formulas, allowing users to apply functions without having to type them in manually. Preset functions are accessible via buttons in spreadsheet program user interfaces. Common functions include sorting and filtering data as well as carrying out calculations such as sums and percentages.

4. Graphical Displays of Data

Spreadsheet programs can transform data sets into various types of graphical displays. In Excel, the Charts section provides the ability to present a data set within a chart or graph. This allows users to visualize and communicate their data sets within presentations, for example using pie or bar charts. Visualizing data in this way can help you understand the data and inform future planning decisions.

5.6 DATABASE

Database is an organised collection of data or information so that it can be easily accessed, updated or manipulated.

5.6.1 Use of Database

- Databases can store very large numbers of records efficiently (they take up little space).
- It is very quick and easy to find *information*.
- It is easy to add new *data* and to edit or delete old data.
- Data can be searched easily, eg 'find all Ford cars'.
- Data can be sorted easily, for example into 'date first registered' order.
- Data can be imported into other *applications*, for example a mail-merge letter to a customer saying that an MOT test is due.
- More than one person can access the same database at the same time *-multi-access*.
- Security may be better than in paper files.

5.6.2 Characteristics of Database

The data in a database should have the following features:

1. **Organized/Related :** It should be well organized and related.
2. **Shared :** Data in a database are shared among different users and applications.
3. **Permanent or Persistence :** Data in a database exist permanently in the sense the data can live beyond the scope of the process that created it.

4. **Validity/integrity/Correctness :** Data should be correct with respect to the real world entity that they represent.
5. **Security :** Data should be protected from unauthorized access.
6. **Consistency :** Whenever more than one data element in a database represents related real world values, the values should be consistent with respect to the relationship.
7. **Non-redundancy :** No two data items in a database should represent the same real world entity.
8. **Independence :** Data at different levels should be independent of each other so that the changes in one level should not affect the other levels.
9. **Easily Accessible :** It should be available when and where it is needed i.e. it should be easily accessible.
10. **Recoverable :** It should be recoverable in case of damage.
11. **Flexible to Change :** It should be flexible to change.

To create, manage and manipulate data in databases, a management system known as database management system was developed.

5.6.3 Classification of database

Database are classified according to their organizational approach.

1. **Relational database** : A tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. It stores data in tables with relationships to other tables.
2. **Distributed database** : A distributed database is one that can be dispersed or replicated among different point in a network.
3. **Object oriented programming database** : In this database, the data is defined in object classes and sub classes.

5.6.4 DBMS

"A Database Management Systems (DBMS) is software designed to assist in maintaining and utilizing large collections of data. DBMS provides an environment that is both convenient and efficient to use".

Database Management System is specially designed applications that interact with the user, other applications and Database (DB) itself to capture and analyze the data.

The DBMS helps create an environment in which end user have better access to more and better managed data than they did before the DBMS become the data management standard.

A database management system, therefore, is a combination of hardware and software that can be used to setup and monitor a database, and can manage the updating and retrieval of database that has been stored in it (figure).

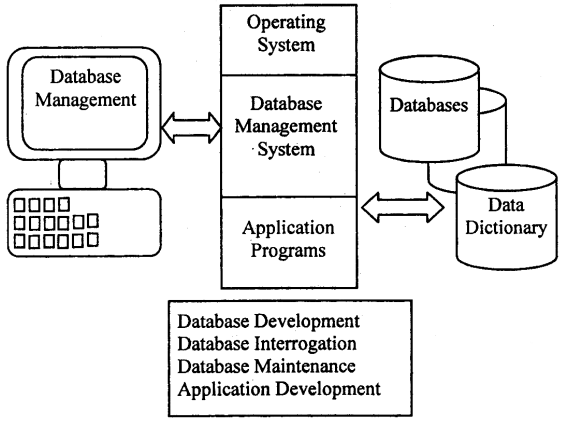


Figure: DBMS

The DBMS of an organization will in some sense reflect the nature of activities in the organization, some familiarity with the basic concepts, principles and terms used in the field are important.

5.6.5 Objective of DBMS

1. **Shareability :** An ability to share data resources is a fundamental objective of DBMS. This means different people and different processes using the same actual data at virtually the same time. The objective of shareability are as below:
   i) Serving different types of users with varying skill levels.
   ii) Handling different user views of the same stored data.

   iii) Combining interrelated data.
   iv) Setting standards.
   v) Controlling concurrent updates so as to maintain data integrity.
   vi) Coordinating restart and recovery operations across multiple users.
2. **Availability :** It means bringing the data of an organisation to the users of that data. The system which manages data resources should be easily accessible to the people within an organisation - making the data available when and where it is needed, and in the manner and form in which it is needed.
3. **Evolvability :** It refers to the ability of the DBMS to change in response to growing user needs and advancing technology.

   Evolvability is the system characteristic that enhances future available of the resources. Evolvability covers expansion or contraction, both of which may occur as the system to fit the ever changing needs and desires of the using environment.

   Evolvability implies the gradual unfolding, development and growth of a system to better meet the needs of the using environment - and it implies change of the system in response to changing needs and technology.
4. **Integrity :** Database integrity are used for:
   i) Protecting the existence of the database,
   ii) Maintaining the quality of the database, and
   iii) Ensuring the privacy of the database.

5.6.6 Components of DBMS

The major components of DBMS are given below:

1. **DML Pre-compiler :** It converts DML (Data Manipulation Language) statement embedded in an application program to normal procedure calls in the host language. The pre-compiler must interact with the query processor in order to generate the appropriate code.
2. **DDL Interpreter :** The DDL (Data Definition Language) interpreter converts the data definition statements into a set of tables. These tables contain information concerning the database and are in a form that can be used by other components of the DBMS.

3. **File Manager :** File manager manages the allocation of space on disk storage and the data structure used to represent information stored on disk. The file manager can be implemented using an interface to the existing file subsystem provided by the operating system of the host computer or it can include a file subsystem written especially for the DBMS.

4. **Database Manager :** A database manager is a program module, which provides the interface between the low level data stored in the database and the application programs and queries submitted to the system. It is responsible for interfacing with file system.

5. **Query Processor :** The query processor is used to interpret the online user's query and convert it into an efficient series of operations in a form capable of being sent to the data manager for execution.

6. **Database Administrator (DBA) :** Data administration is a high level function that is responsible for overall management of data resources in an organization including maintaining corporate wide data definitions and standards.

7. **Data Dictionary :** The data dictionary (or data repository) or system catalogue is an important part of the DBMS. It contains data about data (or metadata). It means that it contains the actual database descriptions used by the DBMS. In most DBMSs, the data dictionary is active and integrated. It means that the DBMS checks the data dictionary every time the database is accessed.

8. **Storage Manager :** It is responsible for storing, retrieving and updating data in the database.

9. **Buffer Manager :** The area into which a block from the file is read islermed as a buffer. The management of buffers has the objective of maximizing the performance or the utilization of the secondary storage systems, while at the same time keeping the demand on CPU resources tolerably low. The use of two or more buffers for a file allows the transfer of data to be overlapped with the processing of data.

10. **Database Users :** One of the most important features of DBMS is that relatively inexperienced users, called end-users, are empowered to retrieve information from the database. The users form the most important component of database management system (DBMS).

5.6.7 Types of Data Model

The main categories of data models are:

A) Relational Model

B) Network Model

C) Hierarchical Model

D) entity-Relationship Model

E) Object-Oriented Model

A) Relational Data Model

This model represents data and relationships among data by a collection of tables known as relations, each of which has a number of columns with unique names. Relational Model relates records by the values they contain. One of the main advantages of the relational model is that it is conceptually simple and more importantly based on mathematical theory of relation. It also frees the users from details of storage structure and access methods.

For example, the following wage table is relational database.

Name	Hours	Rate	Total
Able	40.5	10.35	419.175
Baxter	38	8.75	332.50
Chen	42.70	9.25	394.975

Advantages of Relational Model

1. **Ease of use :** The revision of any information as tables consisting of rows and columns is quite natural and therefore even first time users find it attractive.

2. **Flexibility :** Different tables from which information has to be linked and extracted can be easily manipulated by operators such as project and join to give information in the form in which it is desired.

3. **Precision :** The usage of relational algebra and relational calculus in the manipulation of the relations between the tables ensures that there is no ambiguity, which may otherwise arise in establishing the linkages in a complicated network type database.

4. **Security :** Security control and authorization can also be implemented more easily by moving sensitive attributes in a given table into a separate relation with its own authorization controls. If authorization requirement permits, a particular attribute could be joined back with others to enable full information retrieval.

5. **Data Independence :** Data independence is achieved more easily with normalization structure used in a relational database than in the more complicated tree or network structure.

6. **Data Manipulation Language :** The possibility of responding to ad-hoc query by means of a language based on relational algebra and relational calculus is easy in the relational database approach. For data organized in other structure the query language either becomes complex or extremely limited in its capabilities.

Disadvantages of Relational Model

1. **Low Performance :** The use of relational database system is machine performance. If the number of tables between which relationships to be established are large and the tables themselves are voluminous, the performance in responding to queries is definitely degraded.

2. **Physical Storage Consumption :** With an interactive system, for example an operation like join would depend upon the physical storage also. It is, therefore common in relational databases to tune the databases and in such a case the physical data layout would be chosen so as to give good performance in the most frequently run operations. It is therefore would naturally result in the fact that the lays frequently run operations would tend to become even more shared.

3. **Ease of Design Can Lead to Bad Design :** The relational database is easy to design and use. The user needs not to know the complexities of the data storage. This ease of design and use can lead to the development and implementation of the very poorly designed database management system.

4. **Hardware Overheads :** Relational database systems hide the implementation complexities and the physical data storage details from the user. For doing this, the relational database system need more powerful hardware computers and data storage devices.

B) Network Data Model

This model represents data by collection of records and relationships among data. This is represented by links, which can be viewed as pointers.

There are three basic components in the Network model; they are:

1. **Record Type :** A record type represents a finite number of similar type entities.

2. **Data Elements :** Entities are distinguished by the values of the data elements with which the corresponding record type is associated.

3. **Links :** In the network data model, all relationships between the same or different record types are restricted to binary, many-one relationships. These many-one relationships are called, links.

Advantages of Network Model

1. **Conceptual Simplicity :** Just like hierarchical model, it also simple and easy to implement.

2. **Capability to Handle More Relationship Types :** The network model can handle one to one (1:1) and many to many (N: N) relationship.

3. **Ease to Access Data :** The data access is easier than the hierarchical model.

4. **Data Integrity :** Since it is based on the parent child relationship, there is always a link between the parent segment and the child segment under it.

5. **Data Independence :** The network model is better than hierarchical model in case of data independence.

Disadvantages of Network Model

1. **System Complexity :** All the records have to maintain using pointers thus the database structure becomes more complex.

2. **Operational Anomalies :** In network model large number of pointers is required so insertion, deletion and updating more complex.

3. **Absence of Structural Independence :** There is lack of structural independence because when one change the structure then it becomes compulsory to change the application too.

C) Hierarchical Model

This model is similar to network model in the sense that data and relationships among data are represented by records and links respectively. It differs from network model in that the records are organized as collection of trees rather than arbitrary graphs.

A DBMS belonging to the hierarchical data model uses tree structures to represent relationship among records. Tree structures occur naturally in many data organizations because some entities have an intrinsic hierarchical order. A hierarchical database therefore consists of a collection of records, which are connected with each other through links. Each record is a collection of fields (attributes), each of which contains one data value. A link is an association between precisely two records. For example, consider the EMPLOYEE hierarchy in the figure.

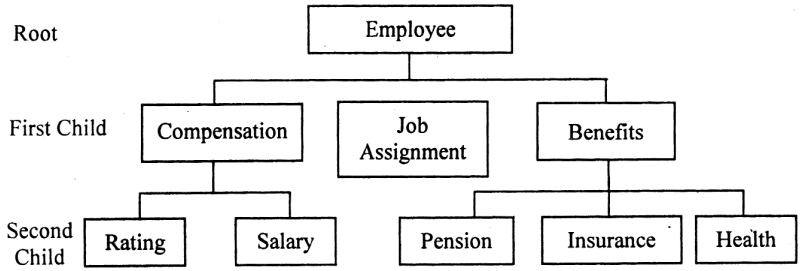


Figure : Hierarchical Model

Advantages of Hierarchical Model

1. It is a simple, straightforward and natural method of implementing record relationships.
2. Hierarchical model is useful when there is some hierarchical character in the database.

Disadvantages of Hierarchical Model

1. The hierarchical model cannot represent all the relationships that occur in the real world.
2. It cannot demonstrate the overall data model for the enterprise because of the non-availability of actual data at the time of designing the data model.

3. The hierarchical model is used only when there is a hierarchical character in the concerned database. It cannot represent many-to-many relationship (a child can have only one parent).

D) Entity-Relationship Data Model

The basic E-R Diagram was conceived by Peter Chen in 1976 as a unifying data model for all data models that existed at that time.

An Entity-Relationship Model (ERM) is an abstract and conceptual representation of data. Entity-relationship modeling is a database modeling method, used to produce a type of conceptual schema or semantic data model of a system, often a relational database, and its requirements in a top-down fashion.

Diagrams created using this process are called entity-relationship diagrams, or ER diagrams or ERDs for short.

There is a relationship between the table (relation) and the ER Diagram. For example, consider the following relation.

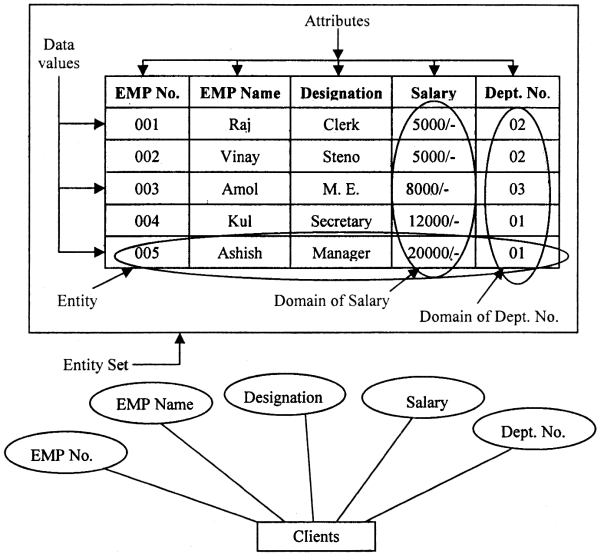


Figure : ERD of Client Table

The above ER diagram shows the relation of entity that is client with its attributes (EMP No, EMP Name, Designation, Salary, Dept. No.)

Advantages of ER Model

1. The relational database structure can be efficiently used even with a PC (Personal Computer) that has limited main memory and processing capability.
2. ER database is very effective for small databases.
3. ER database is much easier to use because it enables a computer system to accommodate a variety of enquiries in an efficient manner.
4. ER database is only concerned with data and not with the structures, which improves the performance.
5. It is very simple and represents the logical relationship among the data items.
6. ER model is very useful for representing most of the real world objects and the relationships among them.

Disadvantages of ER Model

1. Quite complex to handle large databases.
2. Less hierarchical structure of Databases
3. Limited constraint representation.
4. Limited relationship representation.
5. No data manipulation language.
6. Loss of information content.

E) Object-Oriented Data Model

A object- oriented data model is a logic organization of the real world objects (entities), constraints on them, and the relationships among objects. A DB language is a concrete syntax for a data model. A DB system implements a data model.

A core object-oriented data model consists of the following basic object-oriented concepts :

1. **Object and Object Identifier :** Any real world entity is uniformly modeled as an object. For example, person, car etc.

2. **Attributes and Methods :** Every object has a state (the set of values for the attributes of the object) and a behavior (the set of methods - program code - which operate on the state of the object). The state and behavior encapsulated in an object are accessed or invoked from outside the object only through explicit message passing.
3. **Class :** A means of grouping all the objects which share the same set of attributes and methods. An object must belong to only one class as an instance of that class. A class is similar to an abstract data type. A class may also be primitive (no attributes), e.g., integer, string, Boolean.
4. **Class Hierarchy and Inheritance :** Derive a new class (subclass) from an existing class (superclass). The subclass inherits all the attributes and methods of the existing class and may have additional attributes and methods.

Advantages of Object-Oriented Data Model

1. RDBMS does not allow nested structure : Nested structure applications are found in CAD/CAE, aerospace science, etc. It is easier to navigate through these complex structures in the form of objects rather than in the form of tables and records.
2. Relational databases have only a limited number of data types like integer, char, text, etc. Although one can create complex data types in relational database by combining fields, these are restricted by their base data types. But OODBMS allow arbitrary data types and sub-classing with inheritance.
3. Object-oriented databases are favored in those applications where the relationship among data elements is more important than data items themselves. However, relational databases are used in those applications where the values of data elements are more important. If a record makes sense only when used in context of other records, then an object-oriented database would be more appropriate.

5.6.8 Applications of DBMS

DBMS are widely used in different areas because of their numerous advantages. Some of the most common database applications are listed below:

1. **Airlines and Railways :** Airlines and railways use online databases for reservation, and for displaying the schedule information.
2. **Banking :** Banks use databases for customer inquiry, accounts, loans, and other transactions.

3. **Education :** Schools and colleges use databases for course registration, result, and other information.

4. **Telecommunications :** Telecommunication departments use databases to store information about the communication network, telephone numbers, record of calls, for generating monthly bills, etc.

5. **Credit Card Transactions :** Databases are used for keeping track of purchases on credit cards in order to generate monthly statements.

6. **E-Commerce :** Integration of heterogeneous information sources (e.g., catalogues) for business activity such as online shopping, booking of holiday package, consulting a doctor, etc.

7. **Healthcare Information Systems and Electronic Patient Record :** Databases are used for maintaining the patient healthcare details.

8. **Digital Libraries and Digital Publishing :** Databases are used for management and delivery of large bodies of textual and multimedia data.

9. **Finance :** Databases are used for storing information such as sales, purchases of stocks and bonds or data useful for online trading.

10. **Sales :** Databases are used to store product, customer and transaction details.

11. **Human Resources :** Organisations use databases for storing information about their employees, salaries, benefits, taxes, and for generating salary cheques.

5.6.9 Uses / Advantages of DBMS for Office

The database management system has a number of advantages as compared to traditional computer file-based processing approach. The DBA must keep in mind these benefits or capabilities during databases and monitoring the DBMS.

The Main advantages of DBMS are described below

1. Controlling Data Redundancy

In non-database systems each application program has its own private files. In this case, the duplicated copies of the same data is created in many places. In DBMS, all data of an organization is integrated into a single database file. The data is recorded in only one place in the database and it is not duplicated.

2. Sharing of Data

In DBMS, data can be shared by authorized users of the organization. The database administrator manages the data and gives rights to users to access the data. Many users can be authorized to access the same piece of information simultaneously. The remote users can also share same data. Similarly, the data of same database can be shared between different application programs.

3. Data Consistency

By controlling the data redundancy, the data consistency is obtained. If a data item appears only once, any update to its value has to be performed only once and the updated value is immediately available to all users. If the DBMS has controlled redundancy, the database system enforces consistency.

4. Integration of Data

In Database management system, data in database is stored in tables. A single database contains multiple tables and relationships can be created between tables (or associated data entities). This makes easy to retrieve and update data.

5. Integration Constraints

Integrity constraints or consistency rules can be applied to database so that the correct data can be entered into database. The constraints may be applied to data item within a single record or the may be applied to relationships between records.

6. Data Security

Form is very important object of DBMS. You can create forms very easily and quickly in DBMS. Once a form is created, it can be used many times and it can be modified very easily. The created forms are also saved along with database and behave like a software component. A form provides very easy way (user-friendly) to enter data into database, edit data and display data from database. The non-technical users can also perform various operations on database through forms without going into technical details of a Database.

7. Report Writers

Most of the DBMSs provide the report writer tools used to create reports. The users can create very easily and quickly. Once a report is created, it can be used may times and it can be modified very easily. The created reports are also saved along with database and behave like a software component.

8. Control Over Concurrency

In a computer file-based system, if two users are allowed to access data simultaneously, it is possible that they will interfere with each other. For example, if both users attempt to perform update operation on the same record, then one may overwrite the values recorded by the other. Most database management systems have sub-systems to control the concurrency so that transactions are always recorded with accuracy.

9. Backup and Recovery Procedures

In a computer file-based system, the user creates the backup of data regularly to protect the valuable data from damage due to failures to the computer system or application program. It is very time consuming method, if amount of data is large. Most of the DBMSs provide the 'backup and recovery' sub-systems that automatically create the backup of data and restore data if required.

10. Data Independence

The separation of data structure of database from the application program that uses the data is called data independence. In DBMS, you can easily change the structure of database without modifying the application program.

5.6.10 Disadvantages of DBMS

1. High Cost

A significant disadvantage of DBMS is cost. In addition to the cost of purchasing or developing the software, the organisation also purchase or upgrade the hardware and so it becomes a costly system. Also additional cost occurs due to migration of data from one environment of DBMS to another environment.

2. Problems Associated with Centralization

Centralisation also means that data is accessible from a single source. As one know the centralised data can be accessed by each user, so there is no security of data from unauthorised access and data can be damaged or lost.

3. Complexity of Back-Up and Recovery

Back-up and recovery are fairly complex in DBMS environment. As in a DBMS, if one takes a back-up of the data then it may affect the multi-user database system which is in operation. Damaged database can be recovered from the back-up floppy, but iterate duplicacy in loading to the concurrent multi-user database system.

4. Confidentiality, Privacy and Security

When information is centralised and is made available to users from remote locations, the possibilities of abuse are often more than in a conventional system. To reduce the chances of unauthorised users accessing sensitive information, it is necessary to take technical, administrative and, possibly, legal measures. Most databases store valuable information that must be protected against deliberate trespass and destruction.

5. Data Quality

Since the database is accessible to users remotely, adequate controls are needed to control users updating data and to control data quality. With increased number of users accessing data directly, there are enormous opportunities for users to damage the data. Unless there are suitable controls, the data quality may be compromised.

5.7 GROUP WARE

Groupware refers to programs that help people work together collectively while located remotely from each other. Programs that enable real time collaboration are called synchronous groupware.

It is a software tool to support group of people on a network to working together in a same project but in different locations.

It is also called Computer Supported Cooperative Work (CSCW).

Collaboration

Where two or more people can work together for a common goal.

Communication

It is a process to exchange information in several ways.

Coordination

Making different people work together for a goal.

5.7.1 Reasons for Groupware

With any updates that made by each user is available to others.

There are some of the most common reasons people want to use groupware

- Better cost control

- Increased productivity
- Better customer service
- Fewer meetings
- Automating routine processes
- Maintain bulletin boards
- Have several people work on one document
- Hold real-time network meetings
- Share files
- Share spreadsheets
- Share information
- Have cooperative project management
- Extending the organization to include both the customer and the supplier
- Keep common schedules
- Make easy to group solve the problem.

The main goal of the groupware is to improve cooperation and productivity of those workgroups.

5.7.2 Groupware Applications

Task Manager is synchronous groupware for task management. This client/server software allows planning, scheduling, sharing, tracking and reporting tasks, appointments, projects, and any company activities. Authorized users can simultaneously access the common database through Local Network (LAN) to see, add, edit and delete their team or personal tasks, if they are grunted appropriate permissions.

To Do List is asynchronous groupware for task management. It is single-user system that allows team leaders to create, manage and send tasks or individual to-do lists to team members by e-mail or publish to-do lists on company website.

5.7.3 Groupware Workflow

It is a highly structured communication between users. The communication structure may differ from company to company task management helps a common workflow within the company.

Typically a task is planned by team leader and assigned to every employee in that team. Then the employee automatically receives a notification about the assignment of the task and he starts working. After the employee finishes his task he changes status of the task and team leader automatically receives the notification about it.

5.7.4 Groupware Privacy

When setting up a groupware it is important to specify what information is private and what is shared. Simultaneously the data is access by everyone in a group is a key feature of groupware but sometimes it can be in danger and get confused.

Groupware Success = Technology + Culture + Economics + Politics

5.7.5 How Groupware Works

Groupware software can be divided into two categories: *server* and *client.*

1, Server

Depending on the size of an organization and the number of users, the software is installed on one or more computers (called servers) in a network. Server software can also be installed on computers located in other locations. If user wants any information that will be taken from the server. If more than one server is used, the servers will speak to one another in a process called replication. In this way, information held in the same database, but in different locations or on a different server, is exchanged between the servers. Once this is accomplished, the servers are said to be synchronized.

2. Client

Each person using the groupware has the client software installed on their desktop or laptop computer. The client software enables the user to access and interact with the applications stored on the servers. Some users may be remote that is, they are not in the office on a full-time basis but rather use a modem or other type of connection to access and use the groupware.

5.7.6 Advantages of Groupware

1. Groupware helps increase efficiency

The idea behind groupware is to provide one central point of access information. Each individual member of a group has access to all of the information relevant to their tasks in the group project. Unnecessary work is eliminated, less time is spent searching for data, and more time is spent working on required tasks.

2. Groupware stimulates creativity

When collaboration is enabled, one of the resulting benefits is creativity. Ideas can be easily shared, and individuals can build off one another. With open communication, each member of the group can share new ideas and add valuable insight that can only benefit the project as a whole.

3. Groupware provides structure

Workgroups need structure to succeed. Every member needs to know what is expected of them, and what is expected of the other group members. This builds a level of responsibility into the group. It also provides direction as to what the ultimate project goals are, and how everyone fits into the bigger picture. The provision of one central resource point and the improvement of communication channels are two concrete ways groupware provides critical structure to a work group. Another way is by facilitating project management with scheduling and tracking tools that are usually built right into groupware applications.

4. Groupware helps define and enforce a process

By implementing groupware, you are establishing a means to enforce a process for how information is to flow. Documentation is serialized and records are kept on who is responsible for any changes that are made. Communication procedures can be established at the outset, and easily monitored for compliance. This helps ensure all group members are properly performing their specific tasks, and everyone is contributing as agreed upon at the project outset.

5.8 Audio Conferencing / Tele Conferencing

Audio Conferencing is a telephone meeting conducted between multiple separate callers (three callers define a "conference"). The type of telephone used can vary but typically an audio conference includes attendees that use handled wired telephones (such as those at a person's business office or home), conference room speakerphones that can be shared by several people, or individual cellular or mobile telephones.

Audio conferencing is sometimes called "teleconferencing" and traditionally means using a telephone instrument to conduct a business meeting.

This is the technology in which different users are able to communicate with each other by the support of electronic appliances. Here the people available at different locations are able to communicate without making their physical impression. It might be a meeting process which can be done through telephone or video technologies.

Teleconferencing process can be among the people who belong to same organization or department. It can also be the communication process between the people available at different locations.

Benefits of Audio Conferencing

Many companies will consider this kind of conferencing as a communication tool. But what are the benefits and is it a comprehensive solution? Here are some of the advantages of using it:

- **Easy to use :** With all the technology available the last thing a business needs is a slow, difficult to use system. Conferencing systems are easy to use and can be set up quickly and easily. Brands like Konftel offer great solutions that will have businesses having group calls in a very quick turnaround time. Big companies with international offices will benefit most and avoid expensive logistical issues of getting key personal together. Conferencing systems are sleek and very user friendly, making it a pleasure to use and a simple solution to meeting situations.
- **It is cost-effective :** Running a business can be very costly, and saving on the bottom line is the objective of entrepreneurs and global companies alike. Using conferencing is a great way to cut back on costs. Its saves on time and money as you won't have to get all your staff into one stuffy room for a meeting (especially with national and international offices that will have spent on travel and accommodation). Likewise with clients and suppliers – save on logistical costs a save valuable time by conferencing on the phone.
- **It is versatile and mobile:** Because of the latest system configuration conferencing is versatile and mobile. You can access it from any part of the office making it handy when needed quickly or in a vital decision making situation. This is handy when split decisions need to be made and meetings need to be moved or re-scheduled. Because no travel is needed, no meeting can be delayed or disrupted due to strikes, traffic jams delayed flights.
- **It is reliable and secure:** Conferencing is a reliable service that functions 24 hours a day, accessing anyone around the world. It can even be accessed from a cellular phone. Conferencing calls are also very secure with encryption that is protected by individual security codes. The systems (like those offered by Konftel) are configurable and are able to block any outside calls during a meeting, making sure the meeting is secure and uninterrupted.

- **It is professional:** In today's business world it's important to be professional and create the impression that your company is competent and at the cutting edge. Making use of the latest technologies can set you out from the competition and highlights to potential clients that your business is growing and at the forefront of the latest trends and business practices. Being at the cusp of the latest practices will highlight that your business is professional and can be a force to be reckoned with.

5.9 Video Conferencing

This is the technology in which different users are able to communicate with each other by the support of electronic appliances. Here the people available at different locations are able to communicate without making any physical impression. It might be a meeting process which can be done with video cameras or internet connection. Generally, Video conferencing technology is taken care by the government organizations to know the progress of the projects which are introduced the government. Here we require a good infra structure and well-equipped studios.

5.9.1 Reasons To Use Video conferencing

1. Reliability

Hold your meeting regardless of weather, flight delays, or other "acts of God." Over the last few years, regardless of whether I was in Iceland, the Amazon, or on the Iraq border, I was always able to connect with the See team no matter where I was.

2. Increase Productivity

Meet as much as you need to get the job done instead of only when you're scheduled. One of our large customers discovered that the average VSee call is only 10-15 min long while traditional scheduled meetings tend to be 45 minutes. The reason is that with VSee, it's so easy to bring someone into the conversation that there's no pressure to fill up an hour to justify the scheduling overhead.

3. Efficiency

Be in two places at the same time (or nearly at the same time) – Germany at 9 a.m., Japan at 2 p.m. On my last day here in Singapore, I had six in-person meetings and it was exhausting. At home, I routinely visit 10 to 15 places via VSee every day and still have energy to spare.

4. Save Time

No need to wait for people to travel from the four corners of the earth to have an effective meeting. Why are large companies slow to get things done? Because decisions tend to get delayed waiting for meetings to happen.

5. Improve Employee Morale

Let's be honest: A lot of traveling is tiring. People need time to recover and they don't always get to go to enjoyable places like Honolulu. (Although sometimes they do. I am writing this from Singapore, one of my favorite countries.)

6. Save Money

Need I explain? Plane tickets, parking fees, hotel costs, meals, rental car/taxi costs multiply by the number of people traveling and the number of times per month.

7. Tighter Security

Keep your trade secrets in-house. Less chit chat outside the office means less opportunity for eavesdroppers.

8. Improve Safety

Yes, this is kind of morbid, but I know parents who never travel on the same plane because of the possibility of a crash.

9. Convenience

Easily add key personnel, interns, or a surprise speaker with the click of a button and at no added cost. This impromptu ad-hoc collaboration style is one of the key design principles behind VSee. The other two principles are "no app" and "no infrastructure"— more about these in the future.

10. Increase Productivity

Did I mention this one already? All of the above reasons added together means less time wasted on the road, less time wasted recovering from the road, and more time spent getting the job done, resolving unexpected problems, having more opportunities to meet with team members and build better working relationships, and making better decisions.

5.9.2 Equipment needed For Video Conferencing

The following video conferencing equipment will need to be set up according to the type of video conference you're going to have.

- **Camera :** A camera is necessary to send images of your venue to recipients. It is optional when you join a hosted video conferencing session and you only need to view and listen to the broadcast. A basic webcam (including those build-in to notebooks) is quite sufficient for broadcasting the image of a one or two persons. For larger groups it is recommended that you use a mid-range webcam, similar to the Microsoft LifeCam Studio. Specialised video conferencing rooms require a specialised camera with a specific lens suited for the venue and the type of video conference to be set up.
- **Display device :** A display device is required to view the image or video broadcast from your remote venue(s). The basic notebook or computer monitor would be sufficient for one to two people to view a particular broadcast. If your audience increases in size, the display device should be substituted with a digital projector or LCD Monitor. In cases where it is necessary to view multiple groups at the same time or where applications are shared (as part of the video conferencing session) a second display device would be advisable.
- **Speakers :** Speaker technology has advanced so much so that basic build-in notebook or computer speakers are often sufficient for a one-to-one person broadcast. A USB microphone headset would greatly enhance personal sound and voice quality. Depending on the requirements for a specific session, additional speakers might be required. In most cases this could be accomplished by connecting the computer to the venue's sound system.
- **Microphone :** A microphone is only required when sound needs to be contributed. When only viewing a hosted session, a microphone is not required. Specialised microphones are available for larger venues and are selected based on the requirements and venue acoustics. In most cases only one person at each venue would be contributing to the conversation and a USB microphone headset would be sufficient.
- **Venue :** When viewing a broadcast conference using your computer or if you're having a one-to-one conference, the venue itself might not be that important. However, there are some universal environmental factors to consider. When equipping a room with video conferencing facilities it is very important to consider the acoustics, layout, furniture, lighting, wall colour and decorations of the room. See the detailed section on venue considerations for more information.

- **Coder or Decoder :** Non-computer based video conferencing requires a coder or decoder to perform the communication function that the computer would perform. The devices support ISDN, IP or both. ISDN make use of a connection via the telephone network and also require the necessary PABX infrastructure to be in place. ISDN preceded IP technology and therefore most of the older units in use only support ISDN. IP units use an Internet connection to connect with one another. When setting up a multi-location video conferencing session you need to consider the audience and the equipment they will use to connect. Should a combination of ISDN and IP equipment be used then a bridging function is required. It is possible to purchase a video conferencing bridge, however it is more economical to rent time on a hosted bridge. There are a number of service providers available. Reservations on a hosted bridge need to be made in advance and require the opening an account with the specific vendor.

5.9.3 Venue considerations for video Confrencing

- **Table :** The shape of the table will determine the seating position, which in turn will determine if all participants will be visible to the camera. Reflected light is coloured by the surface from which it is reflected. The table surface will not only affect the light reflection, but will also affect the acoustics. For example, a leather-covered table or a table with a table cloth will absorb noise created by someone writing or clicking on the table, whereas a metal or glass table will amplify those sounds.
- **Room :** Colours and decor will determine the amount of reflected light, which will affect the quality of the image transmitted. The shape and layout of your room will greatly influence the quality of the sound and image transmitted from the venue. Non-uniform rooms are best suited to reduce reflection and noise vibration. The ideal shape of a conference venue is a rectangle, as opposed to a square room.
- **Walls :** These should be painted in matte finish as gloss creates unwanted reflections. The most suitable colours are mid-grey and greyish tones of blue and green. Sharp or dark colours should be avoided. Should noise levels be an issue, sound dampening paint or materials could be applied to the walls.
- **Floors :** These play a similar role to that of the table surface depending on the floor covering used. Carpeted floors are ideal as they dampen noise and reduce reflection.

- **Windows :** They provide light, normally from one side of the room, which can cause the faces of participants to be either too light or too dark (depending which side of the room they are located). Try to install either curtains, blinds or some mechanism that will allow control over the amount of light that enters the room. Another alternative is to tint or frost the windows.
- **Lighting :** This will determine the image quality of the viewing parties. Soft diffused lighting is ideal. Fluorescent lighting with diffusers are best suited for video conferencing. Down lighters should be avoided as they cause uneven lighting and cast shadows.
- **Furniture :** The colour of the furniture and its finishes are very important as they affect both the acoustics in the room and the amount of reflected light. Padded chairs will help dampen sound while matte finished covering (without bold patterns) will assist in creating a clear video image. Try to arrange your participants to sit in a horseshoe arrangement. A rectangular or oval table is strongly recommended. Mid-brown tables with limited reflection will help reduce shadows on faces that would be created by an upward reflection. In large venues, table inputs for power, microphones and digital displays should also be considered.

5.9.4 Advantages of Video Conferencing

1. **No time constraint:** Video conferencing can be conducted at any time of the day. Time differences between countries do not matter when people use this method of communication because they do not actually need to travel to attend meetings.
2. **Dramatic travel saving:** Not only is video conferencing a direct replacement for many in-person business trip, but also there is virtually no cost for people to be involved in a virtual meeting, you can easily bring the right them together.
3. **Easy communication:** People can use video conferencing to communicate with anyone with HD video and other collaboration tools such as whiteboard, text exchange, file sharing, media sharing, screen sharing, remote control, electronic voting, conference recording etc.
4. **Increased productivity:** By eliminating time and district barriers, meetings can be hold anytime, anywhere with anyone. In this way, meetings are shorter and more effective. And also with the rich collaboration tools, decisions can be made faster.

5.9.5 Disadvantages of Video Conferencing

1. **Lack of personal interaction:** Some meetings require a personal touch to be successful. Video conferencing can be less personal than meeting face to face, and it can be possible to miss out on vital body language when you're struggling with a pixelated image or stuttering video.
2. **Technical problems:** The major disadvantages are the technical difficulties associated with smooth transmissions that could result from software, hardware or network failure. Remote connections are sometimes known to be hampered by environmental changes. On some occasions, the absence of technical support personnel creates difficulty for participants who are unfamiliar with the videoconferencing technological concepts.
3. **International time zones:** One of the very real disadvantages of using video conferencing is that if you communicate regularly with people in other countries you will be available at different times to them. Unfortunately without the skills of a time lord there's not really a practical way to overcome this.
4. **High cost of setup:** Setting up video conferencing in an office can be a bit expensive for small-sized companies. Simple features can fit into the budget, but if advanced features are required, then a substantial amount of expenditure must be done.

SHORT NOTES

1. Intranets

An intranet is a private computer network that uses Internet protocols and network connectivity to securely share any part of an organization's information or operational systems with its employees. Sometimes, the term refers only to the organization's internal website, but often it is a more extensive part of the organization's computer infrastructure and private websites are an important component and focal point of internal communication and collaboration.

2. Extranet

An Extranet is a private network that uses the internet protocol and the public telecommunication system to securely share part of business information or operations with - suppliers, vendors, partners, customers, or other businesses.

Through e-mail, documents are prepared and sent electronically. The recipients need not be present at the other end to send the message. The message gets stored in the electronic mailbox of the addressee. The recipient can open the mailbox whenever he is free and can read or print the message.

3. VPN

A VPN is a private connection between two machines or networks over a shared or public network. VPN technology lets an organization securely extend its network services over the Internet to remote users, branch offices, and partner companies. VPN turn the Internet into a simulated private WAN.

4. Internet Telephony

Telephony is the technology associated with the electronic transmission of voice, fax, or other information between distant parties using systems historically associated with the telephone, a handheld device containing both a speaker or transmitter and a receiver. With the arrival of computers and the transmittal of digital information over telephone systems and the use of radio to transmit telephone signals, the distinction between telephony and telecommunication has become difficult to make.

5. Spreadsheets

A spreadsheet is an interactive computer application program for organization, analysis and storage of data in tabular form. Spreadsheets are developed as computerized simulations of paper accounting worksheets. The program operates on data represented as cells of an array, organized in rows and columns.

6. Database

Database is an organised collection of data or information so that it can be easily accessed, updated or manipulated.

Use of Database

- Databases can store very large numbers of records efficiently (they take up little space).
- It is very quick and easy to find *information*.
- It is easy to add new *data* and to edit or delete old data.
- Data can be searched easily, eg 'find all Ford cars'.
- Data can be sorted easily, for example into 'date first registered' order.
- Data can be imported into other *applications*, for example a mail-merge letter to a customer saying that an MOT test is due.
- More than one person can access the same database at the same time - *multi-access*.
- Security may be better than in paper files.

7. Group Ware

Groupware refers to programs that help people work together collectively while located remotely from each other. Programs that enable real time collaboration are called synchronous groupware.

It is a software tool to support group of people on a network to working together in a same project but in different locations.

8. Audio Conferencing / Tele Conferencing

Audio Conferencing is a telephone meeting conducted between multiple separate callers (three callers define a "conference"). The type of telephone used can vary but typically an audio conference includes attendees that use handled wired

telephones (such as those at a person's business office or home), conference room speakerphones that can be shared by several people, or individual cellular or mobile telephones.

Audio conferencing is sometimes called "teleconferencing" and traditionally means using a telephone instrument to conduct a business meeting.

9. Video Conferencing

This is the technology in which different users are able to communicate with each other by the support of electronic appliances. Here the people available at different locations are able to communicate without making any physical impression. It might be a meeting process which can be done with video cameras or internet connection. Generally, Video conferencing technology is taken care by the government organizations to know the progress of the projects which are introduced the government. Here we require a good infra structure and well-equipped studios.

FACULTY OF MANAGEMENT

BBA - III - Year Examination

March/April - 2017

INFORMATION TECHNOLOGY

Time : 3 Hours] [Max. Marks : 70

Note : Answer all the questions.

PART - A (10 × 2 = 20 Marks) **ANSWERS**

1. Write short notes on the following at one place only.

a) Backup file.

Ans :

In computing duplicate file is a backup file in location apart from the original file. It is mainly for the purpose of being able to restore a data in case of data lose. In other words file backup is the practice of protecting important data by storing duplicate files on a different location, on the same drive, on different drives, disketts, media, computer and or site. Some application programs allow automatic duplication of files.

b) Debugging.

Ans :

Debugging is the process of finding and resolving of defects that prevent correct operations of computer software or a system. It is a multistep process which involves identifying a problem, isolating the source of a problem and then either correcting the problem or determining a way to work around it.

c) VPN. **(Unit-V, Page No. 260, Short Notes-3)**

d) FTP. **(Unit-IV, Page No. 209, Short Notes-9)**

e) Fire wall. **(Unit-IV, Page No. 212, Short Notes-18)**

f) ISDN.

Ans :

It is "Integrated Services Digital Network". ISDN is a set of communication standards for simultaneous digital transmission of voice, data and other network services over the traditional circuits of the public telephone network. The key feature of ISDN is that it integrates speech and data on the same lines, adding features that were not available in the classic telephone system.

g) Software. **(Unit-I, Page No. 59, Q.7)**

h) LAN. **(Unit-I, Page No. 46, Topic-1.8.1.1)**

i) CPU. **(Unit-I, Page No. 58, Q.5)**

j) Extranet. **(Unit-V, Page No. 260, Q.2)**

PART - B (5 × 10 = 50 Marks)

2. a) Explain the block diagram of computer in detail. **(Unit-I, Page No.7 to 18, Topic-1.4, 1.4.1, 1.4.2, 1.4.3, 1.4.4)**

OR

b) Define operating system. What are the principle functions of the operating sytem . **(Unit-I, Page No. 31, Topic-1.6.3)**

3. a) Explain the different types of informatio systems with suitable examples. **(Unit-II, Page No. 70, Topic-2.4)**

OR

b) Explain about MIS. Differentiate between MIS and DSS with suitable examples. **(Unit-II, Page No. 109, Topic-2.5.5.8)**

4. a) Write a note on the Multimedia. **(Unit-III, Page No. 113 to 116, Topic-3.1.1,3.1.2,3.1.3,3.1.4,3.1.5,3.1.5.1)**

OR

b) Discuss about Compression and Decompression issues in Multimedia. **(Unit-III, Page No. 139, Topic-3.3.3)**

5. a) Discuss about the importance of internet for database. **(Unit-IV, Page No. 172, Topic-4.4)**

OR

b) What are the types of online business. Explain in detail. **(Unit-IV, Page No. 189, Topic-4.6.3)**

6. a) What is database application? Explain in detail. **(Unit-V, Page No. 245, Topic-5.6.8)**

OR

b) Explain the role of intranet in the MNC. **(Unit-V, Page No. 217, Topic-5.1.3)**

FACULTY OF MANAGEMENT

BBA (Regular) III – Year Examination

October / November - 2014

INFORMATION TECHNOLOGY

Course No. 3.4

Time : 3 Hours | Max. Marks : 70

Note : Answer all questions.

PART – A (10 x 2 = 20 Marks)

[Short Answer Type]

1. Answer the following in not more than 75 words.
   - (a) Difference between primary memory and secondary memory
   - (b) Multi programming
   - (c) Information and knowledge
   - (d) DSS
   - (e) Multimedia formats
   - (f) Search Engine
   - (g) Firewall
   - (h) Encryption/decryption
   - (i) Databases
   - (j) Video Conference

PART – B (5 x 10 = 50 Marks)

[Essay Answer Type]

2. (a) Explain the various types of memory devices and their hierarchy with reference to speed and storage.

   OR

   (b) Discuss the differences between LAN, WAN and MAN.

3. (a) Discuss the features of Human Resources IS.

   OR

   (b) Explain the characteristics of Operational IS.

4. (a) Explain the various types of devices used for Multimedia applications.

OR

(b) Explain compression and decompression devices in Multimedia.

5. (a) Discuss the pros and cons of social networking in Business.

OR

(b) Explain how Information systems can be secured.

6. (a) Explain the use of Internet Telephony, Audio and Video Conference for a Business Organization.

OR

(b) Explain the features of Database systems.