

INFORMATION TECHNOLOGY

Unit Structure

- 1.1 Introduction
- 1.2 Development of Information Technology
- 1.3 Computer Technology:
- 1.4 Communications Technology :
- 1.5 Fundamentals of Computer Architecture:
- 1.6 Computer Applications:
- 1.7 The Generation of the Computer:

1.1 INTRODUCTION

Technology has been defined as "systematic knowledge and action, usually of industrial processes but applicable to any recurrent activity". In providing tools and techniques for action, technology at once adds to and draws from a knowledge base in which theory and practice interact and compact. At its most general level technology may be regarded as definable specifiable way of doing anything. In other words, we may say a technology is a codified, communicable procedure for solving problems. Technology, Manfred Kochen observed, impacts in three stages. First, it enables us to do what we are now doing, but better, faster and cheaper; second, it enables us to do what we cannot do now; and third, it changes our life styles. Information technology is a recent and comprehensive term, which describes the whole range of processes for generation, storage, transmission, retrieval and processing of information. In this Unit, an attempt is made to discuss the components of information technology and to identify elements that really matter in the investigation and implementation of new information technologies in information systems and services.

1.2 DEVELOPMENT OF INFORMATION TECHNOLOGY

Despite the impression often given that information technology has suddenly burst on the scene, its roots could be traced well into the past.

12.1 Historical Perspective

The history of man-made information technology is one of slow evolution dating back to 5 Information Technology: 5,000 years. It has followed the mechanical and later electronic rather than biochemical path, with primitive signs, hieroglyphics, the alphabet writing, the book printing, and computer type-setting - a more or less linear development. More recently, the telephone, radio, television, satellite transmission, transistor, the computer, and the microprocessor represent distinct qualitative changes in

the information technology, with the fact that we now have to accept the composite term information technology to include a whole range of new developments. It has been said that information technology is the science of information handling, particularly by computers used to support the communication of knowledge in scientific technical, economic and social fields.

1.2.2 Definition of Information Technology (IT) :

The term 'Information Technology' (IT) has varying interpretations. Macmillan Dictionary of Information Technology defines IT as "the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics-based combination of computing and telecommunications".

Two points are worth consideration about this definition:

- The new information technology is seen as involving the formulating, recording and processing and not just transmitting of, information. These are elements in the communication process which can be separated (both analytically and in practice) but in the context of human communication they tend to be intertwined.
- Modern information technology deals with a wide variety of ways of representing information. It covers not only the textual (i.e., cognitive, propositional and verbalised forms, we often think under the head information), but also numerical, visual, and auditory representations.

We have a convergence of three strands of technologies: computers, micro-electronics and communications. In other words, a mosaic of technologies, products and techniques have combined to provide new electronic dimensions to information management. This mosaic is known by the name new information technology.

It is important to bear in mind that information technology is not just concerned with new pieces of equipment but with much broader spectrum of information activities. Information technology encompasses such different things as book, print; reprography, the telephone network, broadcasting and computers. In the following sections let us briefly consider the major components of information technology namely: computer technology, communications technology and reprographic and micrographic technologies.

1.3 COMPUTER TECHNOLOGY

Technology Computer technology may conveniently be grouped into: processor technology, storage technology and software aspects.

1.3.1 Processor Technology :

Computers consist of electronic components assembled in a design or "architecture" that will perform necessary functions of input, output, and

computation and control (control of both the computer itself and of attached peripheral devices that perform input and output functions and store the files).

- In the past, electronic components were expensive, so a minimum number were used in a single processor that alternately performs input, control, processing and output. Besides, the first generation of computers, operated by means of vacuum tubes or valves, were relatively bulky and energy consuming.
- The first major innovation, leading to microelectronics was the discovery of transistor, a product of solid state physics, which used semiconductor materials. The most important development of these today is based on the non-metallic element 'silicon'. Being much smaller than the vacuum tube, the transistor quickly replaced it in all electronic equipment. However, transistors and other equipment had to be wired together and a single piece of equipment might have thousands of such components. The wiring and assembly of such elements were a delicate and costly process.
- This naturally paved the way for research towards the concept of integrated circuit (IC). At first IC's were simple but, as the technology developed, they rapidly became smaller and more complex. This led to the miniaturization and refinement.
- The central feature of micro-electronics is the development of micro-processor, a special form of IC with functions of arithmetic, logic and control - similar to those of Central Processing Unit (CPU) of a computer and contained in a single chip.
- In addition, the microprocessor includes units to interpret instructions from the stored programme to supply the control memory the information necessary to retrieve instructions and send out data as required.
- The microprocessor is the building block from which modern computer systems are assembled. The microprocessor uses very, little energy and has few environmental requirements of older machinery.
- Air conditioning, for example, might not be necessary for a general purpose computer using microprocessor technology. The practical significance of this is that it is now possible to bring the computer to the problem instead of bringing the problem to the computer.
- The aspects referred to above form a major hardware component of a computer.

1.3.2 Storage Technology:

In the previous section, the, recent innovations relating to the processing aspects of computer technology were discussed briefly. In considering some of the advances in devices for digital information storage, it may be stated that most of the primary storage in computers is now supplied by semi-conductor circuits.

- There have been significant developments in memory technology affecting three areas of performance spectrum; the high speed, high performance; the midrange and the low speed bulk memory systems. It is now possible that even a small computer system might have cache memory, a small associative memory retaining most recently referenced information and in a readily available place.
- In some cases, cache memory may be at the top of a hierarchy of memories having a wide variety of characteristics. Memory management, dynamic memory allocation, and virtual memory schemes, generally found in large computer systems, are now appearing on computers which are small and less costly.
- The development of charge coupled devices (CCDs) and bubble memories has filled the gap which previously existed in the continuum of memory devices such as fixed-head magnetic disks and these are slower than other semi-conductor memories.
- These memories have advantage over magnetic disks in that they contain no mechanical parts and could be used to store significant amount of information and can be treated as a structured file system.
- There has been a continuous improvement in recording densities of magnetic media. Floppy disks and microfloppies provide a convenient media to store data. The development of video Information Technology: disk has added a new dimension to the information storage technology.
- Video disks could be used to store large volumes of information in digital form. This kind of mass storage devices are believed to be very useful in the development of information storage and retrieval systems
- It May be stated that all these innovations in storage technology provide us a variety of alternatives depending on the requirements of speed of operation.

These developments add more capabilities to the storage aspects and may be considered advances in the storage technology.

1.3.2 Software Aspects:

Software is a generic term covering the concepts, procedures and instructions which enable computer systems to do useful things. Usually, software is conceived in terms of computer programs, discrete units of software which make the computer to carry out specific tasks, and or systems or packages. The importance of software is obvious, since it is the software which applies the power of the computer to solve the users' problems. Many of the users need a clear understanding of the capabilities of software more than hardware aspects.

- It is known for some years now that the "rapid increase in the capabilities of computer systems has not been matched by corresponding increases in the development and quality of software.

- This situation has caused much disenchantment with computer systems. The methods by which computer software is produced have changed considerably in recent years with the emergence of "software engineering", which enabled improvements in programming practice, such as structured, or modular programming.
- As one of the solutions to the software problem increased production and availability of packaged software is encouraged. Another solution to the problem is the use of fourth generation languages and flexible integrated software to produce prototypes of programmes to meet the user needs.
- It is hoped that these solutions would be able to meet fairly standard requirements. For the average user they mean that there will be an increasing number of packages to meet most of his needs.

1.4 COMMUNICATIONS TECHNOLOGY

The development of communications technology is, in a sense, a symbol of man's effort to communicate rapidly over great distances. Communications technology is older than computer technology. It has grown as rapidly as the computer technology in recent times. These two technologies are now fusing into 'communications'.

- This newly emergent technology is changing our life styles as few technologies have before. This new technology has probable and important uses in the home, office, factory, community and in information exchange system and holds prospects of immediate relevance to information profession.
- Some of the significant aspects of information transmission technology are discussed briefly in the following paragraphs. A communication system can establish paths over which messages can be sent between any two instruments in specified locations at desired times.
- This type of system is generally known as switched 'network.' Communications technology has advanced to the extent that now it is possible to hire services from a commercially operated network.
- Hence, there is a steady growth of computer-to-computer data traffic. Also, computer manufactures are offering network architectures which together offer multiple operating systems running on families of similar computers.
- A terminal of a computer network may have access to any of the computers within the network, if it is authorized to do so. A computer serves as a terminal when connected for providing computation, information retrieval, etc., in accordance with the request of the terminal.
- A multi-lateral access capability allows the users of the terminal to

share these resources. Such networks are characterized by a new technique known as packet switching in which the message is divided into a number of message blocks called packets and are transmitted between nodes in store and forward basis.

- Among the information resources to be shared are the data bases. A number of information systems have come into operation based on this concept.

As a result of rapid technological progress, a variety of services, which have traditionally been considered separate, are now becoming increasingly similar. This tendency is generally referred to as convergence of service modes.

Telecommunications can now handle not only speech and data but also visual information in a unified manner. Broadcasting is now capable of providing two-way or selective dissemination of audio and visual information by way of a broad-band cables in addition to conventional one way dissemination.

With the result, two traditionally separate 'services, telecommunications and broadcasting tend to merge together in their mode of operation and thereby provide users with diversified types of information more efficiently.

This innovation could be utilized for the publication of journals through the extensive use of techniques like facsimile text processing and word processing. Library and information services may also be included into the integrated whole. To handle the economy of scale, the concept of Integrated Services Digital Network (ISDN) is evolving very rapidly.

1.5 FUNDAMENTALS OF COMPUTER ARCHITECTURE

Speed: Computers can calculate at very high Speeds.

Storage: Computers have their main memory and auxiliary memory systems. A computer can store a large amount of data.

Accuracy: The accuracy of a computer system is very high.

Versatility: Computers are very versatile machines. They can perform activities

, ranging from simple calculations to performing complex CAD modeling and simulation for navigating missiles and satellites.

Automation: Computers can be programmed to perform a series of complex tasks, involving multiple programmes. Computers can perform things flawlessly.

Diligence: Diligence means being constant and earnest in effort and application.

Military application: The first digital computers, with their large and cost, mainly performed scientific calculations, often to support military objectives.

Creative Art: They have also been used for entertainment, with video games becoming a huge industry.

Robotics: Computers have been used to control mechanical devices since they became small and chief.

Networking and the Internet: Computers have been used to coordinate information in multiple locations.

Different types of Computer Systems:

Super Computers: The mightiest computers, and of course the most expensive are known as Super Computers. They process billions of instructions per second. One uses super computers for tasks that require mammoth data manipulation, such as worldwide weather forecasting and weapons research.

Main Frame: In the jargon of the computer trade, large computers are called main frame. Main frame are capable of processing data at very high speeds – millions of instruction per second and have access to billions of characters of data. The principal use of it is for processing vast amounts of data quickly.

Personal Computer: Personal Computer are often called as PC. A PC is based on a microprocessor originally made by the Intel Company with other companies such as – AMD. PCs usually use an operating system.

MAC: The computers made Macintoshes which uses power PC processor made by Motorola are referred as MAC. Macintoshes use operating system, called MAC OS created Apple.

1.7 THE GENERATION OF THE COMPUTER

A generation refers to the state of improvement in the development of a product. It also is used for major state of different advancements/achievements of computer technology. With each new generation, the circuitry has become smaller and more advanced than the previous generation before it. The time span of era of computer generation may vary in different prospects.

a. The First Generation: 1946 – 1958 (The Vacuum Tube Years)

The first generation of computers were huge, slow, expensive and often undependable and used Vacuum Tubes in CPU's. In 1946 two Americans, Presper Eckert and John Mauchly, built the ENIAC electronic computer which used vacuum tubes instead of the

mechanical switches of the Mark I. The ENIAC used thousands of vacuum tubes, which took up a lot of space and gave off a great deal of heat.

First generation computers relied on machine language to perform operations and they could only solve one problem at a time. Input was based on punched cards and paper taps and output was displayed on printouts.

b. The Second Generation: 1959 – 1964 (The Era of the Transistor)

33 Transistors replaced vacuum tubes and ushered in the second generation of computers. In 1947 three scientists, John Barden, William Shockley, and Walter Brattain, working at AT&T's Bell Labs, invented the transistor which functions like a vacuum tube. The transistor was faster, more reliable, smaller and much cheaper to build than vacuum tube.

Second generation computers moved from cryptic binary machine language to symbolic or assembly languages. High level programming languages such as versions of COBOL and FORTRAN were also developed at this time.

c. The Third Generation: 1965-1970 (Integrated Circuits – Miniaturizing the Computer)

Integrated Circuits (IC) have started replacing transistors. The integrated circuits, or as it is sometimes referred to as semiconductor chip, packs a huge number of transistors onto a single wafer of silicon. Placing such large numbers of transistors on a single chip vastly increased the power of a single computer.

Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allow the device to run many different applications at one time with a central programme that monitored the memory.

Computers, for the first time, became accessible to a mass audience because they were smaller and cheaper than their predecessors.

d. The Fourth Generation: 1971- Today (The Microprocessor)

This generation can be characterized by both the jump to monolithic integrated circuits (millions of transistors put onto one integrated circuit chip) and the invention of the microprocessor.

By putting millions of transistors onto on a single chip, more calculation and faster speeds could be reached by computers. Microprocessors moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors. As these small computers became more powerful, they could be linked together to form networks, which

eventually led to the development of the Internet. Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

e. Fifth Generation – Present and Beyond: Artificial Intelligence:

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality.

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IMPLICATIONS OF INFORMATION TECHNOLOGY IN BUSINESS

Unit Structure

- 2.1 Introduction
- 2.2 Advantages of Information Technology in Business

2.1 INTRODUCTION

Information Technology is a terminology which is known to all educated people of the World at present times. Information technology (IT), as defined by the Information Technology Association of America (ITAA), is “the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware.” IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit, and securely retrieve information.

When computer and communications technologies are combined, the result is information technology, or “InfoTech.” Information technology is a general term that describes any technology that helps to produce, manipulate, store, communicate, and disseminate information. Presumably, when speaking of Information Technology (IT) as a whole, it is noted that the use of computers and information are associated.

Globalization has brought in many changes in the business scenario with the whole world inching towards one big market place. Communication between the buyers and sellers has become critical as each can opt to explore a greater number of alternatives than ever before. E-commerce through Internet, e-mails, websites, and other facilities enables a businessman to be linked with every corner of the world, and thus opens up greater opportunities in the world market.

Another important factor is the time required for completing a business transaction. As markets are becoming competitive and information is more readily available, a quick, reliable and replicable transaction implies availing of prevailing opportunities. On the contrary, delays in processing a transaction might become synonymous to wasting an opportunity. Therefore, a fast and alternative mechanism of communication, contract, and payment is an integral part of a globally competitive business organization.

Role of information technology in business Today, technology is becoming very important in our daily lives. It affects individuals, communities, businesses and the nation highly technological impact in the business world. It has helped in terms of management, manufacturing,

marketing of communication products and modular type more easily.

Information technology or IT refers to an entire industry. Information technology is the use of computers and software to manage information. It refers to anything related to computing technology, such as networking, hardware, software, the Internet, or the people that involve

these technologies.

Many companies have IT departments for managing the computers, networks, and other technical parts of their businesses, such as storing information, protecting information, processing the information, transmitting the information as necessary, and later retrieving information as necessary.

This is referred to as Management Information Services (or MIS) or Information Services (or IS). Information technology has become very important in the business world. No matter small or big business, IT has helped the organization, manager, and workers in more efficient management, to inquire about a particular problem, conceive its complexity, and generate new products and services; thereby, improving their productivity and output.

Information technology can help through

- Communication
- Inventory management
- Management Information Systems
- Customer Relationship Management

1. Communication:

In the business world, communication plays an important role in maintaining the relationship between employees, suppliers, and customers. Therefore, the use of IT we can simplify the way to communicate through e-mail, video chat rooms or social networking site.

2. Inventory Management:

Organizations need to maintain enough stock to meet demand without investing in more than they require. Inventory management systems identify the quantity of each item a company maintains, an order of additional stock by using a way of inventory management. It is become more important because organization needs to maintain enough stock to meet customer demand. By using in IT in inventory management, it also will helps in track quantity of each item a company maintains, triggering when it comes to managing inventory.

3. Management Information Systems:

Information data is very important for an organization and a valuable resource requirement for safe and effective care. Then, the company should use the management information system (MIS) to enable the company to track sales data, expenditure and productivity as well as information to track profits from time to time, maximizing return on investment and recognize areas of improvement.

4. Customer Relationship Management:

Companies are using IT to improving the way of design and manage the customer relationship. Customer Relationship Management (CRM) systems capture every relation a company has with a customer so that a more experience gain is possible. If a customer makes a call to center and report an issue, the customer relation officer will be able to see what the customer has purchased, view shipping information, call up the training manual for that item and effectively respond to the issue.

2.2 ADVANTAGES OF INFORMATION TECHNOLOGY IN BUSINESS

2.2.1.Introduction:

Since the computerized system so widely used, it is advantageous to incorporate information technology into the organization. Information technology provides tremendous benefits to the business world such as allowing the organization to work more efficiently and to maximize productivity. Among the advantages of information technologies in business are:

- Storing and Protecting Information
- Working away
- Automated Processes
- Communication Storing and Protecting Information

Information technology helps in storage systems of important data or document to protect company's valuable records. Storage systems, such as vaults, it can help via keep informationsafe by only allowing certain users within your company to access, withdraw, add or change the documents. Working Away Information Technology systems can access the remote network electronics company.

It allows one to work from home or anywhere. From this, it will help in increasing productivity even physical work has been done in the office. Automated Processes Each organization to find ways do more work in a short amount of time.

Therefore, the efficiency of information technology by developing automated processes to take the burden off your staff. Communication In the business world, communication plays an important role in maintaining the relationship between employees, suppliers, and customers. Thus, the use of IT we can simplify the way to communicate through e-mail, video chat rooms or social networking site. It means we can communicate with our employees, supplier and customers anywhere.

2.2.2 Social Media for Business Growth:

A significant amount of social media activity is carried out through mobile devices. Make sure that your social media strategy is compatible with mobile devices to guarantee a worthwhile user experience. Social media sites continue to gain popularity at a rapid rate and it is important for small and growing businesses to use them to advertise and market what they offer. The term “information technology systems in an organization” is composed of four distinct parts which include: an organization, information in an organization, and information technology and information technology systems in an organization. Flow of Information is a key resource for all organizations.

What information describes might be internal, external, objective or subjective. External information describes the environment surrounding the organization.

- Objective information describes something that is known.
- Subjective information describes something that is currently unknown.

With information technology, the flow of all these three types of information is made simple by use of centralized data centers where all this data can be retrieved. Information in an organization can flow in four directions and these include upward flow of information, downward flow of information, outward flow of information and horizontal flow of information.

2.2.3 Transaction processing:

Information technology simplifies the transaction process of an organization. A transaction process system (TPS) is a system that processes transactions that occur within an organization. At the heart of every organization are IT systems whose main role is to capture transaction information, create new information based on the transaction information. TPS will update any transaction process and store that information in a database, so any concerned party in the organization can access that information via a centralized information storage network of internet. Decision support:

A decision support system (DSS) is a highly flexible and interactive IT system that is designed to support decision making when the problem is not structured. A DSS works together with an artificial intelligence system to help the worker create information through (OLAP) online analytical

process to facilitate decision-making tasks that require significant effort and analysis. Workgroup support since information technology facilitates in creating an information sharing environment, workers can easily consult each other across different department without any interruption. They can use emails, text chatting services to inquire something related to a given task at work. With work group support systems, group decision making becomes easier.

2.2.4. Executive support:

An executive information system (EIS) is an interactive management information system (MIS) combined with decision support systems and artificial intelligence for helping managers identify and address problems and opportunities. An EIS allows managers to view information from different angles. It also provides managers with the flexibility to easily create more views to better understand the problem or opportunity at hand.

2.2.5. Data Management:

With the help of database software, an organization stores all its relevant data on a database. This infrastructure can be designed when it is internal or external. An internal centralized system can only be accessed within the organization while an external centralized system allows data to be accessed outside the organization using a remote (IP) internet protocol Address or a domain name. In this case, employees or managers can use a company website to access relevant company data by use of passwords. This data is not exposed to the public and search engines.

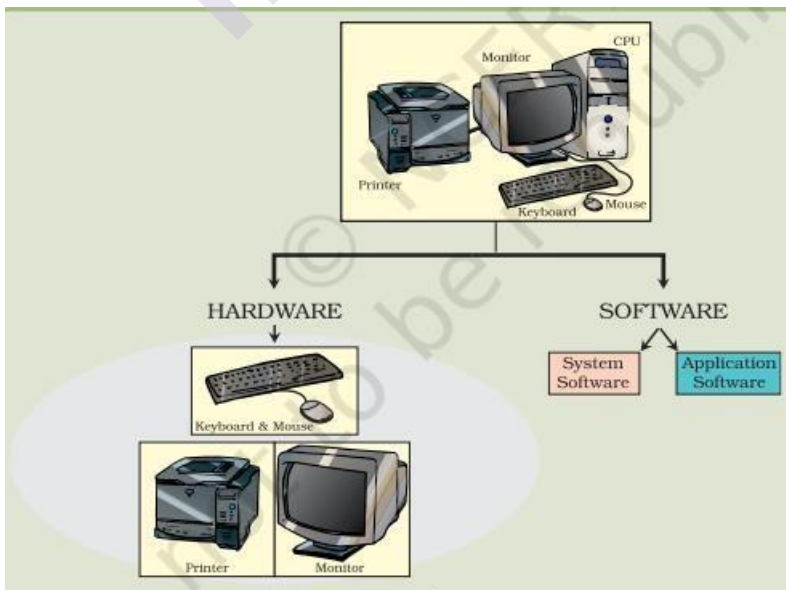
ORGANISATION OF THE COMPUTER SYSTEM

Unit Structure

- 3.1. Introduction
- 3.2. Input devices
- 3.3. Source Data Entry Devices
- 3.4. Storage devices
- 3.5. Secondary Storage
- 3.6. Tertiary Storage
- 3.7. Off-line Storage
- 3.8. Memory Card
- 3.9. Output Devices

3.1 INTRODUCTION

A computer system is usually defined as a combination of hardware and software. Computer hardware is the physical equipment. Software is the collection of programs that make the hardware do its job. Each of the hardware and software components has undergone refinements and modifications depending upon the limitations encountered by the users and the endeavors to overcome these limitations to meet new requirements and challenges. Let us therefore understand the computer from two perspectives, namely, the general functions of its components and the evolution these components have undergone.



3.2 INPUT DEVICES

General Functions It provides a means for the machine to communicate with its external environment by accepting (or reading) data and the program.

1. It converts the data based on the program into computer acceptable form through an input interface.
2. It supplies the converted instructions and data to the computer system for further processing. The very scope of computers is enough to understand that there is no limit to the form and type of data that serves as an input. Sometimes the input is in the form of text in normal language, sometimes it is a picture, sometimes it is a voice input like a song. Selection of an appropriate input device will improve efficiency and keep human interaction minimal.

3.2.1. Types of Input Devices:

On-line or Direct Data Entry Devices:

These devices are under the control of the CPU and communicate directly with the CPU, that is, these are connected via cable to the CPU. This process of data entry may be time consuming and may have errors but by using these devices, we can avoid having to capture data from paper. These are also known as Interactive Input Devices and are classified as:

- (a) Keyboard
- (b) Locator devices
- (c) Interface or pick devices.

(a) Keyboard: The most common input device is the keyboard (Figure 2.10). The modern keyboard generally contains 104 keys and is called the QWERTY keyboard because of the sequence of keys in the top row, which are similar to those of a standard typewriter. A keyboard is used for a wide range of tasks but is well known for its capability to 23 Components of CCT enter data, which is copied from the original paper documents (such as name and address details on a form). Keyboards are also used for typing letters, memos, reports and other documents using word processing software.

(b) Locator devices: Locator devices are used to control the location or position of the cursor on the screen and they allow us to provide the necessary input. Generally, locator devices are good for gross movement but not for precision work.

1. Mouse:

It is a small hand-held device used to indicate a position or movement on a computer's display screen by rolling it over the mouse pad/flat surface. There are different types of this device like physical, optical and laser mouse. Physical mouse works on the

principle of the movement of a ball, whereas optical and laser mouse works on the bases of light signals (i.e. have no mechanical movement inside.)



2. Trackball:

It is a movable ball mounted on top of a stationary base, which can be rotated manually using a finger and it also has two buttons like a mouse for performing operations similar to mouse. Three dimensional track balls are available that allow the movement not only the traditional left/right and forward/ backward movement but also up and down as well.



3. Touch pad:

It is a flat touch sensitive rectangular surface performing similar operations as a mouse or a track ball.



4. Digitizing Tablet:

Digitizing tablet is an electronic plastic board, on which specifying a location corresponds to a location on the computer screen. It is considered to be an absolute locator because it is very precise and when a stylus (pen) is placed in a particular position the same signals are produced each time. It is in this that it differs from other

locator devices. Digitizers are used by architects and engineers in Computer Aided Designing (CAD) for designing buildings, cars, mechanical parts, robots, etc. Moreover, they are used in the Geographical Information System for digitizing of maps.



5. Joystick:

Joystick is a wired/wireless control device which is usually used for playing video games. These are relative locators in which the direction of the push determines the change of position and the amount of deflection determines a change of speed (see Figure). A joystick not only indicates two dimensional positions by moving the ball rotationally but also three dimensional position, where the third dimension is indicated by the rotation of the rod. Games software, flight simulators, etc. often use joystick as the input device.



(c) Interface/Pick Devices Pick devices are used to select an object on the screen. The object may be text or graphic. Examples of pick devices are light pens and touch screens.

3.2.2. Light Pens:

The light pen is a pen-like light-sensitive device that feeds a narrow electrical pulse generated by a pointing device directed towards the screen. It is connected by a wire to the computer terminal that detects the signals from the screen. Light pens may be used in place of a mouse or a keyboard, particularly for menu based applications where an option may be selected by pointing on it. They are used for Computer Aided Designing (CAD) and drawing purposes.

Moreover, with the help of a light pen, engineers, architects or fashion designers can draw and edit the designs directly on the screen, though for editing a drawing keyboard may be used to select colours, lines with varying thickness, cropping or enlarging the drawings. It is also used to read bar codes from products that are available in big departmental stores.

3.2.3. Touch Screens:

Touch screens are monitors on which the user makes selections by touching the screen, rather than moving a cursor to the location with external locator devices. Touch screens are often used in situations where users are likely to have a low level of competence in using computer keyboards. Touch screens are sometimes used in restaurants, building societies and travel information systems.

3.3 SOURCE DATA ENTRY DEVICES

We have observed that in grocery stores, the clerks merely wave the product over a laser scanner/barcode reader, which automatically enters the product code and retrieves the corresponding price of the product automatically. The earlier practice was to enter the code/ product name by using a keyboard (a time consuming process). The laser scanner/barcode reader comes under Source Data Entry Devices category, which increases the efficiency of a user. These devices help us in entering the data directly from the source, without any human intervention. The devices used in this category are:

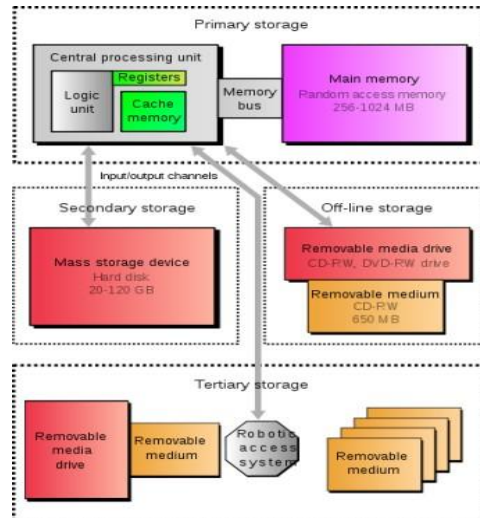
- (a) Video digitizer
- (b) Digital camera
- (c) Scanning devices
- (d) Voice input
- (e) Remote control
- (f) Magnetic stripe reader
- (g) Sound sensor – microphone
- (h) MIDI instrument.

3.4 STORAGE DEVICES

Types of Storage There are four type of storage:

- Primary Storage
- Secondary Storage
- Tertiary Storage

Off-line Storage



3.4.1. Primary Storage:

- Also known as main memory.
- Main memory is directly or indirectly connected to the central processing unit via a memory bus.
- The CPU continuously reads instructions stored there and executes them as required.
- Example: – RAM – ROM – Cache



3.4.2. RAM:

- It is called Random Access Memory because any of the data in RAM can be accessed just as fast as any of the other data.
- There are two types of RAM: –

DRAM (Dynamic Random Access Memory)

SRAM (Static Random Access Memory)

RAM

Static RAM	Dynamic RAM
<ul style="list-style-type: none"> • Faster • More expensive • More power consumption • does not need to be refreshed 	<ul style="list-style-type: none"> • Slower • Less expensive • Less power consumption • needs to be refreshed thousands of times per second
	

3.4.3.ROM:

- This memory is used as the computer begins to boot up.
- Small programs called firmware are often stored in ROM chips on hardware devices (like a BIOS chip), and they contain instructions the computer can use in performing some of the most basic operations required to operate hardware devices.
- ROM memory cannot be easily or quickly overwritten or modified.



3.4.4.Cache:

- Cache is a high-speed access area that can be either a reserved section of main memory or a storage device.
- Most computers today come with L3 cache or L2 cache, while older computers included only L1 cache.

3.5 SECONDARY STORAGE

- It is not directly accessible by the CPU.
- Computer usually uses its input/output channels to access secondary storage and transfers the desired data using intermediate area in primary storage.
- Example: – Hard disk

3.5.1.Hard Disk:

- The hard disk drive is the main, and usually largest, data storage device in a computer.
- It can store anywhere from 160 gigabytes to 2 terabytes.
- Hard disk speed is the speed at which content can be read and written on a hard disk.
- A hard disk unit comes with a set rotation speed varying from 4500 to 7200 rpm.

- Disk access time is measured in milliseconds.



3.6 TERTIARY STORAGE

- Typically it involves a robotic mechanism which will mount (insert) and dismount removable mass storage media into a storage device.
- It is a comprehensive computer storage system that is usually very slow, so it is usually used to archive data that is not accessed frequently.
- This is primarily useful for extraordinarily large data stores, accessed without human operators.
 - Examples: – Magnetic Tape – Optical Disc

3.6.1. Magnetic Tape:

- A magnetically coated strip of plastic on which data can be encoded.
- Tapes for computers are similar to tapes used to store music.
- Tape is much less expensive than other storage mediums but commonly a much slower solution that is commonly used for backup.

3.6.2. Optical Disc:

- Optical disc is any storage media that holds content in digital format and is read using a laser assembly is considered optical media.
- The most common types of optical media are – Blu-ray (BD) – Compact Disc (CD) – Digital Versatile Disc (DVD).

3.7 OFF-LINE STORAGE

- Also known as disconnected storage.
- Is a computer data storage on a medium or a device that is not under the control of a processing unit.
- It must be inserted or connected by a human operator before a computer can access it again. Examples:
 - Floppy Disk
 - Zip diskette
 - USB Flash drive
 - Memory card

3.7.1. Floppy Disk:

- A soft magnetic disk.
- Floppy disks are portable.
- Floppy disks are slower to access than hard disks and have less storage capacity, but they are much less expensive.
- Can store data up to 1.44MB.
- Two common sizes: 5 ¼" and 3 ½"

3.7.2. USB Flash Drive:

- A small, portable flash memory card that plugs into a computer's USB port and functions as a portable hard drive.
- Flash drives are available in sizes such as 256MB, 512MB, 1GB, 5GB, and 16GB and are an easy way to transfer and store information.

3.8 MEMORY CARD

- An electronic flash memory storage disk commonly used in consumer electronic devices such as digital cameras, MP3 players, mobile phones, and other small portable devices.
- Memory cards are usually read by connecting the device containing the card to your computer, or by using a USB card reader.

3.9 OUTPUT DEVICES

(a) Monitor :

Monitor is an output device that resembles the television screen and uses a Cathode Ray Tube (CRT) to display information. The monitor is associated with a keyboard for manual input of characters and displays the information as it is keyed in. It also displays the program or application output. Like the television, monitors are also available in different sizes.

(b) Liquid Crystal Display (LCD):

LCD was introduced in the 1970s and is now applied to display terminals also. Its advantages like low energy consumption, smaller and lighter have paved its way for usage in portable computers (laptops) .

(c) Printer:

- Printers are used to produce paper (commonly known as hardcopy) output. Based on the technology used, they can be classified as Impact or Non-impact printers.

- Impact printers use the typewriting printing mechanism wherein a hammer strikes the paper through a ribbon in order to produce output. Dot-matrix and Character printers fall under this category.
- Non-impact printers do not touch the paper while printing. They use chemical, heat or electrical signals to etch the symbols on paper. Inkjet, Deskjet, Laser, Thermal printers fall under this category of printers.
- When we talk about printers we refer to two basic qualities associated with printers: resolution, and speed. Print resolution is measured in terms of number of dots per inch (dpi). Print speed is measured in terms of number of characters printed in a unit of time and is represented as characters-per-second (cps), lines-per-minute (lpm), or pages-per-minute (ppm).

(d) Plotter:

Plotters are used to print graphical output on paper. It interprets computer commands and makes line drawings on paper using multicolored automated pens. It is capable of producing graphs, drawings, charts, maps etc. Computer Aided Engineering (CAE) applications like CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) are typical usage areas for plotters.

BUSINESS ENVIRONMENT IN IT AGE

Unit Structure

- 4.1. Introduction
- 4.2. Reasons
- 4.3 Conclusion

4.1 INTRODUCTION

The business environment in the Information Age places many pressures on companies. Organizations may respond reactively to a pressure already in existence, or proactively to an anticipated pressure. Company responses are typically facilitated by information technology (IT), which in a broad sense is a collection of the individual technology components that are typically organized into computer-based information systems (ISs).

4.2. REASONS

4.2.1. Global competition for trade and for labor:

Companies in developed countries usually pay high fringe benefits and environmental protection costs. Therefore, they have difficulty competing in labor-intensive industries with developing countries. As a result, companies are moving their manufacturing facilities to countries with low labor costs. Such a global strategy requires extensive communications, frequently in several languages and under several cultural, ethical, and legal conditions. The complexity of the communications system may greatly hinder global competition unless it is properly supported by IT.

4.2.2. Need for real-time operations:

Companies in the Information Age no longer have the luxury of “information float,” which is the time between when a business event occurs and when information captured about that event reaches the necessary decision makers. High-performance telecommunications technologies can reduce this time lag to near zero. Similarly, these same technologies permit financial transactions to be nearly instantaneous. For many businesses, slow, paper-based, mail-based transactions and processes are a thing of the past. Orders now can occur instantly, as can electronic payment transfers and documentation of transactions.

4.2.3. Changing workforce:

The workforce, particularly in developed countries, is changing rapidly and becoming more diversified. An increasing number of females, single parents, minorities, and physically challenged persons work today in all

types of positions. More employees than ever before prefer to defer retirement. IT is easing the integration of these employees into the traditional workforce. In addition, as more organizations become transnational, managerial complexity accompanies growing cultural complexity.

4.2.4. Customer orientation:

Customer sophistication and expectations increase as customers become more knowledgeable about the availability and quality of products and services. They are also more knowledgeable about competing products. In fact, customers ultimately want products “free, perfect, and now.” These expectations translate into the need for organizations to demonstrate a customer orientation. Customers are demanding ever-more detailed information about products and services. They want to know what features are available, what warranties they will receive, what financing is available, and so on, and they want to know immediately. Companies must be able to deliver information quickly to satisfy their customers, or risk losing them. Advances in the use of the Internet and electronic commerce (e-commerce) bring customers information about thousands of products, including cost and quality comparisons.

4.2.5. Technological innovation and obsolescence:

Pressures to produce goods and services efficiently (quickly and at low cost) cause organizations to look for technological breakthroughs that will give them an advantage over their competitors. Technology is playing an increased role in both manufacturing and service organizations. New and improved technologies such as computer-integrated manufacturing enable organizations to produce superior products, to customize products more easily, and to quickly alter manufacturing processes as the market dictates.

4.2.6. Information overload:

The Internet and other telecommunications networks increase the amount of information available to organizations and individuals. The amount of information available on the Internet more than doubles every year, and most of it is free. The information and knowledge generated and stored inside organizations are also increasing exponentially. Managers are at risk of “analysis paralysis”—bombarded with so much potentially useful information that they feel compelled to consider vast amounts of it before taking action. But of course, only some of the information is truly relevant. Therefore, the accessibility, navigation, and management of information necessary for managerial decision making is becoming critical.

4.3 CONCLUSION

To summarize, the modern global business environment is transnational and culturally complex. Its diversity brings different competitive advantages and challenges to each country, to each industry, and to each business. These advantages and challenges appear and disappear as

fast as world events occur and as fast as generations of new technologies are created and become obsolete. The business world is increasingly “transparent”: information moves so rapidly around the world that industrial secrets, technical advantages, and managerial innovations can evaporate with the speed of e-mail. This speed of change and global dispersion of information also accelerates the rate of social change across the globe. These factors have accelerated the need for Information Technology in the Business world.

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NETWORKING AND TELECOMMUNICATION

Unit Structure

- 5.1. Introduction to conceptual framework of Networking & Telecommunication
- 5.2. Computer Network Components
 - 5.2.1. NIC
 - 5.2.2. Hub
 - 5.2.3. Switch
 - 5.2.4. Router
 - 5.2.5. Modem
- 5.3. Computer Network Types
 - 5.3.1. LAN(Local Area Network)
 - 5.3.2. MAN (Metropolitan Area Network)
 - 5.3.3. WAN(Wide Area Network)
- 5.4. Network Topology
 - 5.4.1. Network Topology
 - 5.4.2. Bus Topology
 - 5.4.3. Ring Topology
 - 5.4.5. Star Topology
 - 5.4.6. Tree topology
 - 5.4.7. Mesh topology
 - 5.4.8. Hybrid Topology

5.1. INTRODUCTION TO CONCEPTUAL FRAMEWORK OF NETWORKING & TELECOMMUNICATION

Viable correspondence is fundamental for the accomplishment of each significant human endeavor, from building extraordinary urban areas to taking up arms to running a cutting edge association. Today we utilize electronic informing and systems administration to contract the world and empower individuals wherever to convey and connect successfully without requiring face-to-face gatherings. Despite your picked major or future vocation field, you will require the correspondences capacities given by broadcast communications and organizations, particularly if your work includes the inventory network. Among all business capacities, inventory network the board may utilize media communications and organizations the most on the grounds that it requires participation and correspondences among laborers in inbound coordination's, distribution

center and capacity, creation, completed item stockpiling, outbound coordination's, and generally significant, with clients, providers, and transporters. All individuals from the production network should cooperate adequately to build the worth saw by the client, so accomplices should convey well. Different workers in HR, money, innovative work, promoting, and deals positions should likewise utilize interchanges innovation to speak with individuals inside and outside the association. To be an effective individual from any association, you should have the option to exploit the abilities that these advancements offer you. This section starts by examining the significance of viable interchanges.

5.2. COMPUTER NETWORK COMPONENTS

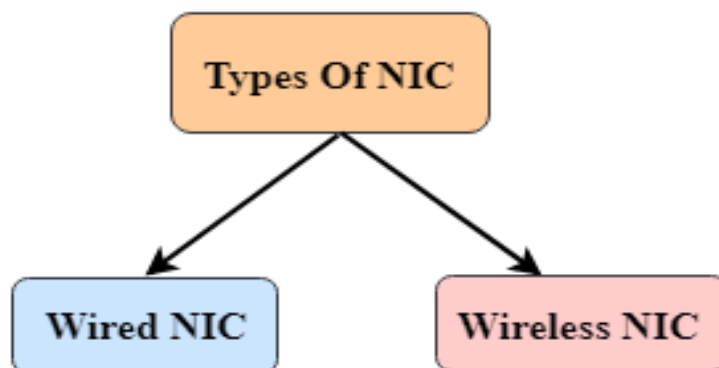
Computer network components are the major parts which are needed to install the software. Some important network components are NIC, switch, cable, hub, router, and modem. Depending on the type of network that we need to install, some network components can also be removed. For example, the wireless network does not require a cable.

Following are the significant parts needed to introduce an organization:

5.2.1. NIC

- NIC represents network interface card.
- NIC is an equipment part used to interface a PC with one more PC onto an organization
- It can uphold an exchange pace of 10,100 to 1000 Mb/s.
- The MAC address or actual location is encoded on the organization card chip which is allocated by the IEEE to distinguish an organization card exceptionally. The MAC address is put away in the PROM (Programmable read-just memory).

There are two types of NIC:



1. Wired NIC
2. Wireless NIC

Wired NIC: The Wired NIC is present inside the motherboard. Cables and connectors are used with wired NIC to transfer data.

Wireless NIC: The wireless NIC contains the antenna to obtain the connection over the wireless network. For example, laptop computer contains the wireless NIC.

5.2.2. Hub

A Hub is an equipment gadget that splits the organization association between different gadgets. At the point when PC demands for some data from an organization, it initially sends the solicitation to the Hub through link. Center will communicate this solicitation to the whole organization. Every one of the gadgets will check if the solicitation has a place with them. If not, the solicitation will be dropped.

The interaction utilized by the Hub burns-through more transmission capacity and limits the measure of correspondence. These days, the utilization of center is old, and it is supplanted by further developed PC network parts like Switches, Routers.

5.2.3. Switch

A switch is an equipment gadget that associates different gadgets on a PC organization. A Switch contains further developed components than Hub. The Switch contains the refreshed table that chooses where the information is sent or not. Switch conveys the message to the right objective dependent on the actual location present in the approaching message. A Switch doesn't communicate the message to the whole organization like the Hub. It decides the gadget to whom the message is to be sent. In this way, we can say that switch gives an immediate association between the source and objective. It speeds up the organization.

5.2.4. Router

- A switch is an equipment gadget which is utilized to interface a LAN with a web association. It is utilized to get, examine and forward the approaching parcels to another organization.
- A switch works in a Layer 3 (Network layer) of the OSI Reference model.
- A switch advances the bundle dependent on the data accessible in the steering table.
- It decides the best way from the accessible ways for the transmission of the bundle.

Advantages of Router:

- **Security:** The data which is sent to the organization will cross the whole link, however the main indicated gadget which has been tended to can peruse the information.

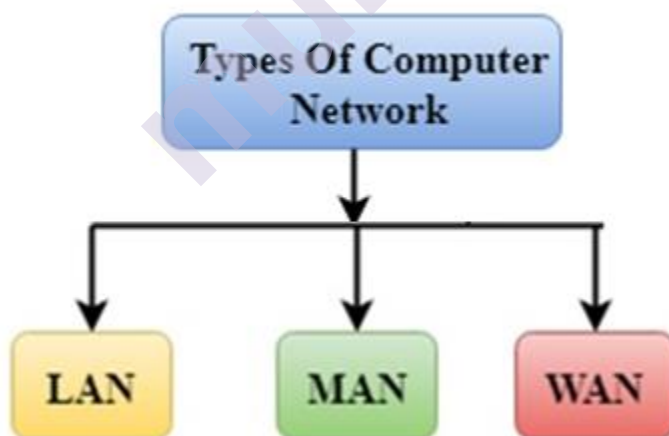
- **Reliability:** If the server has quit working, the organization goes down, yet no different organizations are influenced that are served by the switch.
- **Performance:** Router improves the general exhibition of the organization. Assume there are 24 workstations in an organization produces an equivalent measure of traffic. This builds the traffic load on the organization. Switch parts the single organization into two organizations of 12 workstations each, decreases the traffic load considerably.

5.2.5. Modem

- A modem is an equipment gadget that permits the PC to interface with the web over the current phone line.
- A modem isn't incorporated with the motherboard as opposed to it is introduced on the PCI space found on the motherboard.
- It represents Modulator/Demodulator. It changes over the advanced information into a simple sign via phone lines.

Based on the differences in speed and transmission rate, a modem can be classified in the following categories:

- Standard PC modem or Dial-up modem
- Cellular Modem
- Cable modem



5.3. COMPUTER NETWORK TYPES

A PC network is a gathering of PCs connected to one another that empowers the PC to speak with another PC and offer their assets, information, and applications.

A PC organization can be sorted by their size. A PC network is mostly of four sorts:



- LAN(Local Area Network)
- MAN(Metropolitan Area Network)
- WAN(Wide Area Network)

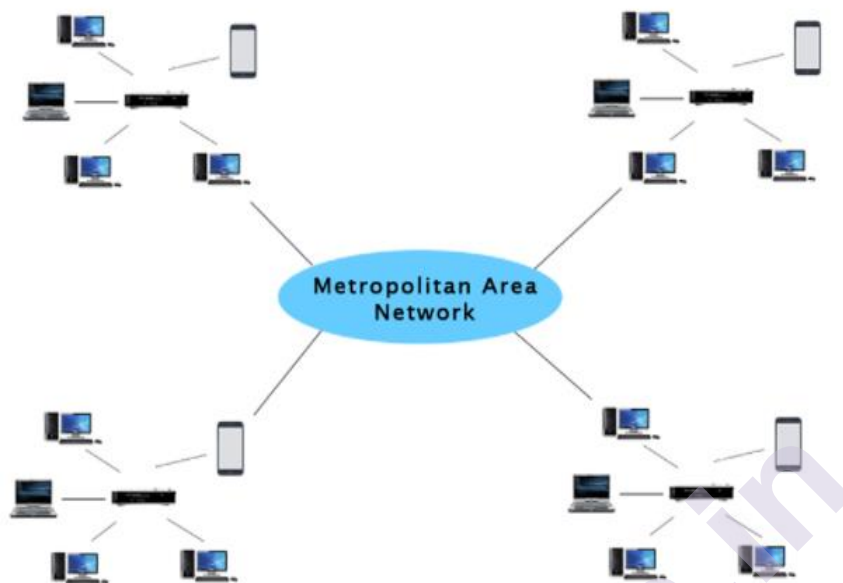
5.3.1. LAN(Local Area Network)

- Local Area Network is a gathering of PCs associated with one another in a little region like structure, office.
- LAN is utilized for interfacing at least two PCs through a correspondence medium like contorted pair, coaxial link, and so forth
- It is less expensive as it is worked with cheap equipment like centers, network connectors, and ethernet links.
- The information is moved at an amazingly quicker rate in Local Area Network.
- Local Area Network gives higher security.

5.3.2. MAN (Metropolitan Area Network)

- A metropolitan region network is an organization that covers a bigger geographic region by interconnecting an alternate LAN to frame a bigger organization.
- Government offices use MAN to associate with the residents and private businesses.
- In MAN, different LANs are associated with one another through a phone trade line.

- The most broadly utilized conventions in MAN are RS-232, Frame Relay, ATM, ISDN, OC-3, ADSL, and so on
- It has a higher reach than Local Area Network(LAN).

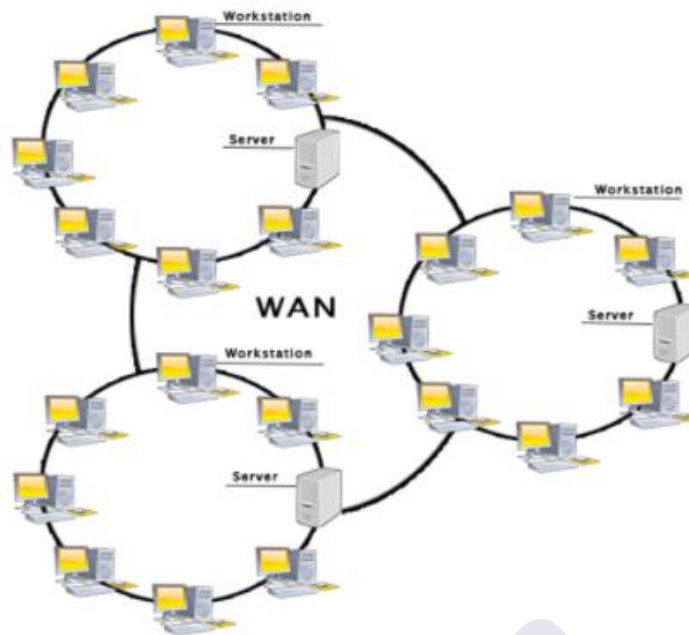


Uses of Metropolitan Area Network:

- MAN is utilized in correspondence between the banks in a city.
- It can be utilized in an Airline Reservation.
- It can be utilized in a school inside a city.
- It can likewise be utilized for correspondence in the military.

5.3.3. WAN(Wide Area Network)

- A Wide Area Network is an organization that stretches out over an enormous geological region like states or nations.
- A Wide Area Network is very greater organization than the LAN.
- A Wide Area Network isn't restricted to a solitary area, yet it ranges over an enormous geological region through a phone line, fiber optic link or satellite connections.
- The web is one of the greatest WAN on the planet.
- A Wide Area Network is broadly utilized in the field of Business, government, and schooling.



Examples of Wide Area Network:

- bank provides a private network that connects the 44 offices. This network **Mobile Broadband:** A 4G network is widely used across a region or country.
- **Last mile:** A telecom company is used to provide the internet services to the customers in hundreds of cities by connecting their home with fiber.
- **Private network:** A is made by using the telephone leased line provided by the telecom company.

Advantages of Wide Area Network:

Following are the benefits of the Wide Area Network:

- **Geographical region:** A Wide Area Network gives a huge geological region. Assume in the event that the part of our office is in an alternate city, we can associate with them through WAN. The web gives a rented line through which we can associate with another branch.
- **Centralized information:** in the event of WAN organization, information is concentrated. Accordingly, we don't have to purchase the messages, records or back up servers.
- **Get refreshed documents:** Software organizations work on the live server. Accordingly, the developers get the refreshed documents in no time.

- Exchange messages: In a WAN organization, messages are sent quick. The web application like Facebook, Whatsapp, Skype permits you to speak with companions.
- Sharing of programming and assets: In WAN organization, we can share the product and different assets like a hard drive, RAM.
- Global business: We can do the business over the web around the world.
- High data transmission: If we utilize the rented lines for our organization then this gives the high transfer speed. The high transmission capacity builds the information move rate which thusly expands the efficiency of our organization.

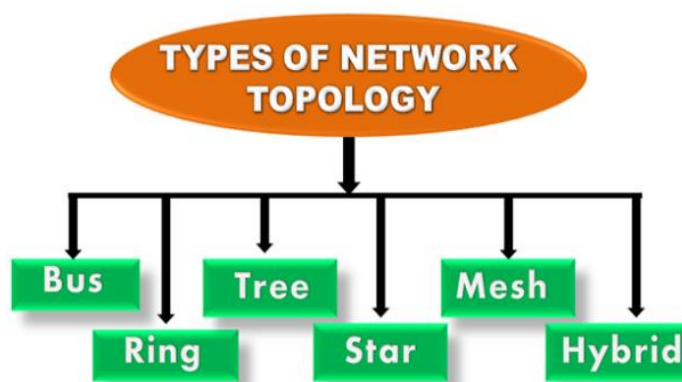
Disadvantages of Wide Area Network:

- Security issue: A WAN organization has greater security issues when contrasted with LAN and MAN network as every one of the advances are joined together that makes the security issue.
- Needs Firewall and antivirus programming: The information is moved on the web which can be changed or hacked by the programmers, so the firewall should be utilized. Certain individuals can infuse the infection in our framework so antivirus is expected to shield from such an infection.
- High Setup cost: An establishment cost of the WAN organization is high as it includes the buying of switches, switches.
- Troubleshooting issues: It covers an enormous region so fixing the issue is troublesome.

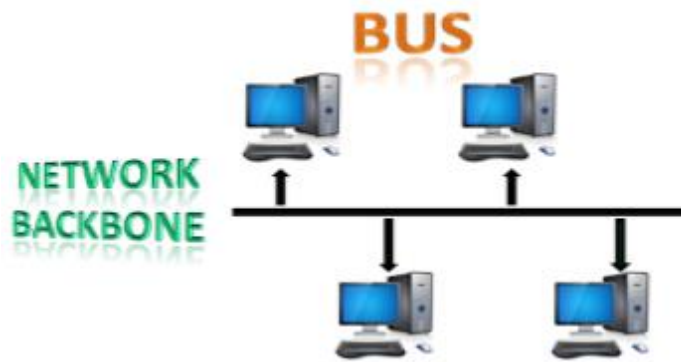
5.4.1. Network Topology

Topology defines the structure of the network of how all the components are interconnected to each other. There are two types of topology: physical and logical topology.

Physical topology is the geometric representation of all the nodes in a network.



5.4.2. Bus Topology



- The transport geography is planned so that every one of the stations are associated through a solitary link known as a spine link.
- Each hub is either associated with the spine link by drop link or straightforwardly associated with the spine link.
- When a hub needs to communicate something specific over the organization, it puts a message over the organization. Every one of the stations accessible in the organization will get the message if it has been tended to.
- The transport geography is essentially utilized in 802.3 (ethernet) and 802.4 standard organizations.
- The arrangement of a transport geography is very less complex when contrasted with different geographies.
- The spine link is considered as a "solitary path" through which the message is communicated to every one of the stations.
- The most normal access strategy for the transport geographies is CSMA (Carrier Sense Multiple Access).

CSMA: It is a media access control used to control the information stream so information honesty is kept up with, i.e., the parcels don't get lost. There are two elective methods of taking care of the issues that happen when two hubs send the messages at the same time.

CSMA CD: CSMA CD (Collision recognition) is an entrance technique used to recognize the crash. When the crash is identified, the sender will quit communicating the information. Thusly, it chips away at "recuperation after the impact".

CSMA CA: CSMA CA (Collision Avoidance) is an access method used to avoid the collision by checking whether the transmission media is busy or not. If busy, then the sender waits until the media becomes idle. This technique effectively reduces the possibility of the collision. It does not work on "recovery after the collision".

Advantages of Bus topology:

- **Low-cost link:** In transport geography, hubs are straightforwardly associated with the link without going through a center. Hence, the underlying expense of establishment is low.
- **Moderate information speeds:** Coaxial or turned pair links are essentially utilized in transport based organizations that help upto 10 Mbps.
- **Familiar innovation:** Bus geography is a recognizable innovation as the establishment and investigating methods are notable, and equipment parts are effectively accessible.
- **Limited disappointment:** A disappointment in one hub won't have any impact on different hubs.

Disadvantages of Bus topology:

- **Extensive cabling:** A transport geography is very less difficult, yet at the same time it requires a great deal of cabling.
- **Difficult investigating:** It requires particular test hardware to decide the link issues. On the off chance that any shortcoming happens in the link, it would upset the correspondence for every one of the hubs.
- **Signal obstruction:** If two hubs send the messages at the same time, then, at that point, the signs of both the hubs crash into one another.
- **Reconfiguration troublesome:** Adding new gadgets to the organization would dial back the organization.
- **Attenuation:** Attenuation is a deficiency of sign prompts correspondence issues. Repeaters are utilized to recover the sign.

5.4.3. Ring Topology



- Ring topology is like a bus topology, but with connected ends.
- The node that receives the message from the previous computer will retransmit to the next node.
- The data flows in one direction, i.e., it is unidirectional.
- The data flows in a single loop continuously known as an endless loop.
- It has no terminated ends, i.e., each node is connected to other node and having no termination point.
- The data in a ring topology flow in a clockwise direction.
- The most common access method of the ring topology is token passing.
- Token passing: It is a network access method in which token is passed from one node to another node.
- Token: It is a frame that circulates around the network.

Working of Token passing

- A token moves around the organization, and it is passed from one PC to another until it arrives at the objective.
- The sender alters the token by putting the location alongside the information.
- The information is passed starting with one gadget then onto the next gadget until the objective location matches. When the token got by the objective gadget, then, at that point, it sends the affirmation to the sender.
- In a ring geography, a token is utilized as a transporter.

Advantages of Ring topology:

- Network Management: Faulty gadgets can be taken out from the organization without cutting the organization down.
- Product accessibility: Many equipment and programming instruments for network activity and checking are accessible.
- Cost: Twisted pair cabling is modest and effectively accessible. Along these lines, the establishment cost is exceptionally low.
- Reliable: It is a more solid organization in light of the fact that the correspondence framework isn't subject to the single host PC.

Disadvantages of Ring topology:

- **Difficult investigating:** It requires particular test hardware to decide the link shortcomings. On the off chance that any shortcoming happens in the link, it would upset the correspondence for every one of the hubs.
- **Failure:** The breakdown in one station prompts the disappointment of the general organization.
- **Reconfiguration troublesome:** Adding new gadgets to the organization would dial back the organization.
- **Delay:** Communication delay is straightforwardly relative to the quantity of hubs. Adding new gadgets builds the correspondence delay.

5.4.5. Star Topology



- Star geography is a game plan of the organization where each hub is associated with the focal center, switch or a focal PC.
- The focal PC is known as a server, and the fringe gadgets joined to the server are known as customers.
- Coaxial link or RJ-45 links are utilized to associate the PCs.
- Hubs or Switches are mostly utilized as association gadgets in an actual star geography.
- Star geography is the most famous geography in network execution

Advantages of Star topology

- **Efficient investigating:** Troubleshooting is very proficient in a star geography when contrasted with transport geography. In a transport geography, the chief needs to assess the kilometers of link. In a star

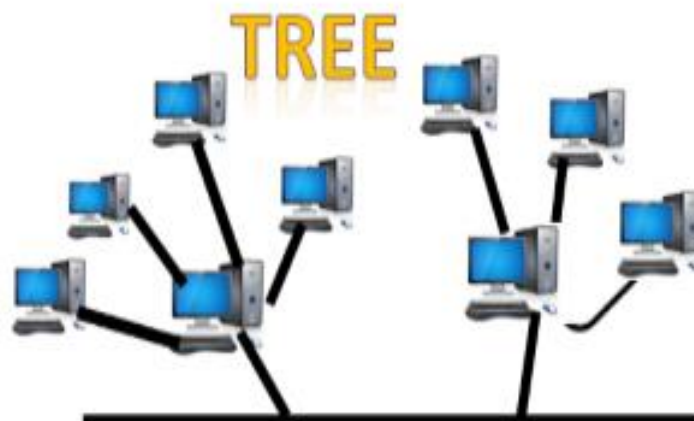
geography, every one of the stations are associated with the concentrated organization. In this manner, the organization executive needs to go to the single station to investigate the issue.

- **Network control:** Complex organization control provisions can be effortlessly executed in the star geography. Any progressions made in the star geography are consequently obliged.
- **Limited disappointment:** As each station is associated with the focal center with its own link, in this way disappointment in one link won't influence the whole organization.
- **Familiar innovation:** Star geography is a recognizable innovation as its apparatuses are savvy.
- **Easily expandable:** It is effectively expandable as new stations can be added to the open ports on the center.
- **Cost powerful:** Star geography networks are practical as it utilizes modest coaxial link.
- **High information speeds:** It upholds a transmission capacity of approx 100Mbps. Ethernet 100BaseT is one of the most well known Star geography organizations.

Disadvantages of Star topology

- **A Central point of failure:** If the central hub or switch goes down, then all the connected nodes will not be able to communicate with each other.
- **Cable:** Sometimes cable routing becomes difficult when a significant amount of routing is required.

5.4.6. Tree topology



- Tree geography joins the attributes of transport geography and star geography.
- A tree geography is a kind of design wherein every one of the PCs are associated with one another in various leveled style.
- The top-most hub in tree geography is known as a root hub, and any remaining hubs are the relatives of the root hub.
- There is just a single way exists between two hubs for the information transmission. Accordingly, it shapes a parent-youngster progressive system.

Advantages of Tree topology

- **Support for broadband transmission:** Tree geography is primarily used to give broadband transmission, i.e., signals are sent over significant distances without being constricted.
- **Easily expandable:** We can add the new gadget to the current organization. Consequently, we can say that tree geography is effectively expandable.
- **Easily reasonable:** In tree geography, the entire organization is separated into sections known as star networks which can be effortlessly overseen and kept up with.
- **Error identification:** Error location and blunder adjustment are exceptionally simple in a tree geography.
- **Limited disappointment:** The breakdown in one station doesn't influence the whole organization.
- **Point-to-point wiring:** It has highlight point wiring for individual sections.

Disadvantages of Tree topology

- **Difficult investigating:** If any shortcoming happens in the hub, then, at that point, it becomes hard to investigate the issue.
- **High cost:** Devices needed for broadband transmission are expensive.
- **Failure:** A tree geography principally depends on primary transport link and disappointment in fundamental transport link will harm the general organization.
- **Reconfiguration troublesome:** If new gadgets are added, then, at that point, it becomes hard to reconfigure.

5.4.7. Mesh topology



- Mesh innovation is a plan of the organization wherein PCs are interconnected with one another through different excess associations.
- There are numerous ways starting with one PC then onto the next PC.
- It doesn't contain the switch, center or any focal PC which goes about as an essential issue of correspondence.
- The Internet is an illustration of the lattice geography.
- Mesh geography is chiefly utilized for WAN executions where correspondence disappointments are a basic concern.
- Mesh topology is mainly used for wireless networks.
- Mesh topology can be formed by using the formula:
- Number of cables = $(n*(n-1))/2$;
- Where n is the number of nodes that represents the network.

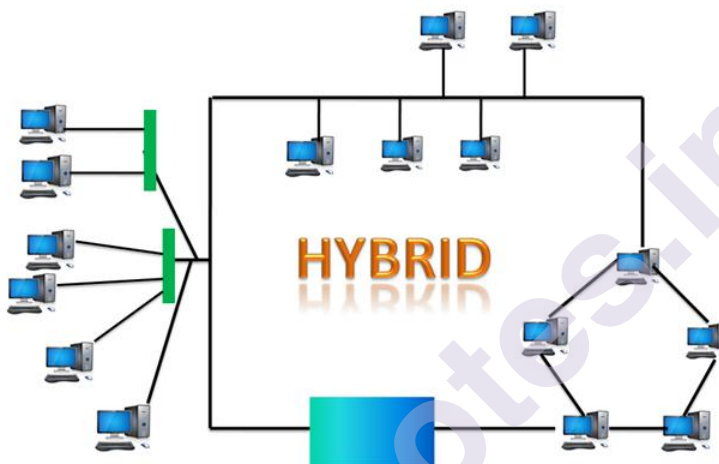
Advantages of Mesh topology:

- **Reliable:** The mesh topology networks are very reliable as if any link breakdown will not affect the communication between connected computers.
- **Fast Communication:** Communication is very fast between the nodes.
- **Easier Reconfiguration:** Adding new devices would not disrupt the communication between other devices.

Disadvantages of Mesh topology

- **Cost:** A mesh topology contains a large number of connected devices such as a router and more transmission media than other topologies.
- **Management:** Mesh topology networks are very large and very difficult to maintain and manage. If the network is not monitored carefully, then the communication link failure goes undetected.
- **Efficiency:** In this topology, redundant connections are high that reduces the efficiency of the network

5.4.8. Hybrid Topology



- The mix of different various geographies is known as Hybrid geography.
- A Hybrid geography is an association between various connections and hubs to move the information.
- When at least two distinct geographies are joined together is named as Hybrid geography and if comparative geographies are associated with one another won't bring about Hybrid geography. For instance, if there exist a ring geography in one part of ICICI bank and transport geography in one more part of ICICI bank, interfacing these two geographies will bring about Hybrid geography.

Advantages of Hybrid Topology

- **Reliable:** If a shortcoming happens in any piece of the organization won't influence the working of the remainder of the organization.
- **Scalable:** Size of the organization can be effortlessly extended by adding new gadgets without influencing the usefulness of the current organization.

- **Flexible:** This geography is entirely adaptable as it very well may be planned by the prerequisites of the association.
- **Effective:** Hybrid geography is exceptionally powerful as it very well may be planned so that the strength of the organization is expanded and shortcoming of the organization is limited.

Disadvantages of Hybrid topology

- **Complex plan:** The significant downside of the Hybrid geography is the plan of the Hybrid organization. It is undeniably challenging to plan the design of the Hybrid organization.
- **Costly Hub:** The Hubs utilized in the Hybrid geography are over the top expensive as these center points are unique in relation to common Hubs utilized in different geographies.
- **Costly framework:** The foundation cost is exceptionally high as a half and half organization requires a ton of cabling, network gadgets, and so on

SUMMARY

In this chapter we covered about conceptual framework of Networking & Telecommunication, Computer Network Components, NIC, Hub, switch, Router, Modem, Also we learned about types of computer network, LAN,MAN,WAN, and Network Topology

REFERENCES

- Principles of Information System by ralph stair and George Reynolds
- www.javatpoint.com

QUESTIONS

- 1) What are the components of computer network.
- 2) Write a short note on NIC.
- 3) Explain the concept of Router.
- 4) Write a short note on MAN.
- 5) Write a Short note on WAN.
- 6) Explain Network topology.
- 7) Explain Ring topology.

COMPUTER NETWORKS AND MEDIUM OF COMMUNICATION

Unit Structure

- 6.1. Various Options Computer Network In Business
 - 6.1.1. Benefits of Computer Networking In Business
- 6.2. Various Medium of Communication
 - 6.2.1. Simplex mode
 - 6.2.2. Half-Duplex mode
 - 6.2.3. Full-duplex mode
 - 6.2.4. Physical and Cable less Transmission media
- 6.3. Classification of Transmission Media
- 6.4. Guided Media
 - 6.4.1. Twisted pair:
 - 6.4.2. Shielded Twisted Pair
 - 6.4.3. Coaxial Cable
 - 6.4.4. Fibre Optic
- 6.5. UnGuided Transmission
 - 6.5.1. Microwaves
 - 6.5.2. Satellite Microwave Communication
 - 6.5.3. Infrared
- 6.6. Internet Technology
 - 6.6.1. How Internet Work

6.1. VARIOUS OPTIONS COMPUTER NETWORK IN BUSINESS

As a business grows, so does its equipment. The more computers and devices a company has the more spread out the programs and information become. Unless you have your computers networked together.

Computer networking is a group of computers that are configured together while not necessarily in the same physical location. When your computers are connected, the transmitted data between the computers make for more seamless communications and operations across the company.

It's also very cost-effective as it allows computers to share hardware and software licenses, cutting back on those company expenses.

6.1.1. Benefits of Computer Networking In Business

Record Sharing Takes Into Account Further Developed Correspondences On A Strong Organization. Consistency Across Individual Pcs With A Focal Information Base Makes Firm Working Frameworks. The Advantages For Business Are Bigger Capacity Limit, Compelling Correspondence, Adaptability, And Getting A Good Deal On The Expenses Of Programming.

1. Large Storage Capacity

With computer networking, your critical files are all a part of central file servers. Your employees can access these files and learn from the data for improved business operations. A central server lowers the number of storage systems you need for the company's data. You gain storage space with an increase in employee productivity with access to files.

2. Improved Business Communication

Information is the basis of communication. Modern networking allows the transfer of information in real-time anywhere with internet access. When your team has access to network files from any device you have more flexibility with remote workers and employees that need to work outside of the office.

The more information available to employees, the more independently they can work. Downtime is a revenue killer. Network access to employees creates the company growth needed to reach long-term business goals.

If you have any issue with one device, you can access your information when you log into another device. This creates network security where you don't have to worry about losing critical files.

3. Flexibility and Convenience

Admittance to data through the organization eliminates steps that workers take to get the data they need for their day by day assignments. At the point when PCs aren't associated you need to move records through a USB drive or messages.

With PC sharing workers can take records from some other associated PC as though it were all alone. This rates up the every day undertakings of your representatives and makes an exceptionally practical work process.

4. Cost Benefits of Computer Networking

A quality PC network considers asset sharing across gadgets. You will require less equipment when your PCs are associated and

equipment is expensive gear. Workers will not require separate printers or reinforcement stockpiling when their PCs are associated.

You will not have to introduce as numerous product updates and representatives can share archive checking programming. The capacity to divide innovation resources between workers is one of the greatest money saving advantages of this systems administration arrangement.

5. Networked Versions of Software

Purchasing programming for each PC and gadget isn't the most financially savvy way of getting your workers the apparatuses that they need. Numerous product organizations offer adaptations of their product that were made for networks. This way you can buy a solitary permit for the item you need. You would then be able to make them run on the focal server that the singular PCs are associated with.

This stops hauling around a USB drive and exchanging it with the following worker that needs the permit. At the point when you have a group of individuals with admittance to the instruments they need, you have an effective group of self-starters.

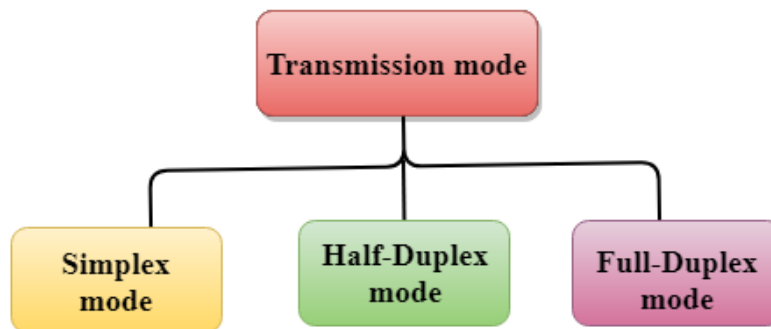
6. Improved Customer Service

At the point when your workers approach organization data they are better ready to serve clients and customers. They can pull up all the data they need on the client and give replies to their inquiries rapidly. They can likewise add data about the client into the framework with the goal that different workers can be refreshed continuously.

6.2. VARIOUS MEDIUM OF COMMUNICATION

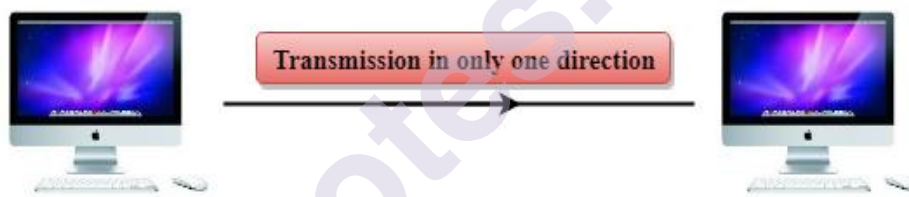
- The manner by which information is communicated starting with one gadget then onto the next gadget is known as transmission mode.
- The transmission mode is otherwise called the correspondence mode.
- Each correspondence channel has a course connected with it, and transmission media give the bearing. Subsequently, the transmission mode is otherwise called a directional mode.
- The transmission mode is characterized in the actual layer.

The Transmission mode is divided into three categories:



- Simplex mode
- Half-duplex mode
- Full-duplex mode

6.2.1.Simplex mode



In Simplex mode, the correspondence is unidirectional, i.e., the information stream one way.

- A gadget can just send the information yet can't get it or it can get the information yet can't send the information.
- This transmission mode isn't extremely famous as predominantly interchanges require the two-way trade of information. The simplex mode is utilized in the business field as in deals that don't need any comparing answer.
- The radio broadcast is a simplex channel as it communicates the sign to the audience members however never permits them to send back.
- Keyboard and Monitor are the instances of the simplex mode as a console can just acknowledge the information from the client and screen must be utilized to show the information on the screen.
- The fundamental benefit of the simplex mode is that the full limit of the correspondence channel can be used during transmission

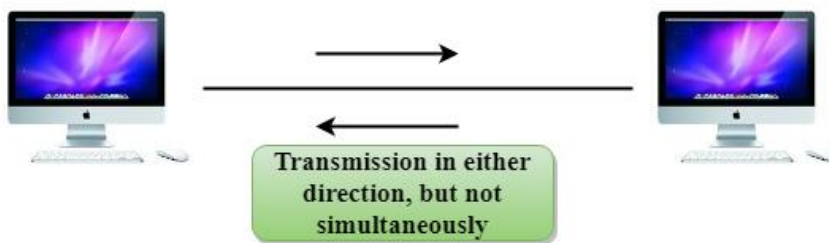
Advantage of Simplex mode:

- In simplex mode, the station can utilize the entire bandwidth of the communication channel, so that more data can be transmitted at a time.

Disadvantage of Simplex mode:

- Communication is unidirectional, so it has no inter-communication between devices.

6.2.2. Half-Duplex mode



- In a Half-duplex channel, direction can be reversed, i.e., the station can transmit and receive the data as well.
- Messages flow in both the directions, but not at the same time.
- The entire bandwidth of the communication channel is utilized in one direction at a time.
- In half-duplex mode, it is possible to perform the error detection, and if any error occurs, then the receiver requests the sender to retransmit the data.
- A Walkie-talkie is an example of the Half-duplex mode. In Walkie-talkie, one party speaks, and another party listens. After a pause, the other speaks and first party listens. Speaking simultaneously will create the distorted sound which cannot be understood.

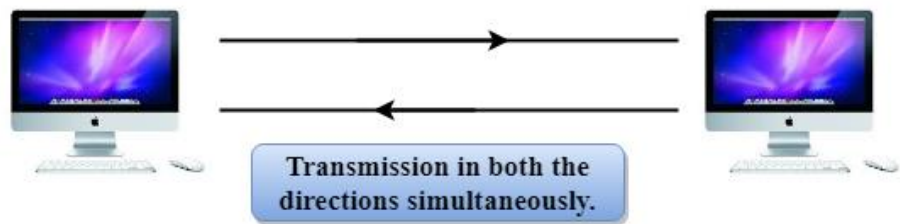
Advantage of Half-duplex mode:

- In half-duplex mode, both the devices can send and receive the data and also can utilize the entire bandwidth of the communication channel during the transmission of data.

Disadvantage of Half-Duplex mode:

- In half-duplex mode, when one device is sending the data, then another has to wait, this causes the delay in sending the data at the right time.

6.2.3. Full-duplex mode



- In Full duplex mode, the communication is bi-directional, i.e., the data flow in both the directions.
- Both the stations can send and receive the message simultaneously.
- Full-duplex mode has two simplex channels. One channel has traffic moving in one direction, and another channel has traffic flowing in the opposite direction.
- The Full-duplex mode is the fastest mode of communication between devices.
- The most common example of the full-duplex mode is a telephone network. When two people are communicating with each other by a telephone line, both can talk and listen at the same time.

Advantage of Full-duplex mode:

- Both the stations can send and receive the data at the same time.

Disadvantage of Full-duplex mode:

- If there is no dedicated path exists between the devices, then the capacity of the communication channel is divided into two parts.

6.2.4. Physical and Cable less Transmission media

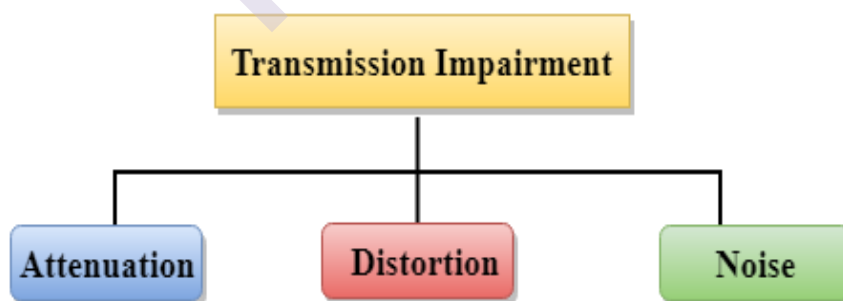
- Transmission media is a correspondence channel that conveys the data from the sender to the collector. Information is communicated through the electromagnetic signs.
- The principle usefulness of the transmission media is to convey the data as pieces through LAN(Local Area Network).
- It is an actual way among transmitter and recipient in information correspondence.
- In a copper-based organization, the pieces as electrical signs.
- In a fiber based organization, the pieces as light heartbeats.
- In OSI(Open System Interconnection) stage, transmission media upholds the Layer 1. Along these lines, it is viewed as a Layer 1 part.

- The electrical signs can be sent through the copper wire, fiber optics, climate, water, and vacuum.
- The attributes and nature of information transmission are dictated by the qualities of medium and sign.
- Transmission media is of two sorts are wired media and remote media. In wired media, medium attributes are more significant while, in remote media, signal qualities are more significant.
- Different transmission media have various properties like data transfer capacity, deferral, cost and simplicity of establishment and upkeep.
- The transmission media is accessible in the least layer of the OSI reference model, i.e., Physical layer.

Some factors need to be considered for designing the transmission media:

- **Bandwidth:** All the components are staying consistent, the more noteworthy the transfer speed of a medium, the higher the information transmission pace of a sign.
 - **Transmission weakness:** When the got signal isn't indistinguishable from the sent one because of the transmission hindrance. The nature of the signs will get annihilated because of transmission hindrance.
 - **Interference:** An impedance is characterized as the method involved with upsetting a sign when it goes over a correspondence medium on the expansion of some undesirable sign.

Causes of Transmission Impairment

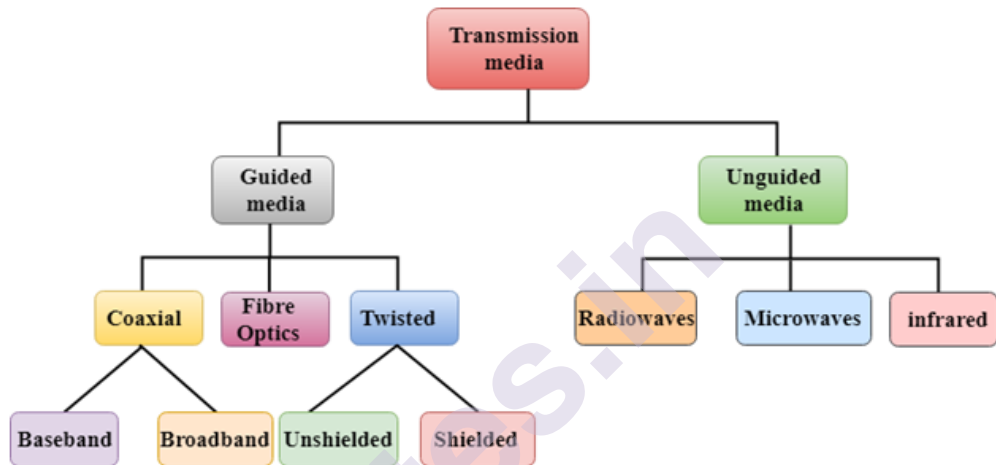


- **Attenuation:** Attenuation implies the deficiency of energy, i.e., the strength of the sign reductions with expanding the distance which causes the deficiency of energy.
- **Distortion:** Distortion happens when there is an adjustment of the state of the sign. This kind of twisting is inspected from various signs having various frequencies. Every recurrence part has its own

engendering speed, so they reach at an alternate time which prompts the defer twisting.

- **Noise:** When information is gone over a transmission medium, some undesirable sign is added to it which makes the clamor.

6.3. CLASSIFICATION OF TRANSMISSION MEDIA



6.4. GUIDED MEDIA

It is defined as the physical medium through which the signals are transmitted. It is also known as Bounded media.

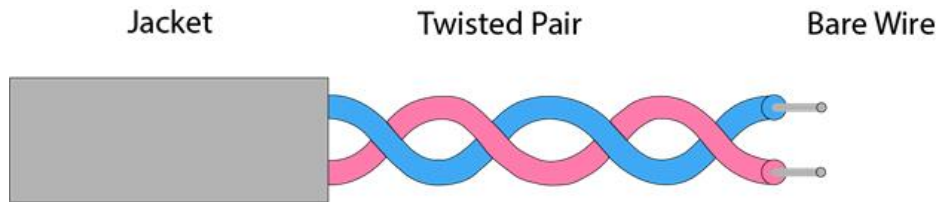
Types of Guided media:

6.4.1. Twisted pair:

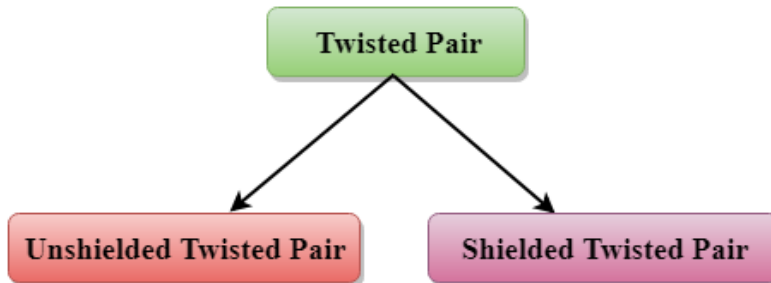
Twisted pair is a physical media made up of a pair of cables twisted with each other. A twisted pair cable is cheap as compared to other transmission media. Installation of the twisted pair cable is easy, and it is a lightweight cable. The frequency range for twisted pair cable is from 0 to 3.5KHz.

A twisted pair consists of two insulated copper wires arranged in a regular spiral pattern.

The degree of reduction in noise interference is determined by the number of turns per foot. Increasing the number of turns per foot decreases noise interference.



Types of Twisted pair



Unshielded Twisted Pair:

An unshielded twisted pair is widely used in telecommunication. Following are the categories of the unshielded twisted pair cable:

Category 1: Category 1 is used for telephone lines that have low-speed data.

Category 2: It can support upto 4Mbps.

Category 3: It can support upto 16Mbps.

Category 4: It can support upto 20Mbps. Therefore, it can be used for long-distance communication.

Category 5: It can support upto 200Mbps.

Advantages Of Unshielded Twisted Pair:

- It is cheap.
- Installation of the unshielded twisted pair is easy.
- It can be used for high-speed LAN.

Disadvantage:

This cable can only be used for shorter distances because of attenuation.

6.4.2. Shielded Twisted Pair

A shielded twisted pair is a cable that contains the mesh surrounding the wire that allows the higher transmission rate.

Characteristics Of Shielded Twisted Pair:

- The cost of the shielded twisted pair cable is not very high and not very low.
- An installation of STP is easy.

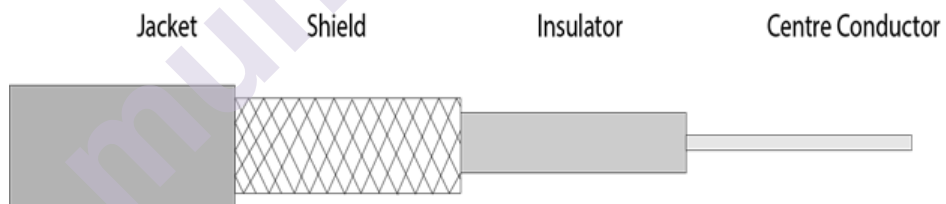
- It has higher capacity as compared to unshielded twisted pair cable.
- It has a higher attenuation.
- It is shielded that provides the higher data transmission rate.

Disadvantages

- It is more expensive as compared to UTP and coaxial cable.
- It has a higher attenuation rate.

6.4.3. Coaxial Cable

- Coaxial link is ordinarily utilized transmission media, for instance, TV wire is typically a coaxial link.
- The name of the link is coaxial as it contains two conductors corresponding to one another.
- It has a higher recurrence when contrasted with Twisted pair link.
- The internal conveyor of the coaxial link is comprised of copper, and the external transmitter is comprised of copper network. The center is comprised of non-conductive cover that isolates the internal conductor from the external conductor.
- The center is answerable for the information moving while the copper network keeps from the EMI(Electromagnetic impedance).



Coaxial cable is of two types:

1. **Baseband transmission:** It is defined as the process of transmitting a single signal at high speed.
2. **Broadband transmission:** It is defined as the process of transmitting multiple signals simultaneously.

Advantages Of Coaxial cable:

- The data can be transmitted at high speed.
- It has better shielding as compared to twisted pair cable.
- It provides higher bandwidth.

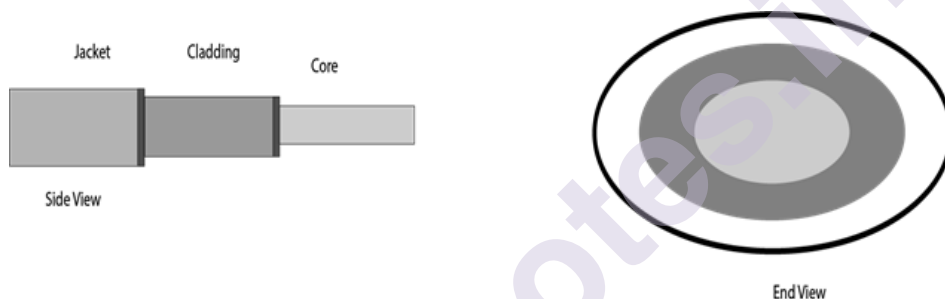
Disadvantages Of Coaxial cable:

- It is more expensive as compared to twisted pair cable.
- If any fault occurs in the cable causes the failure in the entire network.

6.4.4. Fibre Optic

- Fibre optic link is a link that utilizes electrical signs for correspondence.
- Fibre optic is a link that holds the optical strands covered in plastic that are utilized to send the information by beats of light.
- The plastic covering shields the optical strands from heat, chilly, electromagnetic impedance from different sorts of wiring.
- Fibre optics give quicker information transmission than copper wires.

Diagrammatic representation of fibre optic cable:



Basic elements of Fibre optic cable:

- **Core:** A center is a light transmission space of the fiber. Deeply, the more light will be sent into the fiber.
- **Cladding:** The concentric layer of glass is known as cladding. The principle usefulness of the cladding is to give the lower refractive index at the center interface as to cause the reflection inside the center with the goal that the light waves are sent through the fiber.
- **Jacket:** The defensive covering comprising of plastic is known as a coat. The Fundamental reason for a coat is to safeguard the fiber strength, retain shock and additional fiber security.

Following are the advantages of fibre optic cable over copper:

- **Greater Bandwidth:** The fiber optic link gives more data transmission as analyzed copper. Consequently, the fiber optic conveys more information when contrasted with copper link.
- **Faster speed:** Fiber optic link conveys the information as light. This permits the fiber optic link to convey the signs at a higher speed.

- Longer distances: The fiber optic link conveys the information at a more drawn out distance when contrasted with copper link.
- Better dependability: The fiber optic link is more solid than the copper link as it is safe to any temperature changes while it can cause hinder in the availability of copper link.
- Thinner and Sturdier: Fiber optic link is more slender and lighter in weight so it can withstand more draw strain than copper link.

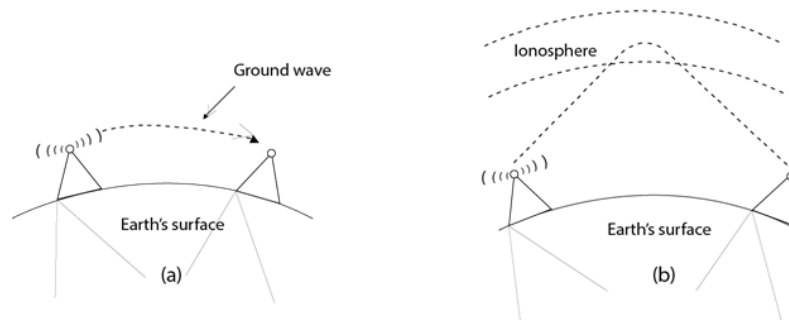
6.5. UNGUIDED TRANSMISSION

- An unguided transmission sends the electromagnetic waves without utilizing any actual medium. Along these lines it is otherwise called remote transmission.
- In unguided media, air is the media through which the electromagnetic energy can stream without any problem.

Unguided transmission is comprehensively arranged into three classifications:

Radio waves

- Radio waves are the electromagnetic waves that are sent in every one of the headings of free space.
- Radio waves are omnidirectional, i.e., the signs are spread in every one of the headings.
- The range in frequencies of radio waves is from 3Khz to 1 khz.
- In the instance of radio waves, the sending and getting recieving wire are not adjusted, i.e., the wave sent by the sending radio wire can be gotten by any getting recieving wire.
- An illustration of the radio wave is FM radio.



Applications Of Radio waves:

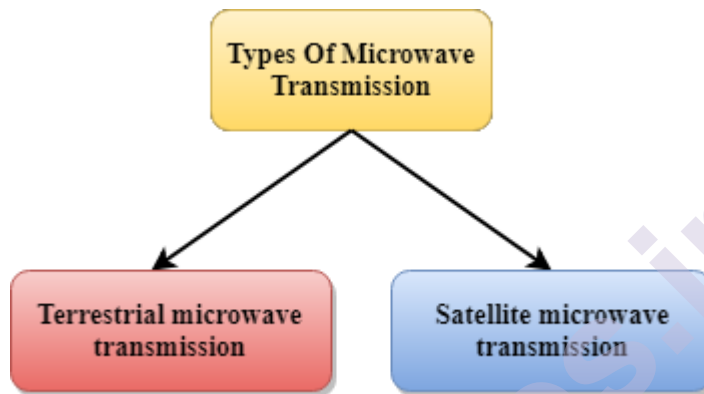
- A Radio wave is useful for multicasting when there is one sender and many receivers.

- An FM radio, television, cordless phones are examples of a radio wave.

Advantages Of Radio transmission:

- Radio transmission is mainly used for wide area networks and mobile cellular phones.
- Radio waves cover a large area, and they can penetrate the walls.
- Radio transmission provides a higher transmission rate.

6.5.1. Microwaves



- Terrestrial microwave
- Satellite microwave communication.

Terrestrial Microwave Transmission

- Terrestrial Microwave transmission is an innovation that sends the engaged light emission radio sign from one ground-based microwave transmission receiving wire to another.
- Microwaves are the electromagnetic waves having the recurrence in the reach from 1GHz to 1000 GHz.
- Microwaves are unidirectional as the sending and getting receiving wire is to be adjusted, i.e., the waves sent by the sending radio wire are barely engaged.
- In this case, receiving wires are mounted on the pinnacles to send a pillar to another radio wire which is km away.
- It deals with the view transmission, i.e., the radio wires mounted on the pinnacles are the immediate sight of one another.

Characteristics of Microwave:

- **Frequency range:** The frequency range of terrestrial microwave is from 4-6 GHz to 21-23 GHz.
- **Bandwidth:** It supports the bandwidth from 1 to 10 Mbps.

- **Short distance:** It is inexpensive for short distance.
- **Long distance:** It is expensive as it requires a higher tower for a longer distance.
- **Attenuation:** Attenuation means loss of signal. It is affected by environmental conditions and antenna size.

Advantages of Microwave:

- Microwave transmission is less expensive than utilizing links.
- It is liberated from land obtaining as it doesn't need any land for the establishment of links.
- Microwave transmission gives a simple correspondence in territories as the establishment of link in landscape is a serious troublesome assignment.
- Communication over seas can be accomplished by utilizing microwave transmission.

Disadvantages of Microwave transmission:

- **Eavesdropping:** An eavesdropping creates insecure communication. Any malicious user can catch the signal in the air by using its own antenna.
- **Out of phase signal:** A signal can be moved out of phase by using microwave transmission.
- **Susceptible to weather condition:** A microwave transmission is susceptible to weather condition. This means that any environmental change such as rain, wind can distort the signal.
- **Bandwidth limited:** Allocation of bandwidth is limited in the case of microwave transmission.

6.5.2. Satellite Microwave Communication

- A satellite is an actual item that spins around the earth at a known tallness.
- Satellite correspondence is more solid these days as it offers more adaptability than link and fiber optic frameworks.
- We can speak with any point on the globe by utilizing satellite correspondence.

How Does Satellite work?

The satellite accepts the signal that is transmitted from the earth station, and it amplifies the signal. The amplified signal is retransmitted to another earth station.

Advantages Of Satellite Microwave Communication:

- The inclusion space of a satellite microwave is more than the earthbound microwave.
- The transmission cost of the satellite is free of the separation from the focal point of the inclusion region.
- Satellite correspondence is utilized in versatile and remote correspondence applications.
- It is not difficult to introduce.
- It is utilized in a wide assortment of utilizations like climate guaging, radio/TV signal telecom, portable correspondence, and so forth

Disadvantages of Satellite Microwave Communication:

- Satellite planning and advancement requires additional time and greater expense.
- The Satellite should be checked and controlled on normal periods so it stays in circle.
- The life of the satellite is around 12-15 years. Because of this explanation, one more dispatch of the satellite must be arranged before it becomes non-utilitarian.

6.5.3. Infrared

- An infrared transmission is a remote innovation utilized for correspondence over short ranges.
- The recurrence of the infrared in the reach from 300 GHz to 400 THz.
- It is utilized for short-range correspondence, for example, information move between two PDAs, TV far off activity, information move between a PC and mobile phone lives in a similar shut region.

Characteristics of Infrared:

- It upholds high transmission capacity, and subsequently the information rate will be extremely high.
- Infrared waves can't infiltrate the dividers. In this way, the infrared correspondence in one room can't be hindered by the close by rooms.
- An infrared correspondence gives better security least impedance.

- Infrared correspondence is problematic external the structure in light of the fact that the sun beams will meddle with the infrared waves.

6.6. INTERNET TECHNOLOGY

Web is a worldwide organization that interfaces billions of PCs across the world with one another and to the World Wide Web. It utilizes standard web convention suite (TCP/IP) to interface billions of PC clients around the world. It is set up by utilizing links like optical strands and other remote and systems administration innovations. As of now, web is the quickest mean of sending or trading data and information between PCs across the world.



It is believed that the internet was developed by "Defense Advanced Projects Agency" (DARPA) department of the United States. And, it was first connected in 1969.

6.6.1. How Internet Work

Web is known as an organization as it makes an organization by associating PCs and servers across the world utilizing switches, switches and phone lines, and other specialized gadgets and channels. Along these lines, it tends to be viewed as a worldwide organization of actual links, for example, copper phone wires, fiber optic links, television links, and so forth Moreover, even remote associations like 3G, 4G, or Wi-Fi utilize these links to get to the Internet.

Web is not the same as the World Wide Web as the World Wide Web is an organization of PCs and servers made by associating them through the web. Thus, the web is the foundation of the web as it gives the specialized framework to build up the WWW and goes about as a medium to send data starting with one PC then onto the next PC. It utilizes internet browsers to show the data on the customer, which it brings from web servers.

The web isn't claimed by a solitary individual or association completely. It is an idea dependent on actual framework that associates networks with different organizations to make a worldwide organization of billions of

PCs. Starting at 12 August 2016, there were in excess of 300 crores of web clients across the world.

The web works with the assistance of customers and servers. A gadget like a PC, which is associated with the web is known as a customer, not a server as it isn't straightforwardly associated with the web. Notwithstanding, it is in a roundabout way associated with the web through an Internet Service Provider (ISP) and is distinguished by an IP address, which is a series of numbers. Very much like you have a location for your home that particularly distinguishes your home, an IP address goes about as the delivery address of your gadget. The IP address is given by your ISP, and you can perceive what IP address your ISP has given to your framework.

A server is a huge PC that stores sites. It additionally has an IP address. Where countless servers are put away is known as a server farm. The server acknowledges demands sent by the customer through a program over an organization (web) and reacts appropriately.

Advantages of the Internet:

- **Instant Messaging:** You can send messages or impart to anybody utilizing web, like email, voice talk, video conferencing, and so forth
- **Get bearings:** Using GPS innovation, you can get headings to pretty much every spot in a city, country, and so on. You can discover cafés, shopping centers, or some other help close to your area.
- **Online Shopping:** It permits you to shop online, for example, you can buy garments, shoes, book film tickets, rail line tickets, flight tickets, and the sky is the limit from there.
- **Pay Bills:** You can take care of your bills on the web, for example, power charges, gas charges, school expenses, and so on
- **Online Banking:** It permits you to utilize web banking in which you can really look at your equilibrium, get or move cash, get an assertion, demand check-book, and so on
- **Online Selling:** You can sell your items or administrations on the web. It assists you with arriving at more clients and in this way builds your deals and benefit.
- **Work from Home:** In the event that you need to telecommute, you can do it utilizing a framework with web access. Today, many organizations permit their representatives to telecommute.
- **Entertainment:** You can pay attention to online music, watch recordings or motion pictures, play web based games.
- **Cloud processing:** It empowers you to interface your PCs and web empowered gadgets to cloud administrations, for example, distributed storage, distributed computing, and so on

- **Career building:** You can look for occupations online on various occupation entryways and send you CV through email whenever required.

SUMMARY:

In this chapter we discuss the concept of Various Options Computer Network in Business, Various Medium of Communication, Classification of Transmission Media, Guided Media, UnGuided Transmission, Internet Technology.

REFERENCES:

- Principles of Information System by ralph stair and George Reynolds
- www.javatpoint.com

QUESTIONS:

- 1) What are the Various Options Computer Network in Business.
- 2) What are the Various Medium of Communication.
- 3) Explain Classification of Transmission Media.
- 4) What are Guided Media.
- 5) What are Unguided Media.
- 6) Write a short note on Internet Technology.

BROWSER

Unit Structure

- 7.1. Browser
 - 7.1.2. History of Web Browser
 - 7.1.3. Features of Web Browser
- 7.2. What is the URL
 - 7.2.1. How does a browser work
 - 7.2.2. List of Internet Browsers
- 7.3. Search Engines
 - 7.3.1 Components of Search Engine
 - 7.3.2 How do search engines work
 - 7.3.3 Search Engine Processing
 - 7.3.4 Search Engine (Google) algorithm updates
 - 7.3.5. Most Popular Search Engines in the world
- 7.4. Website
 - 7.4.1.Types of Websites
- 7.5. Blog
- 7.6. FTP
- 7.7. Voice Over Internet Protocol (VoIP)
- 7.8. Introduction to Cloud Computing
 - 7.8.1. Types of Cloud Computing
 - 7.8.2.What types of cloud services do businesses use?
- 7.9. Cloud Computing For Business
 - 7.9.1.Cloud Business Information Systems

7.1. BROWSER

A browser is a software program that is used to explore, retrieve, and display the information available on the World Wide Web. This information may be in the form of pictures, web pages, videos, and other files that all are connected via hyperlinks and categorized with the help of URLs (Uniform Resource Identifiers). For example, you are viewing this page by using a browser.

A browser is a client program as it runs on a user computer or mobile device and contacts the webserver for the information requested by the user. The web server sends the data back to the browser that displays the results on internet supported devices. On behalf of the users, the browser

sends requests to web servers all over the internet by using HTTP (Hypertext Transfer Protocol). A browser requires a smartphone, computer, or tablet and internet to work.

7.1.2. History of Web Browser

- The **WorldWideWeb** was the first web browser. It was created by W3C Director Tim Berners-Lee in **1990**. Later, it was renamed **Nexus** to avoid confusion caused by the actual World Wide Web.
- The **Lynx** browser was a text-based browser, which was invented in **1992**. It was not able to display the graphical content.
- Although, the first graphical user interface browser was NCSA Mosaic. It was the first most popular browser in the world, which was introduced in **1993**.
- In **1994**, there were some improvements occurred in Mosaic and came to Netscape Navigator.
- In **1995**, Microsoft introduced the **Internet Explorer**. It was the first web browser developed by Microsoft.
- A research project started on Opera in **1994**. Later, it was publicly introduced in 1996.
- **Apple's Safari** browser was introduced in **2003**. It was specifically released for Macintosh computers.
- In **2004**, Mozilla introduced **Firefox** as Netscape Navigator.
- In **2007**, a browser **Mobile Safari** was released as Apple mobile web browser.
- The popular browser **Google Chrome** was launched in **2008**.
- The fast-growing mobile-based browser **Opera Mini** was released in **2011**.
- The Microsoft **Edge** browser was launched in **2015**.

7.1.3. Features of Web Browser

Most Web browsers offer common features such as:

1. **Refresh button:** Refresh button allows the website to reload the contents of the web pages. Most of the web browsers store local copies of visited pages to enhance the performance by using a caching mechanism. Sometimes, it stops you from seeing the updated information; in this case, by clicking on the refresh button, you can see the updated information.

2. **Stop button:** It is used to cancel the communication of the web browser with the server and stops loading the page content. For example, if any malicious site enters the browser accidentally, it helps to save from it by clicking on the stop button.
3. **Home button:** It provides users the option to bring up the predefined home page of the website.
4. **Web address bar:** It allows the users to enter a web address in the address bar and visit the website.
5. **Tabbed browsing:** It provides users the option to open multiple websites on a single window. It helps users to read different websites at the same time. For example, when you search for anything on the browser, it provides you a list of search results for your query. You can open all the results by right-clicking on each link, staying on the same page.
6. **Bookmarks:** It allows the users to select particular website to save it for the later retrieval of information, which is predefined by the users.

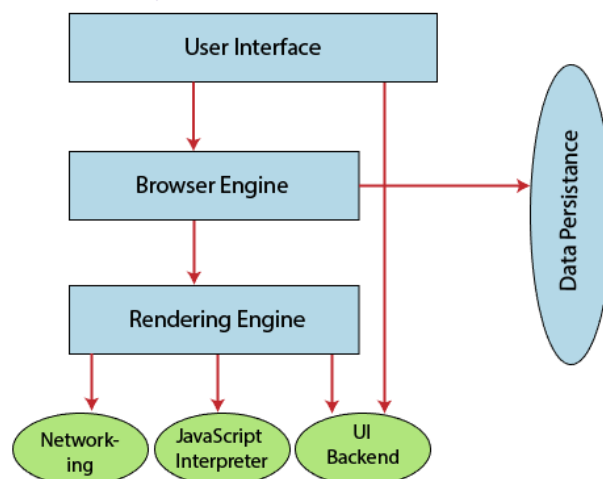
7.2. WHAT IS THE URL (UNIFORM RESOURCE LOCATOR)?

A **uniform resource locator** is the address of a resource on the internet or the World Wide Web. It is also known as a web address or uniform resource identifier (URI). For example, **https://www.mu.ac.in**, which is the URL or web address for the , Mumbai university website.

A URL represents the address of a resource, including the protocol used to access it.

Component of a Web browser

The primary components of a browser are shown in the below image:



1. **User Interface:** The user interface is an area where the user can use several options like address bar, back and forward button, menu, bookmarking, and many other options to interact with the browser.
2. **Browser Engine:** It connects the UI (User Interface) and the rendering engine as a bridge. It queries and manipulates the rendering engine based on inputs from several user interfaces.
3. **Rendering Engine:** It is responsible for displaying the requested content on the browser screen. It translates the HTML, XML files, and images, which are formatted by using the CSS. It generates the layout of the content and displays it on the browser screen. Although it can also display the other types of content by using different types of plugins or extensions. such as:
 - Internet Explorer uses **Trident**
 - Chrome & Opera 15+ use **Blink**
 - Chrome (iPhone) & Safari use **Webkit**
 - Firefox & other Mozilla browsers use **Gecko**
4. **Networking:** It retrieves the URLs by using internet protocols like HTTP or FTP. It is responsible for maintaining all aspects of Internet communication and security. Furthermore, it may be used to cache a retrieved document to reduce network traffic.
5. **JavaScript Interpreter:** As the name suggests, JavaScript Interpreter translates and executes the JavaScript code, which is included in a website. The translated results are sent to the rendering engine to display results on the device screen.
6. **UI Backend:** It is used to draw basic combo boxes and Windows (widgets). It specifies a generic interface, which is not platform-specific.
7. **Data Storage:** The data storage is a persistence layer that is used by the browser to store all sorts of information locally, like cookies. A browser also supports different storage mechanisms such as IndexedDB, WebSQL, localStorage, and FileSystem. It is a database stored on the local drive of your computer where the browser is installed. It handles user data like cache, bookmarks, cookies, and preferences.

7.2.1. How does a browser work

When a user enters a web address or URL in the search bar like javatpoint.com, the request is passed to a **domain name servers** (DNS). All of these requests are routed via several routers and switches.

The domain name servers hold a list of system names and their corresponding IP addresses. Thus, when you type something in the

browser search bar, it gets converted into a number that determines the computers to which the search results are to be displayed.

The browser acts as a part of the client-server model. A browser is a client program that sends the request to the server in response to the user search queries by using Hypertext Transfer Protocol or HTTP. When the server receives the request, it collects information about the requested document and forwards the information back to the browser. Thereafter, the browser translates and displays the information on the user device.

In Brief:

- When a user enters something (like javatpoint.com) in the browser. This request goes to a domain name server.
- The browser sends the user request to the server using an IP address, which is described by the domain name server.
- The domain name server sends an IP address to the web server that hosts the website.
- The server sends the information back to the IP address, which is defined by the browser at the time of the request. The requested page may include links to other files on the same server, like images, for which the browser also requests the server.
- The browser gathers all the information requested by the user, and displays on your device screen in the form of web pages.

7.2.2. List of Internet Browsers

There are various types of internet browsers, which are as follows:

Microsoft Edge: Microsoft Edge is a web browser that comes pre-installed with Windows 10 operating system and Windows Server 2016. It was introduced to replace the Internet Explorer Web browser, and its code name was Spartan. It offers various types of features such as freestyle writing over Web page displays, refined search, and presentations for e-books and other reading resources.

Microsoft Edge was developed under the **Spartan codename** Project. In April 2015, Microsoft changed the project Spartan name as Microsoft Edge. Although Internet Explorer and Edge are included with Windows 10, Edge act as a default browser. It combines new web technology evaluations and enhances the speed of browsing.

Although, Internet Explorer 11 was available in Microsoft Windows operating system, Microsoft Edge has become the default browser in Windows 10. It needs at least 1 gigabyte of memory. It offers several types of features, such as annotation features, a new rendering engine, and easy-to-use icons, etc. Furthermore, it also provides better security as compared to Internet Explorer, and it can be combined with Cortana, Microsoft's virtual personal assistant.

Features of Microsoft Edge

- It provides support for Firefox and Chrome add-ons.
 - It has the ability to fill the form automatically.
 - It can be integrated with Cortana.
 - It provides faster page rendering.
 - It has more security features and also allows private browsing.
 - It is modern, lightweight, and reduces resource consumption.
1. **Opera:** An Opera web browser was first conceived at Telenor company in 1994, later bought by the Opera Software on 1 April 1995. It was designed for desktop and mobile interfaces, but it is more popular now for mobile phones. It is based on Chromium, and it uses the blink layout engine. An opera mini was released for smartphones on 10 August 2005 that could run standard web browsers. It can be downloaded from the google play store or Apple play store.
 2. **Apple Safari:** Safari is an internet browser available for the Macintosh, and Windows operating systems included the iPhone, iPad, and iPod Touch. It was developed by Apple, Inc. on 30 June 2003. It is the default browser for the operating system in its products, such as OS X for the MacBook and Mac computers and iOS for the iPad and iPhone mobile devices. It is at number four in the browser market after Microsoft Internet Explorer, Mozilla Firefox, and Google Chrome. It uses the WebKit engine, which is used for rendering fonts, displays graphics, determining page layout, and running JavaScript.
 3. **Google Chrome:** Google Chrome is an open-source internet browser. It is developed by Google on 11 December 2008 for Windows, Linux, Mac OS X, Android, and iOS operating systems.
 4. **Mozilla Firefox:** The Mozilla Firefox web browser is developed by the Mozilla Foundation and its subordinate company, Mozilla Corporation. It was first released was beta on 23 September 2002. Although it was released as the Mozilla Browser, it was internally code-named Phoenix. The First version 1.0 of Firefox was introduced on 9 November 2004.
 5. **Internet Explorer:** It is a web browser that is manufactured by Microsoft Corporation, and it is included with the Microsoft Windows operating system. But It was removed in Window 10 in support of Microsoft's new Edge Browser.

7.3. SEARCH ENGINES

A search engine is an **online answering machine**, which is used to search, understand, and organize content's result in its database based on the

search query (keywords) inserted by the end-users (internet user). To display search results, all search engines first find the valuable result from their database, sort them to make an ordered list based on the search algorithm, and display in front of end-users. The process of organizing content in the form of a list is commonly known as a **Search Engine Results Page (SERP)**.

Google, Yahoo!, Bing, YouTube, and DuckDuckGo are some popular examples of search engines.

Advantages of Search Engine

Searching content on the Internet becomes one of the most popular activities all over the world. In the current era, the search engine is an essential part of everyone's life because the search engine offers various popular ways to find valuable, relevant, and informative content on the Internet.

A list of advantages of search engines is given below -

1. Time-Saving

Search engine helps us to save time by the following two ways -

Eliminate the need to find information manually.

Perform search operations at a very high speed.

2. Variety of information

The search engine offers various variety of resources to obtain relevant and valuable information from the Internet. By using a search engine, we can get information in various fields such as education, entertainment, games, etc. The information which we get from the search engine is in the form of blogs, pdf, ppt, text, images, videos, and audios.

3. Precision

All search engines have the ability to provide more precise results.

4. Free Access

Mostly search engines such as Google, Bing, and Yahoo allow end-users to search their content for free. In search engines, there is no restriction related to a number of searches, so all end users (Students, Job seekers, IT employees, and others) spend a lot of time to search valuable content to fulfill their requirements.

5. Advanced Search

Search engines allow us to use advanced search options to get relevant, valuable, and informative results. Advanced search results make our searches more flexible as well as sophisticated. For

example, when you want to search for a specific site, type "**site:**" without quotes followed by the site's web address.

To search about education institution sites (colleges and universities) for B.Tech in computer science engineering, then use "**computer science engineering site:.edu.**" to get the advanced result.

6. Relevance

Search engines allow us to search for relevant content based on a particular keyword. For example, a site "javatpoint" scores a higher search for the term "java tutorial" this is because a search engine sorts its result pages by the relevance of the content; that's why we can see the highest-scoring results at the top of SERP.

Disadvantages of Search Engine

There are the following disadvantages of Search Engines -

Sometimes the search engine takes too much time to display relevant, valuable, and informative content.

Search engines, especially Google, frequently update their algorithm, and it is very difficult to find the algorithm in which Google runs.

It makes end-users effortless as they all time use search engines to solve their small queries also.

7.3.1. Components of Search Engine

There are the following four basic components of Search Engine -

1. Web Crawler

Web Crawler is also known as a **search engine bot**, **web robot**, or **web spider**. It plays an essential role in search engine optimization (SEO) strategy. It is mainly a software component that traverses on the web, then downloads and collects all the information over the Internet.

There are the following web crawler features that can affect the search results –

Included Pages

Excluded Pages

Document Types

Frequency of Crawling

2. Database

The search engine database is a type of **Non-relational database**. It is the place where all the web information is stored. It has a large

number of web resources. Some most popular search engine databases are **Amazon Elastic Search Service** and **Splunk**.

There are the following two database variable features that can affect the search results:

Size of the database

The freshness of the database

3. Search Interfaces

Search Interface is one of the most important components of Search Engine. It is an interface between the user and the database. It basically helps users to search for queries using the database.

There are the following features Search Interfaces that affect the search results -Operators

Phrase Searching Truncation

4. Ranking Algorithms

The ranking algorithm is used by Google to rank web pages according to the Google search algorithm.

There are the following ranking features that affect the search results -Location and frequency

Link Analysis Click through measurement

7.3.2. How do search engines work

There are the following tasks done by every search engines -

1. Crawling

Crawling is the first stage in which a search engine uses web crawlers to find, visit, and download the web pages on the WWW (World Wide Web). Crawling is performed by software robots, known as "**spiders**" or "**crawlers**." These robots are used to review the website content.

2. Indexing

Indexing is an online library of websites, which is used to sort, store, and organize the content that we found during the crawling. Once a page is indexed, it appears as a result of the most valuable and most relevant query.

3. Ranking and Retrieval

The ranking is the last stage of the search engine. It is used to provide a piece of content that will be the best answer based on the user's query. It displays the best content at the top rank of the website.

7.3.3 Search Engine Processing

There are following two major Search Engine processing functions -

1. Indexing process

Indexing is the process of building a structure that enables searching.

Indexing process contains the following three blocks -

i. Text acquisition

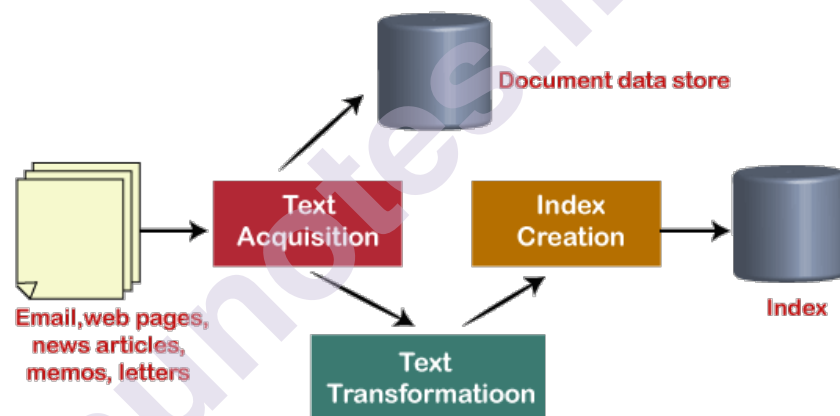
It is used to identify and store documents for indexing.

ii. Text transformation

It is the process of transform documents into index or features.

iii. Index creation

Index creation takes the output from text transformation and creates the indexes or data searches that enable fast searching.



The indexing process

2. Query process

The query is the process of producing the list of documents based on a user's search query.

There are the following three tasks of the Query process -

i. User interaction

User interaction provides an interface between the users who search the content and the search engine.

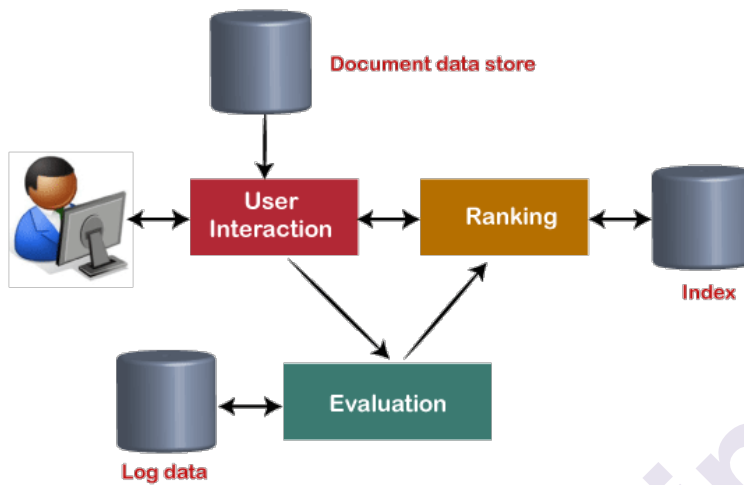
ii. Ranking

The ranking is the core component of the search engine. It takes query data from the user interaction and generates a ranked list of data based on the retrieval model.

iii. Evaluation

Browser

Evaluation is used to measure and monitor the effectiveness and efficiency. The evaluation result helps us to improve the ranking of the search engine.



The query process

7.3.4. Search Engine (Google) algorithm updates

Before learning about search engine algorithm, first, understand

What is an algorithm?

An algorithm is a set of instructions that we use to solve an infinite number of problems. Google's algorithm also follows some set of rules to solve the problem. Google's algorithm is very complex to understand and use because Google changes its algorithm very frequently, which is very tough for users to identify in which algorithm currently, Google is working.

The search engine uses a combination of algorithms to deliver webpages based on the relevance rank of a webpage on its search engine results pages (SERPs).

There are the following major updates occurred in Google's algorithm -

1. Google Panda

Google Panda update was the major change made in Google's search result. It is a search filter introduced on **23 February 2011**. The name "Panda" derives from Google's Engineer **Mr. Navneet Panda**, who made it possible for Google to create and implement the Google Panda Update. The aim of Google Panda update is to reduce the occurrence of low-quality content, duplicate content, and thin content in the search results. It contains unique as well as valuable results at the top of the search engine page ranking.

2. Google Penguin

In April 2012, Google launched the "**webspam algorithm update**." This webspam algorithm later called a **Penguin algorithm**. Currently, Penguin is a part of the core Google search engine algorithm. It is mainly designed to target **link spam**, **manipulative link building practices**, as well as **webpage's scoring** when crawled and indexed, which are analyzed by Google.

3. Google Hummingbird

Google Hummingbird was introduced on **August 20, 2013**. Hummingbird focuses more attention to each word in a search query to bring better results. It is able to catch users and find the content that matches the best intent. The advantage of a hummingbird update is that it provides fast, accurate, and semantics results.

4. Google Payday

Google Payday was introduced on **June 11, 2013**. It mainly impacted 0.3 percent (approx.) of queries in the U.S. Google Payday update is used to identify and penalize the lower quality of websites that uses various heavy spam techniques (spammy queries) to increase the rank and traffic. The advantage of Payday is that it improves ranking (quality) of search queries.

5. Google Pigeon

Google Pigeon is one of the biggest updates in Google's algorithm. Pigeon update launched on July 24, 2014. This update is designed to provide better local search results by rewarding local searches that have a strong organic presence with better visibility. It also improves the ranking of a search parameter based on distance and location.

6. Google Rank Brain

Google's Rank Brain is a **machine learning** and **artificial intelligence** system. It introduced in 2015 via a Bloomberg news story. It is Google's third most important ranking system. It has the ability to sort content based on accuracy and determine the most relevant results based on the search query entered by the end-users.

7. Google EMD (Exact Match Domain)

Google EMD was launched on September 27, 2012, to improve the quality of content. It worked in the industry for a long time. As the name suggested, it exactly matches the keyword from a website and falls the low quality of content in a lower rank of Google's search result. According to Google, the EMD affected .6% of English searches.

8. Google Page Layout Algorithm

Browser

Google page layout algorithm was introduced on **January 19, 2012**. It helps us to find high-quality results that are easily accessible and visible at the top of the search engine. It mainly affects 1% of worldwide search requests. This update mainly focuses on the user experience on a website.

7.3.5. Most Popular Search Engines in the world

1. Google

Google is one of the most popular and trusted search engines in the world. It is created by **Sergey Brin** and **Larry Page** as their research project in **1996**. Many website browsers like Chrome, Safari, Edge, and Firefox come with the default search engine "**Google**," which set as a home page or starting page on every browser.

Google includes Machine Learning (ML), Artificial Intelligence (AI), and other algorithms to identify user's behavior and quality of results in which they are interested. Google regularly improves the search engine algorithm to produce the best results for end-users.

There are the following features of Google search engine -

- **HTML Improvements**

HTML Improvements help to improve the display of the Search Engine Results Page (SERP). It also helps us to identify issues related to Search Engine Optimization (SEO), such as Missing Metadata, Duplicated content, and more.

- **Search Analytics**

Search Analytics is one of the most popular features of Google search engine. It filters data in multiple ways like pages, queries, and more as well as tells how to get organic traffic from Google.

- **Crawl Errors**

Crawl Errors help us to solve the problem related to the crawl section. In crawling pages, all errors related to Google bot are shown.

- **Instantly matching our search**

Google's search engine algorithms help to sort billions of webpages according to end-users requirements and present the most relevant, valuable, as well as useful results in front of end-users.

- **Calculation**

Google allows us to use its platform to perform calculations rather than using the computer's calculator. To perform a calculation in Google, you just simply type "2345+234" in Google's search box and press "Enter." Now, Google displays results at the top of search results.

Click on the below link to search on Google -
<https://www.google.com/>

2. Bing

Bing search engine was introduced by **Microsoft** in **2009**. It is the second most visited search engine in the world. It allows us to filter results in different tabs such as images, ads, videos, and more. The disadvantage of using Bing is that it produces slower results compared to Google.

There are the following features offered by Bing -

- **Image Search**

Bing offers a more advanced way to organize files than Google. It provides more information to users and various advanced options to filter the photos.

- **Video Search**

Bing is one of the best search engine platforms for video content. It mostly brings videos from YouTube to display. Bing allows us to hover the cursor over any videos to display a short clip of the selected video.

- **Computations**

Most of the users like the Bing search engine platform for computation tasks. We can simply type our math query in the search box to get instant results. Using Bing, we find top-rated websites to solve equations and mathematics tasks.

- **Homescreen**

Bing attracts users by frequently changing background images and makes a home screen more attractive for end-users. It also uses smaller pictures at the bottom of the screen with trending headlines.

Click on the below link to search on Bing -
<https://www.bing.com/>

3. DuckDuckGo

DuckDuckGo is an internet-based search engine which was founded in **2008**. It does not track, collect, and store our personal information. It is the best platform for those who want to keep their **browsing information secure and private**. According to a research, DuckDuckGo is 3rd most popular search engine in

Australia, approximately 35 million users use it to search their queries.

Browser

There are the following unique features of DuckDuckGo -

- **Quick Stopwatch**

DuckDuckGo uses both quick timer and stopwatch to measure the time. To start a Quick stopwatch, we simply type "stopwatch" in the search box.

- **Check number of characters**

Check number of characters is the most interesting feature of DuckDuckGo. Using this, we can quickly check the number of characters that we are inserting in the search query. To check the character in search query simply type "chars" before and after the query.

- **Check whether websites are down or not**

In DuckDuckGo, we use the keyword the "Is website's name.com down for me" Example: (Is javatpoint.com down for me) to check whether a particular website is down and up for us.

- **Calendar**

DuckDuckGo helps us to find instant answers related to calendars. If you want to see the calendar of your Date of Birth, then use the keyword "calendar month year" (calendar December 1997) in the search box.

- **Features for Developers**

DuckDuckGo also provides features for developers. Some cool developer features of DuckDuckGo are given below -

- It generates lorem ipsum text and encodes URLs to machine-readable text.
- It helps the developer to convert input stream binary to decimal.
- It shows a list of special characters and their HTML values.

Click on the below link to search on DuckDuckGo -
<https://duckduckgo.com/>

4. YouTube

YouTube was founded in **2005**. It is the best video content delivery search engine. YouTube offers the easiest way to learn new

technologies. Currently, more than 1.5 billion users per month use YouTube to deliver information.

Based on the Alexa Traffic ranking, YouTube is 2nd largest search engine and 3rd most visited website in the world.

There are the following features of YouTube, which are used to improve User Experience -

- **Better Live Streams**

YouTube offers a better live streaming feature since **2013**. As we know, a good video helps to grow business, so when it comes to live streaming, you must be prepared with reliable lighting, audio, recording equipment, and decent as well as the well-prepared script.

- **YouTube Cards**

YouTube includes various links such as Link Cards, Fan Funding Cards, Donation Cards, and Playlist Cards. These all cards help us to drive traffic on our website, promote our content, and build social lists.

- **Captioning**

Captioning helps search engines to find the videos. It adds more text metadata to the videos to makes rank higher on query searches.

5. **Baidu**

Baidu is the first search engine introduced in **2000**. It is the dominant search engine in China. It is a free web browser that is used for both Windows as well as Android. It cooperates with companies like Microsoft, Intel, and Qualcomm. It offers services such as **cloud services, social networking, maps, videos, images search**, and many more. The main disadvantage of using Baidu is that it can transmit the user's personal data to the Baidu server without using any encryption algorithm.

A list of features of Baidu is given below -

- **Ads**

Ads are one of the most important features of Baidu. Ads help us to generate more leads, optimize our site in a global way, and use various optimization techniques to bring our content up to date for end users.

- **Automatic Transcoding**

Baidu transcodes non-friendly mobile websites without any approval by the site owner.

- **Click Behaviour - Opens in a new tab**

In Baidu, search results always open in a new tab when we click on a selected website.

- **Structured Data Implementation**

To accumulate structured data, Baidu uses its own properties, such as Baidu Open and Baidu webmaster tools.

- **Mobile Search**

Baidu uses m.baidu.com as its mobile search engine.

Click on the below link to search on Baidu - <https://www.baidu.com/>

6. **Yahoo!**

It is the most widely used Internet search engine and the largest web portal. It provides a structure to view thousands of websites and millions of web pages. Yahoo email services help us to capture a huge market. It includes various services such as Yahoo answers, Yahoo groups, Yahoo search engine, and Yahoo messengers, etc.

As the biggest web portal, it offers various following services -

- Yahoo! Finance
- Yahoo! Shopping
- Yahoo! Games
- Yahoo! Travel
- Yahoo! Maps
- Yahoo! Messengers
- Yahoo! Mail

There are the following features of Yahoo!

- **Storage Capacity**

Yahoo provides a huge amount of storage capacity (25 GB) to store data online on Yahoo. This stored data can be used anywhere and anytime.

- **Flickr**

Flickr is the best media platform for uploading, managing, organizing, and sharing photos as well as videos.

- **Latest News**

Yahoo allows us to share the latest information with our customers from time to time. This information is available in the form of photos, videos, audios, and more.

- **Privacy & Security**

Yahoo! Search engine always takes care of the privacy of its users and provides a secure platform with all its privacy constraints.

- **User friendly**

Yahoo! Offer extra user-friendly features to its customers. It provides a clear difference between indexes, sent content, receives content, etc. To save memory, it saves unwanted emails only for 90 days; after that, it automatically deletes it from the user's account.

Click on the below link to search on Yahoo - <https://in.yahoo.com/?p=us>

7. Ask

Ask was launched by **Garret Gruener** and **David Warthen** in 1996. The aim to design Ask is to perform the search based on the questions submitted by internet users.

It is similar to search engines like Google, Bing, DuckDuckGo, and Yahoo! .

A list of features of Ask is given below -

- **Home page**

Ask provides a set of the homepage or default search provider, you must disable the Ask extension in order to change the setting and set your desired homepage. The home page of Ask.com shows a few categories of articles such as Culture, Travel, and Entertainment.

- **Answers**

In the Ask search engine, if you type in the search bar to search for something, then a list of searched results related to your query appears on the screen.

- **Videos**

Ask.com allows us to search for video content easily. Ask.com filters HD and 3D videos based on length, which helps us to listen and watch the better quality of videos, music, video clips, documentaries, and more.

- **Ask Toolbar**

Ask toolbar is a type of search tool which regularly bundled and offers various other products during the installation. It also allows us

to change our browser homepage and replace our default search engine without permission.

Browser

You can also uninstall the Ask toolbar by using Add/Remove programs in the Windows Control Panel.

Click on the below link to search on Ask - <https://www.ask.com/>

7.4. WEBSITE

Website is a collection of related web pages that may contain text, images, audio, and video, etc. The first page of a website is called a home page. Each website has a specific internet address (URL) that you need to enter in your browser to access a website.

A website is hosted on one or more servers and can be accessed by visiting its homepage using a computer network. A website is managed by its owner that can be an individual, company, or organization.

The first website was introduced on 6 August 1991. It was developed by Tim Berners-Lee at CERN. As of January 2018, there were around 1.7 billion websites on the internet.

What is the need for a website?

A popular website is another name of success in modern times as today we are living in a digital world where people are spending most of their spare time on internet browsing news, images, videos, and more. A website is the first thing that appears on the screen of your laptop when you search for a product or service, or any other information online. So, it is very important to have a website whether you are a businessman, organization, online store, etc. Let us understand how a website can help you grow your business!

The benefits of having a website are as follows:

1. **Cost-effective:** The marketing of products and services through a website is less costly than print advertising, TV, and radio advertising. It also allows you to make changes related to your products and services such as you can edit products' specifications, features, discount offers, etc.
2. **Broder demographic reach:** A website can help your business reach people with diverse backgrounds throughout the world.
3. **Business credibility:** Having a website that is user-friendly and professional looking for your business makes people consider your business more credible than others who don't have a website to represent their businesses online.
4. **24/7 availability:** You can keep your products available for sale around the clock through a website. Customers can buy anytime, and thus you can earn more profits than a traditional storefront.

5. **Consumer convenience:** It improves the shopping experience of your customers; they can buy your products from the comfort of their home.
6. **Build customer rapport:** Online presence helps you build and maintain a rapport among your customers. You can also introduce special offers or discounts for your loyal customers.
7. **Improves productivity:** It saves your time as you don't need to explain your products or services to each customer separately, as all the information is already available on the website.
8. **Educate your customers:** You can educate people about the benefits of your products and can show them how they are better than the competitors' products.
9. **Change location:** You can move your business to another location without affecting your sales as customers still can find you through your website.
10. **Grow manpower:** You can post job openings for vacant positions and allow applicants to check job descriptions and apply online.
11. **Personalized email address:** It allows you to set up personalized email addresses for employees, companies, partners, etc. You can receive mails on these mail ids and reply accordingly. Furthermore, you can share offers, happy hours, updates, and can get feedback through email.
12. **Improve customer service:** It allows you to improve customer services such as you can share phone numbers to contact you, and display other relevant information such as order status, delivery status, refund or replacement procedure, etc.

7.4.1. Types of Websites:

A website can be of two types based on the type of webpages:

- **Static Website**
- **Dynamic Website**

Static website

A static website, as the name suggests, is a website in which pages do not change or remain the same. It is the basic type of website that is easy to create, maintain, and host. You don't need web programming and database design to create a static website. Its webpages are coded in HTML.

The codes are fixed for each page, so the information contained in the page does not change, and it looks like a printed page. However, changes can be made by changing the codes if required.

You can think of it as a brochure for a business that has the same information for every user. So, all users see the same information irrespective of their location, interests, etc., when they open a particular page of a static website.

In the case of a static website, the content or webpage is taken directly from the file stored in the server without requiring any interpreter (application software) to interact with a database to fetch data from the database. So, database and server-side scripting are not required in static websites.

Benefits of a Static Website:

- It takes less time to create a static website.
- It is less costly to develop this website.
- The webpages are delivered at high speed by the servers.
- Hosting through dedicated servers is available at a low price.

It is more secure than dynamic sites as it does not rely on CMS plugins and server-side scripting.

Dynamic website

A dynamic website is a collection of dynamic web pages whose content changes dynamically. It accesses content from a database or Content Management System (CMS). Therefore, when you alter or update the content of the database, the content of the website is also altered or updated.

A dynamic website uses client-side scripting or server-side scripting, or both to generate the dynamic content. For example, when a browser sends a request to the server, the server contacts the application server which further interacts with the database server to fetch the content, which is customized as per the user's requests and requirements. For example, a Facebook page may appear different to different users as per their friends' list, interests, location, etc.

Benefits of a Dynamic Website:

- It is very quick and easy to make changes in a dynamic website as it is integrated with high-end programming.
- The webpages are easier to maintain despite of being full of information and graphics.
- E-commerce sites are dynamic as they need to be impressive and have easy navigation from one page to other pages.

- It makes your site look professional.

The users can get customized information as per their interests, needs, and profile, etc. For example, facebook.com, flipkart.com, etc.

7.5. BLOG:

It is a type of website that provides information or in which posts are added regularly in reverse chronological order, latest post or entries on top of the main page, and old ones towards the bottom. A blog is usually owned by a single person or a small group of people.

The content in a blog is written in an informal or conversational style and can be focused on one subject or a wide range of related subjects. Furthermore, the posts are organized into categories if required, e.g., posts that provide similar information can be kept in a separate category.

The content of a blog is generally referred to as a blog post, and it generally appears as posts on a streaming page. The information is regularly updated in a blog, e.g., articles, photos, and videos are added on a daily basis to keep readers engaged and increase the traffic to the blog. It also allows readers to leave a comment about the posts.

7.6. FTP

FTP stands for File transfer protocol.

FTP is a standard internet protocol provided by TCP/IP used for transmitting the files from one host to another.

It is mainly used for transferring the web page files from their creator to the computer that acts as a server for other computers on the internet.

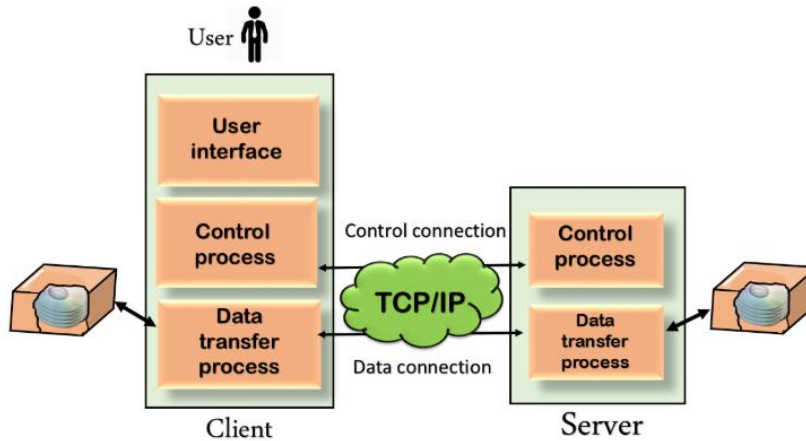
It is also used for downloading the files to computer from other servers.

Objectives of FTP

- It provides the sharing of files.
- It is used to encourage the use of remote computers.
- It transfers the data more reliably and efficiently.

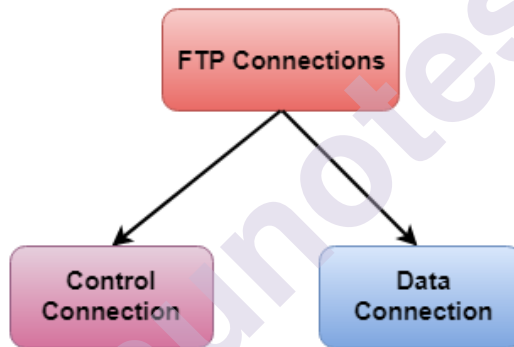
Why FTP?

Although transferring files from one system to another is very simple and straightforward, but sometimes it can cause problems. For example, two systems may have different file conventions. Two systems may have different ways to represent text and data. Two systems may have different directory structures. FTP protocol overcomes these problems by establishing two connections between hosts. One connection is used for data transfer, and another connection is used for the control connection.



The above figure shows the basic model of the FTP. The FTP client has three components: the user interface, control process, and data transfer process. The server has two components: the server control process and the server data transfer process.

There are two types of connections in FTP:



Control Connection: The control connection uses very simple rules for communication. Through control connection, we can transfer a line of command or line of response at a time. The control connection is made between the control processes. The control connection remains connected during the entire interactive FTP session.

Data Connection: The Data Connection uses very complex rules as data types may vary. The data connection is made between data transfer processes. The data connection opens when a command comes for transferring the files and closes when the file is transferred.

FTP Clients

- FTP client is a program that implements a file transfer protocol which allows you to transfer files between two hosts on the internet.
- It allows a user to connect to a remote host and upload or download the files.

- It has a set of commands that we can use to connect to a host, transfer the files between you and your host and close the connection.
- The FTP program is also available as a built-in component in a Web browser. This GUI based FTP client makes the file transfer very easy and also does not require to remember the FTP commands.

Advantages of FTP:

- **Speed:** One of the biggest advantages of FTP is speed. The FTP is one of the fastest way to transfer the files from one computer to another computer.
- **Efficient:** It is more efficient as we do not need to complete all the operations to get the entire file.
- **Security:** To access the FTP server, we need to login with the username and password. Therefore, we can say that FTP is more secure.
- **Back & forth movement:** FTP allows us to transfer the files back and forth. Suppose you are a manager of the company, you send some information to all the employees, and they all send information back on the same server.

Disadvantages of FTP:

- The standard requirement of the industry is that all the FTP transmissions should be encrypted. However, not all the FTP providers are equal and not all the providers offer encryption. So, we will have to look out for the FTP providers that provides encryption.
- FTP serves two operations, i.e., to send and receive large files on a network. However, the size limit of the file is 2GB that can be sent. It also doesn't allow you to run simultaneous transfers to multiple receivers.
- Passwords and file contents are sent in clear text that allows unwanted eavesdropping. So, it is quite possible that attackers can carry out the brute force attack by trying to guess the FTP password.
- It is not compatible with every system.

7.7. VOICE OVER INTERNET PROTOCOL (VOIP)

Voice Over Internet Protocol (VoIP) is also referred to as **Voice over IP, IP technology, Internet telephony, broadband phone, Internet phone, and digital phone**. It is an internet protocol that provides services over the internet. This protocol allows us to make voice calls over the internet and transmit multimedia using a broadband internet connection instead of an analog (or regular) phone line.

In short terms, we can say that VoIP provides phone services over the internet.

Browser

Why Use VoIP?

VoIP is mainly used for **digital communications**. It allows you to easily connect with your employees and customers using a computer.

Some most important uses of VoIP is given below -

1. Chat and Video calling

VoIP allows us to share business information, ideas, and thoughts via chat and video calls using desktop and mobile phones. It also allows us to collaborate on tools such as Instant messaging (IM), group chats, and video sharing.

In the Chat and Video calling field, VoIP also allows us to do the following -

- Instant messaging (IM)
- Group chats
- Video sharing
- Conference calling
- Teleconferencing
- Switch between simultaneous calls
- Share screens

2. Lower Cost

We can configure VoIP at a lower cost.

3. Connect multiple businesses

VoIP helps you connect multiple businesses to a single system by combining multiple office phone systems.

How does VoIP Work

VoIP helps you to make phone calls anytime, anywhere using an internet connection instead of a mobile network or landline. It helps us to improve productivity and enhance collaboration.

It converts our voice signals (Analog signals) into a digital signal (packets of data). This packet travel over the public and private internet protocol network.

Using this VoIP packet, you can do landline calls and computer to computer calls with both parties, speak into a computer microphone and listen through computer headsets.

A VoIP includes a service provider who offers better services than your traditional landline phones. In VoIP, your data is stored in the cloud because it runs over the internet. It also uses an online dashboard that allows users to manage contacts, business phone calls, call forwarding, and VoIP systems.

Features of VoIP

A list of cool features of VoIP is given below -

1. Unlimited calling

VoIP allows us to make unlimited international as well as national phone calls.

2. Online Faxing

Online Faxing is the best VoIP feature. It allows us to send and receive a large number of faxes, without using any hardware and wires.

3. HD Voice Quality

A high-speed internet connection allows us to make a high-speed HD voice calling using VoIP.

4. Conference Lines

VoIP dedicated conference lines are used to do meeting up to nine participants at the same time.

5. Smartphone App

VoIP is used in the iOS and Android devices for free. It helps us to answer any business calls from anywhere and anytime using the Smartphone.

6. Text Messaging (SMS)

Text Messaging is one of the best features of VoIP. In VoIP, text messages help employees to send and receive text messages from their target customers.

7. Team Collaboration

Team Collaboration help organizations to chat with their team using one system. It enables wireless video calling and screen sharing to do work faster and easier.

8. CRM Integration

Browser

CRM Integration is used to Boost productivity with a deeply integrated workflow.

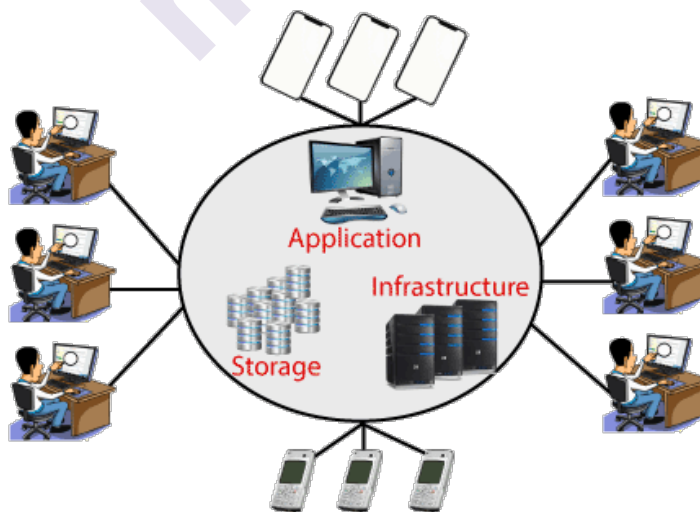
Advantages of VoIP

A list of advantages of VoIP is given below -

- Some VoIP service providers offer free VoIP services.
- VoIP allows you to directly make a call from a computer, a VoIP phone, or a traditional phone that is connected to an adapter.
- VoIP services are reliable and available at a lower cost.
- VoIP uses a single network to carry voice and data.
- VoIP phones can be operated from anywhere using an excellent internet connection.
- Services like call forwarding, international calls, and business communications are easy with VoIP.
- VoIP is more secure than traditional phones.
- VoIP helps us to improve productivity.
- VoIP also has the capability to integrates with other apps.

7.8. INTRODUCTION TO CLOUD COMPUTING

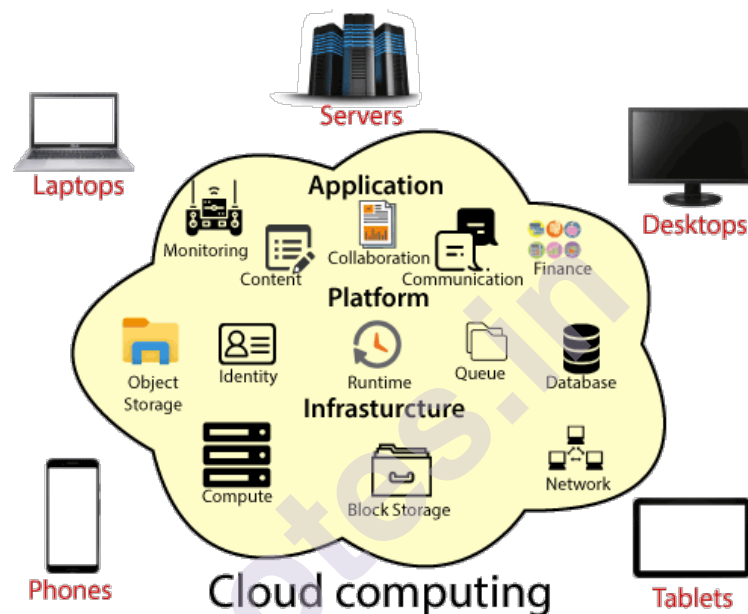
Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, software, analytics, intelligence, and more, over the Cloud (Internet).



Cloud Computing provides an alternative to the on-premises datacentre. With an on-premises datacentre, we have to manage everything, such as

purchasing and installing hardware, virtualization, installing the operating system, and any other required applications, setting up the network, configuring the firewall, and setting up storage for data. After doing all the set-up, we become responsible for maintaining it through its entire lifecycle.

But if we choose Cloud Computing, a cloud vendor is responsible for the hardware purchase and maintenance. They also provide a wide variety of software and platform as a service. We can take any required services on rent. The cloud computing services will be charged based on usage.

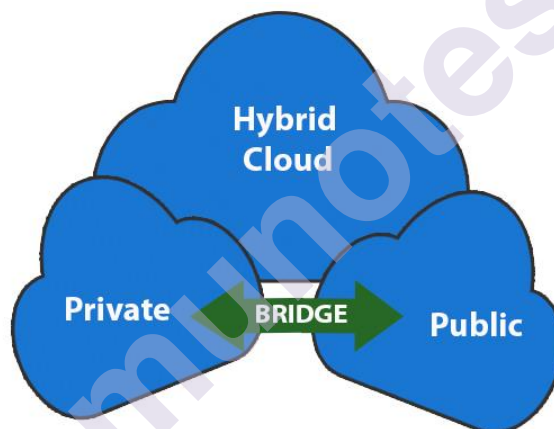


The cloud environment provides an easily accessible online portal that makes handy for the user to manage the compute, storage, network, and application resources. Some cloud service providers are in the following figure.



- **Cost:** It reduces the huge capital costs of buying hardware and software.
- **Speed:** Resources can be accessed in minutes, typically within a few clicks.
- **Scalability:** We can increase or decrease the requirement of resources according to the business requirements.
- **Productivity:** While using cloud computing, we put less operational effort. We do not need to apply patching, as well as no need to maintain hardware and software. So, in this way, the IT team can be more productive and focus on achieving business goals.
- **Reliability:** Backup and recovery of data are less expensive and very fast for business continuity.
- **Security:** Many cloud vendors offer a broad set of policies, technologies, and controls that strengthen our data security.

7.8.1. Types of Cloud Computing



- **Public Cloud:** The cloud resources that are owned and operated by a third-party cloud service provider are termed as public clouds. It delivers computing resources such as servers, software, and storage over the internet.
- **Private Cloud:** The cloud computing resources that are exclusively used inside a single business or organization are termed as a private cloud. A private cloud may physically be located on the company's on-site datacentre or hosted by a third-party service provider.
- **Hybrid Cloud:** It is the combination of public and private clouds, which is bounded together by technology that allows data applications to be shared between them. Hybrid cloud provides flexibility and more deployment options to the business.

7.8.2. What types of cloud services do businesses use?

Cloud-computing services range from data storage to functional programs, including accounting software, customer service tools and remote desktop hosting. These services can be categorized into three groups: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS).

Infrastructure as a service

IaaS replaces physical hardware like in-house web hosting servers. By providing things like virtual servers or virtual machines, IaaS helps businesses take advantage of a range of configurations to handle different workload needs. Two of the key players in this field are Amazon Web Services and Microsoft Azure.

Platform as a service

Through this cloud service, software developers are given access to cloud-based tools like APIs, gateway software or web portals. Services like Salesforce's Lightning, the Google App Engine and AWS' Elastic Beanstalk are popular solutions.

Software as a service

SaaS gives users access to software over the internet. Accessible through computers, as well as internet-enabled mobile devices, SaaS applications let workers collaborate on projects, download important files and work directly on specialized computer programs. Services like Microsoft Office 365 or Google Workspace are examples of SaaS applications.

7.9. CLOUD COMPUTING FOR BUSINESS

Cloud computing became a mandatory technology for each company. It has significant potential and provides effective business opportunities for organizations that adopted this approach. Along with all the advantages associated with cloud computing, businesses can elicit additional benefits (5):

- Reduced investments for building IT infrastructure and administrative costs for IT personnel. Cloud technologies eliminate the need for significant capital investments – companies do not have to purchase expensive equipment (servers and network equipment) and software licenses. They can start their business by employing less computing resources and increase them only when their needs grow. There is a transformation of capital investments to operational expenses and thus eliminates the high barrier to entry in the business. Small and medium businesses can afford to hire resources and technologies, which can not buy, and start from equal positions with other competitors on the market.

- Possibilities of using modern ICT, which enable efficient management of business processes. Small businesses can not afford to buy the latest versions of the software and to pay licenses, but by cloud technologies they have up-to-date applications. □ Scalability of the business. From a business perspective cloud technologies allow companies not only to increase or decrease computing capacity, but also to expand their business processes and activities. The opportunities for fast and almost unlimited provision of computing power and software applications support the growth and expansion of the companies.
- Adaptation and adjustment to the changing market conditions. Today's economic situation and environment requires the ability to react quickly and respond to changing conditions and needs of consumers. Through cloud computing, companies can adapt processes, products and services to the new market circumstances quickly and they are more competitive.

CLOUD SERVICES FOR BUSINESS

CLOUD OFFICE SUITES The advantages of cloud office suites compared to the traditional ones are:

- Easy administration. Office suites are accessible via web browser and can be used regardless of the operating system. There is no need to install the packages on the local devices and software versions are updated regularly by the service provider.
- Reduced costs. Companies do not need to pay legacy license fees. Usually, prices are per user per month, but sometimes there are annual plans with discounts.
- Accessibility. Documents are accessible anywhere at any time, from various devices (including mobile) with different operating systems and browsers.
- Documents sharing and collaboration. Cloud office suites give opportunities for documents sharing, joint simultaneous work on them with options for tracking changes. All these possibilities increase the office work productivity. The most popular office suites are Google Apps for Work, Microsoft Office 365 and Zoho Docs.

Google Apps for Work (previously known as Google Apps for Business) is an office suite based on cloud technologies that includes additional features specific to business. Applications in the package can be grouped into four categories (7, 8): Communicate (Gmail, Hangouts and Calendar, Google+), Store (Drive), Collaborate (Docs, Sheets, Forms, Slides and Sites) and Manage (Admin and Vault). There is a free 30-day trial period (up to 10 users). There are different payment options with opportunities for flexible adding new user accounts – Flexible Plan (payment is for the services used during each month) and Annual Plan (the contract is for one year with discounts). Google Apps for Work

provides opportunities for offline work – users can create and edit content even when they are not connected to the Internet and synchronize it later when they are online.

Microsoft Office 365 includes traditional office suites components and provides almost all features of standard office. Office 365 provides tools for collaboration and data sharing in real time – documents are stored in the cloud and everyone has access to their latest version. There are options for tracking changes and recovering older versions. The collaboration includes online meetings, portal for sharing corporate videos and etc. Microsoft Office 365 involves enterprise social network Yammer, which supports collaboration and cooperation among employees. There are various options for using Microsoft Office 365 – 3 Business plans and 3 Enterprise plans, which offer different functionality at different prices

Zoho Office Suite is a free software package that includes applications for text processing, spreadsheets and presentations. There are opportunities for synchronizing files across various devices and maintain different documents versions. Zoho supports all types of Microsoft Office documents, allows export to XML, PDF and LaTeX format. Zoho provides opportunities for sharing files, integration with Google Apps, task management. The package includes application Projects to facilitate projects work. Zoho offers real-time collaboration, such as online meetings, desktop sharing and a private social network Connect that allows employees to share data and collaborate with each other. The main Office Suite advantage is the availability of applications that are specific to business – marketing and finance tools, CRM system, human resources management and others.

7.9.1. Cloud Business Information Systems

Today business information systems are an extremely important factor that provides the necessary information for decision-making. Companies implement various software applications – from traditional (accounting, human resource, warehousing) programs to integrated software solutions (CRM, ERP, BI, etc.). Information systems are expensive software, which is a large investment for companies and requires proper IT infrastructure. More vendors offer cloud based versions of business information systems. Cloud solutions allow transforming the large investment cost into operating expenses, which is suitable for small and medium-sized companies and start-ups.

The advantages of cloud business information systems over the traditional ones are:

- **Flexibility and efficiency.** There is a lower cost for using the service (system) that can vary according to the consumption based on particular needs. Flexibility is in terms of functionality – at any time, companies can choose to add new services (modules) or abandon existing.

- **Improved connectivity.** Companies can quickly provide access to the system or certain modules to its partners in order to work collaboratively that improves cooperation.
- **Easier administration.** Administration and renewal of the system is a liability of the service provider that facilitates IT departments in companies and enables their optimization. Using cloud business information systems is accompanied by some problems. Cloud systems are not as comprehensive and functional as traditional solutions. There are difficulties in adapting cloud services to the specific business and its processes. The integration with already deployed applications (cloud, mobile and traditional), which have to operate in a dynamic environment, is complicated.

Despite these problems and shortcomings cloud systems are a good solution for small and medium companies. They are a not so expensive option for the use of modern business information systems. For companies that have already implemented business systems, a good decision is the integration between cloud and traditional applications. Businesses can add new modules with new functionalities, which are based on cloud technologies, to existing traditional systems. The process of upgrading systems allows easy implementation and expansion of functionality.

SUMMARY

- In this chapter, we covered what is Browser, History of Web Browser Features of Web Browser,
- Also in this chapter we understand What is the URL, **How does a browser work**, List of Internet Browsers, how Search Engines works, types of Search Engines.
- Also we know about Website, Types of Websites, **Blog**, FTP, Voice Over Internet Protocol (VoIP), Introduction to Cloud Computing, Types of Cloud Computing.
- Also about Cloud Computing For Business and Cloud Business Information Systems

REFERENCES:

- Principles of Information System by ralph stair and George Reynolds
- www.javatpoint.com

QUESTIONS:

- 1) What is browser?
- 2) What is mean by web browser?
- 3) Write a short note on DNS.
- 4) Explain the working of search engine.
- 5) What are the applications of internet.
- 6) Write a short note on FTP.
- 7) Write a short note on cloud computing.
- 8) How cloud computing help for business.

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INFORMATION TECHNOLOGY SYSTEMS

Unit Structure

- 8.1 Role and emerging trends of information technology
- 8.2 Concept of ERP, SCM, CRM
- 8.3 Database management
- 8.4 Data warehousing
- 8.5 Business Intelligent System
- 8.6 Knowledge Management
- 8.7 E- Commerce
- 8.8 E- Business and M- Commerce
- 8.9 Digital Business
- 8.10 E-governance
- 8.11 Conclusion

INTRODUCTION

Information technology is related to networking. As globalization spreads throughout the world the traditional business partners are changing. Everyone is your competitor now including suppliers, customers, and partners as well as industry. New Global Models have been established by alliances, partnerships, and strategic outsourcing of companies because of this there is a full range of skills, resources and market offerings which are easily accessible for everyone. In a complex global business environment, no specific, single model will fit the broad range of situations that leaders will come across. Devices have been used for centuries to aid computation. The world's first programmable computer was available in 1941. Initially the computer work stands alone with one terminal now it is working with several terminals. It has become the need of whole organization.

Organizations and individuals around the world spend billions of dollars each year providing and using information technology. New capabilities, standards, and products appear every day. Many involve unsuited or even competing specifications and interfaces. The main feature of the information revolution is the growing economic, social and technological role of information. Information-related activities did not come up with the Information Revolution. They existed, in one form or the other, in all human societies, and eventually developed into institutions. Technology is the combination of several aspects including data, information, knowledge and wisdom. Data and information are easily transferable in the modern world, whether through oral, written or electronic methods. Knowledge, however, is built by one person and transferred (more slowly) through

education and human interaction. Research in information technology is used to identify those factors that facilitate the IT- Based processes and procedures.

8.1 ROLE AND EMERGING TRENDS OF INFORMATION TECHNOLOGY

Information Technology is particularly concerned with Internet. It distributes at exponential rates among the business-to-business organizations. IT has positive impact on the development of the organizations. Internet has been the favorable topic for various researchers and scholars during the last decade. Marketing and sales practices of today's world are highly attributed for adoption of new technology. Now it is the era of information technology in which the knowledge of information technology has become a competitive necessity. Everybody must have the knowledge of how to establish and manage effective relationships both within the organizations. The firm's competitive advantage is the management of the firm's information- processing system. The multiple tools of the Internet enable the communication and transformation of information through multiple ways, namely one-to-one communication, one- to-many and many-to-many. The internet facilities the information exchanges between organizations, concerning issues such as discovery of new customer needs, trends of the local and global markets, competitive moves, joint development of products, joint selling activities, etc. There is a lack of any established criteria for measuring the use of the Internet, as well as the success of its use. WWW researchers need to develop concepts and to shape standards, to provide mechanisms for measuring investment opportunities and business success on the Internet. People have become habitual of computers and even a single day without computer will make them paralytic. Information technology is a dynamic and vast area has made us dependent for simple day to day task. Let's talk about sector wise implication of IT:

- IT has entered almost in all industries. For instance, railways, airways and sea networks are connected with the help of IT. As information plays a vital role in the smooth functioning of all these sectors and without this even a second will become havoc.
- Banking is another sector that is mostly depending on IT. All-important transactions are being carried out with the help of information technology; similarly bulk of most confidential data is stored in banking softwares and systems. Several time-consuming tasks have become simpler and much easier with substantial amount of safety. In fact, e-commerce has made online banking as well as online purchasing and selling of commodities and services much easier and faster adding to the convenience of the common man. By simply searching on the internet one can order anything with just a single click on the mouse button.

- Similarly, another most important sector which is benefited a lot by information technology is the travel and tourism sectors. By Means of online booking and reservation facilities one can avoid the crowd and lengthy procedures of booking air or railway tickets. People can also enjoy the best deals and book tickets online from the comfort of their living room
- IT plays a major role in simplifying various organizational processes. Most business enterprises rely on the power of information technology for carrying out their daily tasks conveniently and faster. IT makes complex procedures easier, faster and also helps a lot in avoiding redundancy. It lets individual's access necessary data, ensuring the safety of confidential ones.
- The field of education has also been blessed with the benefits of IT. Online application to universities, checking results, study materials and much more has made the reach of education broader and easier.

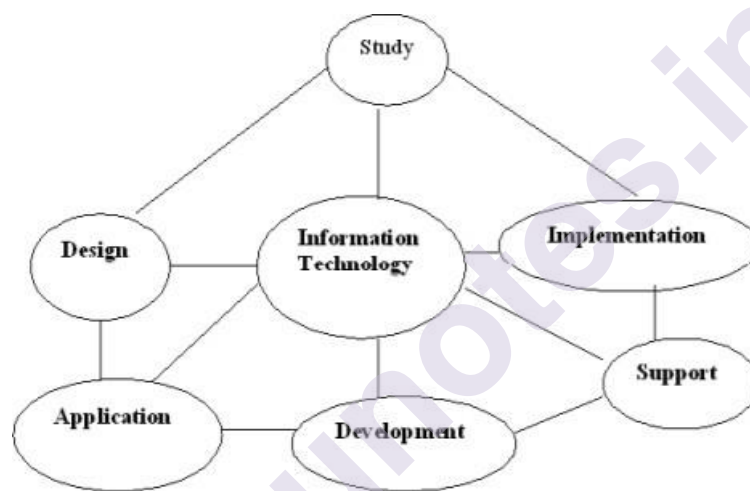


Fig. 5.1: Components of Information Technology

8.1.1. Technological Trends from 1950's to Till Date

In 1950's the electronic computer on the face of European continent was invented and lot of research took place about potential development of Human, Computer Intelligence and Communication. That initial system was basically a pilot computer with 800 vacuum tubes. These computers were specially designed to handle numeric as well as textual information. In European world some business applications as well as payroll activities were carried out through electronic computers.

During the era of 1954 in United States I.B.M 650 was introduced which was slightly inexpensive machine with drum storage. The computer systems produced in this period were First Generation Computers. During the era of 1960's the first structural, technical, procedural, and programming languages were released, and those systems were launched which were functional trial product of computer and priced for individual users. It was used in health sciences as well as different fields and people of that time considered it as Personal Computer. The series of compatible

computers were also initiated during this period. In this age several terminals were attached with one central computer from where they get access. H.P (Hewlett Packard) and other top-notch players also entered in the industry during this period. So, we can say that this period was considered as Second-Generation Computer Era. In the period of 1970's the first Ram chip was introduced by Intel. The first microprocessor was also developed by the team of Intel. Apple II Computers were also introduced. So, in short it was the big era for invention of programming as well as new languages in the field of computer sciences.

During 1980's and 1990's many companies dealing in sale and purchase of computers were entered in the market and this period was considered as bestselling era. So many different features were added in the system to make them smart and for easy usage. These systems are useful in every aspect of human life including education and business applications. By means of this cost can be reduced and volume of production can be enhanced. During this age printers as well as other storage devices were also developed and sold. Different models were there for digital audio and graphics. Several up gradations took place in this period. From 2000's onward there is a shift from analog, mechanical and electronical technology to digital technology. The cyber system was introduced and people from all over the world started using internet. It was a major revolution and landmark in the history of information technology. From then to till now computer knowledge has become necessary for every job. Due to all this revolution the economy is now changed from internal, specialized, and proprietary based economy to external, networked and shared based economy.

8.1.2. Current Advancement in Technology

There are some of the most important new technologies, trends, approaches, standards and issues which should be identified while considering the trends in Information Technology systems. As we now perceived from above discussion that information technology is particularly concerned with the applications of computer system. Firstly we gather the data, then store this in data warehouses after that relevant information can be extracted by means of data mining and by applying technological tools finally after manipulation of data we get relevant information. Different industries are interlinked with information technology which may include computer hardware, softwares, semiconductors, electronics, internet, telecommunication networks, e-commerce as well as computer services etc.

Internet as well as Intranet facilities are there which provides resources of Information Technology used within certain premises or outside the boundaries. Virtualization of systems, softwares and approaches are also there and many organizations have virtualized their computing environments. It has been implemented since 1960's but has become widely used only in 21st century; virtualization helps to streamline resources and processes by increasing the utilization rates and flexibility

of computers. Virtualization essentially allows you to do a lot more with less effort.

Mobile Computing is another concept which involves mobile communications, softwares and hardware of mobiles. So mobile computing is portable and even though the location is being changed but the device work properly. As Man is a social animal. Social networking is another most important need of today's humanity. It has become an important part of our lives. We update our status on regular basis and communicate with our friends and family members for people distances don't matter in this regard. Now computer and its usage has become the necessity of present age so the ultimate users want wireless and 24/7 connectivity from everywhere around the world and IT providers are working hard to fulfill the need in this respect.

8.1.3. World Wide Web Most

commonly it is abbreviated as www and is the system of interlinked documents which are in access of users with the help of internet. While clicking on a single button one can have an easy access on different web pages including texts, images as well videos and so many other features. So there are several benefits of World Wide Web in this regard which shows that users can access the data at any location while using the server from World Wide Web. E-mails are one of the blessings which have replaced letters, in past people rely on writing letters to their dear ones but now just only you can simply go on the web and type out the e-mail and send it instantly in the persons e-mail's inbox. We can say that World Wide Web has so many benefits. By means of this we can find lot of information. We can purchase online, movies and songs can be downloaded. Similarly as far as studies are concerned we can get millions of information about our concerned topics. We can also play games, make friends and check our accounts.

8.1.4. Information Security Issues

Apart from various benefits there are cyber attacks which have threatened the whole IT industry. Different computer worms and viruses are there to attack the information available in systems and harm the network as well as corrupt or modify the existing files. It is the need to aware all the users about these security threats. Many companies are spending their budget and conducting lot of awareness programs in assessment of security technology and also providing training and development and certifications to their employees. Similarly risk management teams are working in this regard to keep proper record of all the information available in their systems and also to keep the backup of the important files. In order to protect themselves from these attacks the internet users must change their passwords on regular basis and also they

should install anti-virus and firewall software applications for security purpose. Firewall can be used both in terms of hardware or softwares so its main purpose is to secure the network from all unwanted threats coming from network sources. There are different antivirus softwares which detect

the viruses and remove them. So everyone must be aware about these measures and try to adopt that in order to prevent themselves from several cyber diseases.

8.1.5. Artificial Intelligence

The intelligent digital personal assistants like Siri, Google Now, Cortana, Alexa are all powered by AI. Artificial Intelligence endeavours to simulate the natural intelligence of human beings into machines, thus making them behave intelligently. An intelligent machine is supposed to imitate some of the cognitive functions of humans like learning, decisionmaking and problem solving. In order to make machines perform tasks with minimum human intervention, they are programmed to create a knowledge base and make decisions based on it. AI system can also learn from past experiences or outcomes to make new decisions.

8.1.6. Machine Learning

Machine Learning is a subsystem of Artificial Intelligence, wherein computers have the ability to learn from data using statistical techniques, without being explicitly programmed by a human being. It comprises algorithms that use data to learn on their own and make predictions. These algorithms called models, are first trained and tested using a training data and testing data, respectively. After successive trainings, once these models are able to give results to an acceptable level of accuracy, they are used to make predictions about new and unknown data.

8.2. CONCEPT OF ERP, SCM, CRM

In any industry, some of the demands managers face is to be cost effective. In addition to that, they are also faced with challenges such as to analyze costs and profits on a product or consumer basis, to be flexible to face ever altering business requirements, and to be informed of management decision making processes and changes in ways of doing business.

However, some of the challenges holding managers back include the difficulty in attaining accurate information, lack of applications that mimic existing business practices and bad interfaces. When some challengers are holding a manager back, that is where Enterprise Resource Planning (ERP) comes into play. Supply chain management basically merges the supply and demand management. It uses different strategies and approaches to view the entire chain and work efficiently at each and every step involved in the chain. Every unit that participates in the process must aim to minimize the costs and help the companies to improve their long term performance, while also creating value for its stakeholders and customers. This process can also minimize the rates by eradicating the unnecessary expenses, movements and handling. CRM is an enterprise application module that manages a company's interactions with current and future customers by organizing and coordinating, sales and marketing, and providing better customer services along with technical support.

8.2.1. Enterprise Resource Planning (ERP)

In a nutshell, the Enterprise Resource Planning software tries to integrate all the different departments and functions of an organization into a single computer system to serve the various needs of these departments.

Over the years business applications have evolved from Management Information Systems with no decision support to Corporate Information Systems, which offer some decision support to Enterprise Resource Planning. Enterprise Resource Planning is a software solution that tackles the needs of an organization, taking into account the process view to meet an organization's goals while incorporating all the functions of an organization.

Its purpose is to make easy the information flow between all business functions within the boundaries of the organization and manage the organization's connections with its outside stakeholders. The task at hand, of implementing one software program that looks after the needs of the Finance Department together with the needs of the Human Resource Department and the Warehouse, seems impossible. These different departments usually have an individual software program that is optimized in the way each department works.

ERP is a business management software that is implemented by many business houses to increase their productivity and performance. It is basically used to collect, store, manage and interpret data from many business activities like Product planning, cost, Manufacturing or Service delivery, Marketing and Sales, Inventory management, Shipping and payment etc.

ERP software is very useful for large organization. It comes in many modules:

- Human Resources
- Financial Accounting
- Supply Chain Management
- Customer Relationship Management
- Inventory
- Purchasing
- Project management



Fig 5.1: ERP System

8.2.1.1. Advantages of ERP System

- With Enterprise Resource Planning (ERP) software, accurate forecasting can be done. When accurate forecasting inventory levels are kept at maximum efficiency, this allows for the organization to be profitable.
- Integration of the various departments ensures communication, productivity and efficiency.
- Adopting ERP software eradicates the problem of coordinating changes between many systems.
- ERP software provides a top-down view of an organization, so information is available to make decisions at anytime, anywhere.

8.2.1.2. Disadvantages of ERP System

- Adopting ERP systems can be expensive.
- The lack of boundaries created by ERP software in a company can cause problems of who takes the blame, lines of responsibility and employee morale.

Time and Cost are the important factors that need to be considered before buying or implementing an ERP system. The implementation can take several months to couple of years. The cost is also not fixed and varies based on your requirements and the features provided by the vendor. So, it is advisable to thoroughly analyse the vendor's ERP package modules, features and supporting infrastructure before implementing the ERP.

- SAP
- Oracle
- Microsoft
- Epicor
- Infor
- QAD
- Lawson
- SAGE
- JD Edwards

8.2.2. Supply Chain Management (SCM)

SCM can be defined as the management of flow of products and services, which begins from the origin of products and ends at the product's consumption. It also comprises movement and storage of raw materials that are involved in work in progress, inventory and fully furnished goods. The main objective of supply chain management is to monitor and relate production, distribution, and shipment of products and services. This can be done by companies with a very good and tight hold over internal inventories, production, distribution, internal productions and sales.



Fig 5.2: Supply Chain Management

In the above figure, we can see the flow of goods, services and information from the producer to the consumer. The picture depicts the movement of a product from the producer to the manufacturer, who forwards it to the distributor for shipment. The distributor in turn ships it

to the wholesaler or retailer, who further distributes the products to various shops from where the customers can easily get the product. Supply chain management basically merges the supply and demand management. It uses different strategies and approaches to view the entire chain and work efficiently at each and every step involved in the chain. Every unit that participates in the process must aim to minimize the costs and help the companies to improve their long term performance, while also creating value for its stakeholders and customers. This process can also minimize the rates by eradicating the unnecessary expenses, movements and handling. Here we need to note that supply chain management and supply chain event management are two different topics to consider. The Supply Chain Event Management considers the factors that may interrupt the flow of an effective supply chain; possible scenarios are considered and accordingly, solutions are devised for them.

Every firm strives to match supply with demand in a timely fashion with the most efficient use of resources. Here are some of the important goals of supply chain management:

- Supply chain partners work collaboratively at different levels to maximize resource productivity, construct standardized processes, remove duplicate efforts and minimize inventory levels.
- Minimization of supply chain expenses is very essential, especially when there are economic uncertainties in companies regarding their wish to conserve capital.
- Cost efficient and cheap products are necessary, but supply chain managers need to concentrate on value creation for their customers.
- Exceeding the customers' expectations on a regular basis is the best way to satisfy them.
- Increased expectations of clients for higher product variety, customized goods, off-season availability of inventory and rapid fulfillment at a cost comparable to in-store offerings should be matched.
- To meet consumer expectations, merchants need to leverage inventory as a shared resource and utilize the distributed order management technology to complete orders from the optimal node in the supply chain.

The key benefits of supply chain management are as follows:

- Develops better customer relationship and service.
- Creates better delivery mechanisms for products and services in demand with minimum delay.
- Improvises productivity and business functions.
- Minimizes warehouse and transportation costs.

- Minimizes direct and indirect costs.
- Assists in achieving shipping of right products to the right place at the right time.
- Enhances inventory management, supporting the successful execution of just-in-time stock models. • Assists companies in adapting to the challenges of globalization, economic upheaval, expanding consumer expectations, and related differences.
- Assists companies in minimizing waste, driving out costs, and achieving efficiencies throughout the supply chain process.

8.2.2.1. SCM Process

Supply chain management is a process used by companies to ensure that their supply chain is efficient and cost-effective.

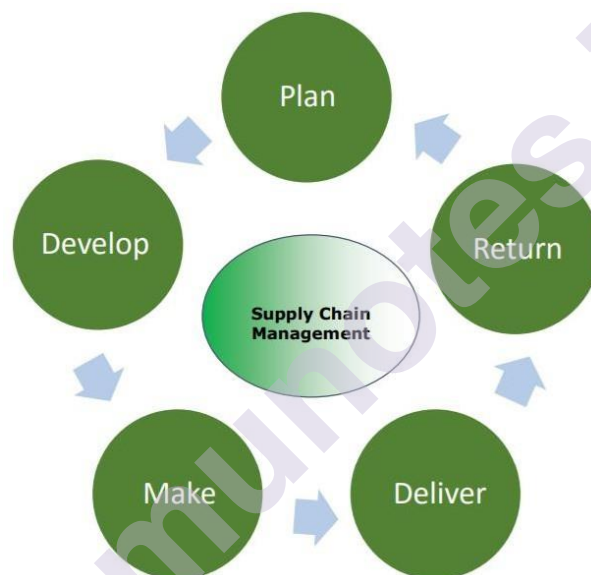


Fig 5.3: SCM Process

A supply chain is the collection of steps that a company takes to transform raw materials into a final product. The five basic components of supply chain management are discussed below:

1. Plan

The initial stage of the supply chain process is the planning stage. We need to develop a plan or strategy in order to address how the products and services will satisfy the demands and necessities of the customers. In this stage, the planning should mainly focus on designing a strategy that yields maximum profit. For managing all the resources required for designing products and providing services, a strategy has to be designed by the companies. Supply chain management mainly focuses on planning and developing a set of metrics.

2. Develop (Source)

After planning, the next step involves developing or sourcing. In this stage, we mainly concentrate on building a strong relationship with suppliers of the raw materials required for production. This involves not only identifying dependable suppliers but also determining different planning methods for shipping, delivery, and payment of the product. Companies need to select suppliers to deliver the items and services they require to develop their product. So in this stage, the supply chain managers need to construct a set of pricing, delivery and payment processes with suppliers and also create the metrics for controlling and improving the relationships. Finally, the supply chain managers can combine all these processes for handling their goods and services inventory. This handling comprises receiving and examining shipments, transferring them to the manufacturing facilities and authorizing supplier payments.

3. Make

The third step in the supply chain management process is the manufacturing or making of products that were demanded by the customer. In this stage, the products are designed, produced, tested, packaged, and synchronized for delivery. Here, the task of the supply chain manager is to schedule all the activities required for manufacturing, testing, packaging and preparation for delivery. This stage is considered as the most metric-intensive unit of the supply chain, where firms can gauge the quality levels, production output and worker productivity.

4. Deliver

The fourth stage is the delivery stage. Here the products are delivered to the customer at the destined location by the supplier. This stage is basically the logistics phase, where customer orders are accepted and delivery of the goods is planned. The delivery stage is often referred as logistics, where firms collaborate for the receipt of orders from customers, establish a network of warehouses, pick carriers to deliver products to customers and set up an invoicing system to receive payments.

5. Return

This stage often tends to be a problematic section of the supply chain for many companies. The planners of supply chain need to discover a responsive and flexible network for accepting damaged, defective and extra products back from their customers and facilitating the return process for customers who have issues with delivered products.

8.2.2.2. SCM Process Flow

Supply chain management can be defined as a systematic flow of materials, goods, and related information among suppliers, companies, retailers, and consumers.

Types

There are three different types of flow in supply chain management:

- Material flow
- Information/Data flow
- Money flow

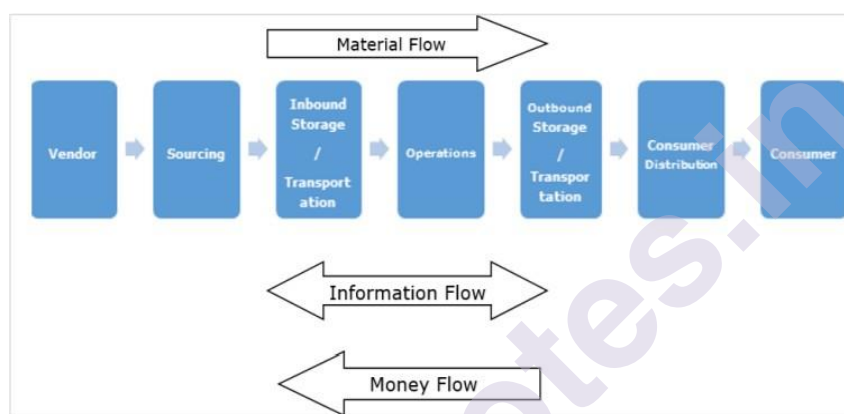


Fig 5.4: SCM Process Flow

Material Flow

Material flow includes a smooth flow of an item from the producer to the consumer. This is possible through various warehouses among distributors, dealers and retailers. The main challenge we face is in ensuring that the material flows as inventory quickly without any stoppage through different points in the chain. The quicker it moves, the better it is for the enterprise, as it minimizes the cash cycle. The item can also flow from the consumer to the producer for any kind of repairs, or exchange for an end of life material. Finally, completed goods flow from customers to their consumers through different agencies. A process known as 3PL is in place in this scenario. There is also an internal flow within the customer company.

Information Flow

Information/data flow comprises the request for quotation, purchase order, monthly schedules, engineering change requests, quality complaints and reports on supplier performance from customer side to the supplier. From the producer's side to the consumer's side, the information flow consists of the presentation of the company, offer, confirmation of purchase order, reports on action taken on deviation, dispatch details, report on inventory, invoices, etc.

Money Flow

Based on the invoice raised by the producer, the clients examine the order for correctness. If the claims are correct, money flows from the clients to the respective producer. Flow of money is also observed from the producer side to the clients in the form of debit notes.

8.2.3. Customer Relationship Management

Atul Parvatiyar and Jagdish N. Sheth provide an excellent definition for customer relationship management in their work titled - 'Customer Relationship Management: Emerging Practice, Process, and Discipline' –

Customer Relationship Management is a comprehensive strategy and process of acquiring, retaining, and partnering with selective customers to create superior value for the company and the customer. It involves the integration of marketing, sales, customer service, and the supply-chain functions of the organization to achieve greater efficiencies and effectiveness in delivering customer value.

8.2.3.1. Need of CRM

- To keep track of all present and future customers.
- To identify and target the best customers.
- To let the customers know about the existing as well as the new products and services.
- To provide real-time and personalized services based on the needs and habits of the existing customers.
- To provide superior service and consistent customer experience.
- To implement a feedback system.

8.2.3.2. Scope of CRM



Fig 5.5: CRM Model

8.2.3.3. Objectives of CRM

The most prominent objectives of using the methods of Customer Relationship Management are as follows –

- **Improve Customer Satisfaction** – CRM helps in customer satisfaction as the satisfied customers remain loyal to the business and spread good word-of-mouth. This can be accomplished by fostering customer engagement via social networking sites, surveys, interactive blogs, and various mobile platforms.
- **Expand the Customer Base** – CRM not only manages the existing customers but also creates knowledge for prospective customers who are yet to convert. It helps creating and managing a huge customer base that fosters profits continuity, even for a seasonal business.
- **Enhance Business Sales** – CRM methods can be used to close more deals, increase sales, improve forecast accuracy, and suggestion selling. CRM helps to create new sales opportunities and thus helps in increasing business revenue.
- **Improve Workforce Productivity** – A CRM system can create organized manners of working for sales and sales management staff of a business. The sales staff can view customer's contact information, follow up via email or social media, manage tasks, and track the salesperson's performance. The salespersons can address the customer inquiries speedily and resolve their problems.

8.2.3.4. Types of CRM

There are four basic types of CRM systems –

- Strategic CRM
- Operational CRM
- Analytical CRM
- Collaborative CRM

Strategic CRM

Strategic CRM is a type of CRM in which the business puts the customers first. It collects, segregates, and applies information about customers and market trends to come up with better value proposition for the customer.

The business considers the customers' voice important for its survival. In contrast to Product- Centric CRM (where the business assumes customer requirements and focuses on developing the product that may sometimes lead to over-engineering), here the business constantly keeps learning about the customer requirements and adapting to them.

These businesses know the buying behavior of the customer that happy customers buy more frequently than rest of the customers. If any business is not considering this type of CRM, then it risks losing the market share to those businesses, which excel at strategic CRM.

Operational CRM

Operational CRM is oriented towards customer-centric business processes such as marketing, selling, and services. It includes the following automations: Sales Force Automation, Marketing Automation, and Service Automation.

Salesforce is the best suitable CRM for large established businesses and Zoho is the best CRM for growing or small-scale businesses.



Fig 5.6: Operational CRM

Sales Force Automation

SFA is the application of technology to manage selling activities. It standardizes a sales cycle and common terminology for sales issues among all the sales employees of a business. It includes the following modules –

- **Product Configuration** – It enables salespersons or customers themselves to automatically design the product and decide the price for a customized product. It is based on if-then-else structure.
- **Quotation and Proposal Management** – The salesperson can generate a quotation of the product prices and proposal for the customer by entering details such as customer name, delivery requirements, product code, number of pieces, etc.
- **Accounts Management** – It manages inward entries, credit and debit amounts for various transactions, and stores transaction details as records.
- **Lead Management** – It lets the users qualify leads and assigns them to appropriate salespersons.
- **Contact Management** – It is enabled with the features such as customers' contact details, salespersons' calendar, and automatic

dialing numbers. These all are stored in the form of computerized records. Using this application, a user can communicate effectively with the customers.

- **Opportunity Management** – It lets the users identify and follow leads from lead status to closure and beyond closure.

Marketing Automation

Marketing automation involves market segmentation, campaigns management, event-based marketing, and promotions. The campaign modules of Marketing Automation enable the marketing force to access customer-related data for designing, executing and evaluating targeted offers, and communications.

Event-based (trigger) marketing is all about messaging and presenting offers at a particular time. For example, a customer calls the customer care number and asks about the rate of interest for credit card payment. This event is read by CRM as the customer is comparing interest rates and can be diverted to another business for a better deal. In such cases, a customized offer is triggered to retain the customer.

Service Automation

Service automation involves service level management, resolving issues or cases, and addressing inbound communication. It involves diagnosing and solving the issues about product.

With the help of Interactive Voice Response (IVR) system, a customer can interact with business computers by entering appropriate menu options. Automatic call routing to the most capable employee can be done.

Consumer products are serviced at retail outlets at the first contact. In case of equipment placed on field, the service expert may require product servicing manual, spare parts manual, or any other related support on laptop. That can be availed in service automation.

Analytical CRM

Analytical CRM is based on capturing, interpreting, segregating, storing, modifying, processing, and reporting customer-related data. It also contains internal business-wide data such as Sales Data (products, volume, purchasing history), Finance Data (purchase history, credit score) and Marketing Data (response to campaign figures, customer loyalty schemes data). Base CRM is an example of analytical CRM. It provides detailed analytics and customized reports.

Business intelligence organizations that provide customers' demographics and lifestyle data over a large area pay a lot of attention to internal data to get more detail information such as, "Who are most valuable customers?", "Which consumers responded positively to the last campaign and converted?", etc.

Analytical CRM can set different selling approaches to different customer segments. In addition, different content and styling can be offered to different customer segments. For the customers, analytical CRM gives customized and timely solutions to the problems. For the business, it gives more prospects for sales, and customer acquisition and retention.

Collaborative CRM

Collaborative CRM is an alignment of resources and strategies between separate businesses for identifying, acquiring, developing, retaining, and maintaining valuable customers. It is employed in B2B scenario, where multiple businesses can conduct product development, market research, and marketing jointly.

Collaborative CRM enables smooth communication and transactions among businesses. Though traditional ways such as air mail, telephone, and fax are used in communication, collaborative CRM employs new communication systems such as chat rooms, web forums, Voice over Internet Protocol (VoIP), and Electronic Data Interchange (EDI).



Fig 5.7: Collaborative CRM

There are collaborative CRMs with in-built **Partner Relationship Management (PRM)** software application which helps in managing partner promotions.

8.2.3.5. Advantages of CRM

- Provides better customer service and increases customer revenues.
- Discovers new customers.
- Cross-sells and up-sells products more effectively.
- Helps sales staff to close deals faster.
- Makes call centers more efficient.
- Simplifies marketing and sales processes.

8.2.3.6. Disadvantages of CRM

- Sometimes record loss is a major problem.
- Overhead costs.
- Giving training to employees is an issue in small organizations.

8.3. DATABASE MANAGEMENT SYSTEM

The database is a collection of inter-related data which is used to retrieve, insert and delete the data efficiently. It is also used to organize the data in the form of a table, schema, views, and reports, etc. for e.g. Bank database organizes the data about its account holders with different attributes like account number, account name, account type etc.

- Database management system is a software which is used to manage the database. For example: MySQL, Oracle, etc are a very popular commercial database which is used in different applications.
- DBMS provides an interface to perform various operations like database creation, storing data in it, updating data, creating a table in the database and a lot more.
- It provides protection and security to the database. In the case of multiple users, it also maintains data consistency.

DBMS allows users the following tasks:

- Data Definition: It is used for creation, modification, and removal of definition that defines the organization of data in the database.
- Data Updation: It is used for the insertion, modification, and deletion of the actual data in the database.
- Data Retrieval: It is used to retrieve the data from the database which can be used by applications for various purposes.
- User Administration: It is used for registering and monitoring users, maintain data integrity, enforcing data security, dealing with concurrency control, monitoring performance and recovering information corrupted by unexpected failure.

8.3.1. Characteristics of DBMS

- It uses a digital repository established on a server to store and manage the information.
- It can provide a clear and logical view of the process that manipulates data.
- DBMS contains automatic backup and recovery procedures.

- It contains ACID properties which maintain data in a healthy state in case of failure.
- It can reduce the complex relationship between data.
- It is used to support manipulation and processing of data.
- It is used to provide security of data.
- It can view the database from different viewpoints according to the requirements of the user.

8.3.2. Advantages of DBMS

- Controls database redundancy: It can control data redundancy because it stores all the data in one single database file and that recorded data is placed in the database.
- Data sharing: In DBMS, the authorized users of an organization can share the data among multiple users.
- Easily Maintenance: It can be easily maintainable due to the centralized nature of the database system.
- Reduce time: It reduces development time and maintenance need.
- Backup: It provides backup and recovery subsystems which create automatic backup of data from hardware and software failures and restores the data if required.
- multiple user interface: It provides different types of user interfaces like graphical user interfaces, application program interfaces

8.3.3. Disadvantages of DBMS

- Cost of Hardware and Software: It requires a high speed of data processor and large memory size to run DBMS software.
- Size: It occupies a large space of disks and large memory to run them efficiently.
- Complexity: Database system creates additional complexity and requirements.
- Higher impact of failure: Failure is highly impacted the database because in most of the organization, all the data stored in a single database and if the database is damaged due to electric failure or database corruption then the data may be lost forever.

A Data Warehouse (DW) is a relational database that is designed for query and analysis rather than transaction processing. It includes historical data derived from transaction data from single and multiple sources.

An operational database undergoes frequent changes on a daily basis on account of the transactions that take place. Suppose a business executive wants to analyze previous feedback on any data such as a product, a supplier, or any consumer data, then the executive will have no data available to analyze because the previous data has been updated due to transactions.

A Data Warehouse provides integrated, enterprise-wide, historical data and focuses on providing support for decision-makers for data modeling and analysis.

A Data Warehouse is a group of data specific to the entire organization, not only to a particular group of users.

It is not used for daily operations and transaction processing but used for making decisions. A Data Warehouse can be viewed as a data system with the following attributes:

- It is a database designed for investigative tasks, using data from various applications.
- It supports a relatively small number of clients with relatively long interactions.
- It includes current and historical data to provide a historical perspective of information.
- Its usage is read-intensive.
- It contains a few large tables.

"Data Warehouse is a subject-oriented, integrated, and time-variant store of information in support of management's decisions."

8.4.1. Characteristics of Data Warehouse

The characteristics of a data warehouse are discussed below –

- **Subject Oriented** – A data warehouse is subject oriented because it provides information around a subject rather than the organization's ongoing operations. These subjects can be product, customers, suppliers, sales, revenue, etc. A data warehouse does not focus on the ongoing operations, rather it focuses on modelling and analysis of data for decision making.
- **Integrated** – A data warehouse is constructed by integrating data from heterogeneous sources such as relational databases, flat files, etc. This integration enhances the effective analysis of data.

- **Time Variant** – The data collected in a data warehouse is identified with a particular time period. The data in a data warehouse provides information from the historical point of view.
- **Non-volatile** – Non-volatile means the previous data is not erased when new data is added to it. A data warehouse is kept separate from the operational database and therefore frequent changes in operational database is not reflected in the data warehouse.

8.4.2. Data Warehouse Applications

As discussed before, a data warehouse helps business executives to organize, analyze, and use their data for decision making. A data warehouse serves as a sole part of a plan-execute-assess "closed-loop" feedback system for the enterprise management. Data warehouses are widely used in the following fields –

- Financial services
- Banking services
- Consumer goods
- Retail sectors
- Controlled manufacturing

8.4.3. Types of Data Warehouse

Information processing, analytical processing, and data mining are the three types of data warehouse applications that are discussed below –

- **Information Processing** – A data warehouse allows to process the data stored in it. The data can be processed by means of querying, basic statistical analysis, reporting using crosstabs, tables, charts, or graphs.
- **Analytical Processing** – A data warehouse supports analytical processing of the information stored in it. The data can be analyzed by means of basic OLAP operations, including slice-and-dice, drill down, drill up, and pivoting.
- **Data Mining** – Data mining supports knowledge discovery by finding hidden patterns and associations, constructing analytical models, performing classification and prediction. These mining results can be presented using the visualization tools.

8.4.4. Benefits of Data Warehouse

1. Understand business trends and make better forecasting decisions.
2. Data Warehouses are designed to perform well enormous amounts of data.

3. The structure of data warehouses is more accessible for end-users to navigate, understand, and query.
4. Queries that would be complex in many normalized databases could be easier to build and maintain in data warehouses.
5. Data warehousing is an efficient method to manage demand for lots of information from lots of users.
6. Data warehousing provide the capabilities to analyze a large amount of historical data.

8.5. BUSINESS INTELLIGENT SYSTEM

With increased data load emerged the need of organizing, storing and drawing useful insights from it in order to enhance business value. Which introduced concepts of Business Intelligence in the picture.

The term Business Intelligence refers collectively to the tools and techniques used for the collection, integration, analysis and visualization of raw data. The raw data collected and processed through the Business Intelligence processes is then transformed into comprehensible data or meaningful information.

This information is then interpreted strategically by looking for trends and patterns in order to make business decision supported by facts. To simplify the concept, raw data is collected from various sources and with the help of Business Intelligence tools and is transformed into meaningful information, stored in data warehouses in predefined manners. From the data warehouses, we can retrieve stored data in the form of a report, query or conduct an analysis. This can also be explained using ETL (Extract, Transform, Load concept).

It helps in analyzing business trends from past and help in taking lucrative business steps in future. BI is a dynamic approach, that means it's output changes and evolves with time and trends in business.

8.5.1. Business Intelligence Examples

For example, 'Westside Store' selling products of various brands both in-store and online.

All the customers are offered a loyalty card which has a unique ID. These cards are used while shopping from Westside stores or Westside's online portal. All your purchase details associated with your unique account ID are stored into the Westside's database. Now, the manager of Westside will use BI methods and software to run analytical reports on huge amounts of customer information to identify consumer trends like their favorite brand, do they prefer in-store shopping or online shopping? What price range is the most affordable? and during which months or seasons of the year, they shop the most.

Thus, giving the organization valuable information like customer preferences, needs, and habits. Using which the organization could anticipate new opportunities, deliver better service and come up with new marketing campaigns like releasing offer coupons, launching a sale etc., serving the ultimate goal of growth of the business.

8.5.2. Characteristics of BIS

- It is created by procuring data and information for use in decision-making.
- It is a combination of skills, processes, technologies, applications and practices.
- It contains background data along with the reporting tools.
- It is a combination of a set of concepts and methods strengthened by fact-based support systems.
- It is an extension of Executive Support System or Executive Information System.
- It collects, integrates, stores, analyzes, and provides access to business information
- It is an environment in which business users get reliable, secure, consistent, comprehensible, easily manipulated and timely information.
- It provides business insights that lead to better, faster, more relevant decisions.

8.5.3. Benefits of BIS

- Improved Management Processes.
- Planning, controlling, measuring and/or applying changes that results in increased revenues and reduced costs.
- Improved business operations.
- Fraud detection, order processing, purchasing that results in increased revenues and reduced costs.
- Intelligent prediction of future.

8.6. KNOWLEDGE MANAGEMENT

Knowledge management is an activity practised by enterprises all over the world. In the process of knowledge management, these enterprises comprehensively gather information using many methods and tools.

Then, gathered information is organized, stored, shared, and analyzed using defined techniques. The analysis of such information will be based on resources, documents, people and their skills.

Properly analyzed information will then be stored as 'knowledge' of the enterprise. This knowledge is later used for activities such as

organizational decision making and training new staff members. There have been many approaches to knowledge management from early days. Most of early approaches have been manual storing and analysis of information. With the introduction of computers, most organizational knowledge and management processes have been automated.

Therefore, information storing, retrieval and sharing have become convenient. Nowadays, most enterprises have their own knowledge management framework in place.

The framework defines the knowledge gathering points, gathering techniques, tools used, data storing tools and techniques and analyzing mechanism.

8.6.1 The Knowledge Management Process

The process of knowledge management is universal for any enterprise. Sometimes, the resources used, such as tools and techniques, can be unique to the organizational environment.

The Knowledge Management process has six basic steps assisted by different tools and techniques. When these steps are followed sequentially, the data transforms into knowledge.

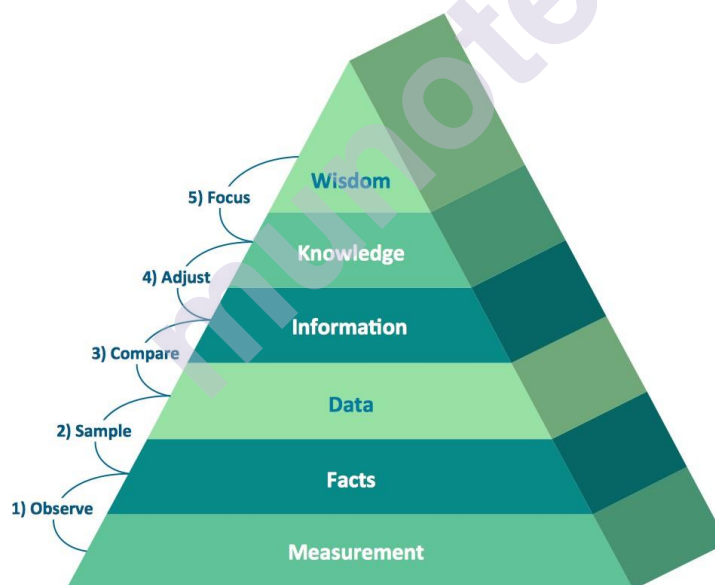


Fig 5.8: Knowledge Management Process

Step 1: Collecting

This is the most important step of the knowledge management process. If you collect the incorrect or irrelevant data, the resulting knowledge may not be the most accurate. Therefore, the decisions made based on such knowledge could be inaccurate as well.

There are many methods and tools used for data collection. First of all, data collection should be a procedure in knowledge management process. These procedures should be properly documented and followed by people involved in data collection process.

The data collection procedure defines certain data collection points. Some points may be the summary of certain routine reports. As an example, monthly sales report and daily attendance reports may be two good resources for data collection.

With data collection points, the data extraction techniques and tools are also defined. As an example, the sales report may be a paper-based report where a data entry operator needs to feed the data manually to a database whereas, the daily attendance report may be an online report where it is directly stored in the database.

In addition to data collecting points and extraction mechanism, data storage is also defined in this step. Most of the organizations now use a software database application for this purpose.

Step 2: Organizing

The data collected need to be organized. This organization usually happens based on certain rules. These rules are defined by the organization.

As an example, all sales-related data can be filed together and all staff-related data could be stored in the same database table. This type of organization helps to maintain data accurately within a database.

If there is much data in the database, techniques such as 'normalization' can be used for organizing and reducing the duplication.

This way, data is logically arranged and related to one another for easy retrieval. When data passes step 2, it becomes information.

Step 3: Summarizing

In this step, the information is summarized in order to take the essence of it. The lengthy information is presented in tabular or graphical format and stored appropriately.

For summarizing, there are many tools that can be used such as software packages, charts (Pareto, cause-and-effect), and different techniques.

Step 4: Analyzing

At this stage, the information is analyzed in order to find the relationships, redundancies and patterns.

An expert or an expert team should be assigned for this purpose as the experience of the person/team plays a vital role. Usually, there are reports created after analysis of information.

Step 5: Synthesizing

At this point, information becomes knowledge. The results of analysis (usually the reports) are combined together to derive various concepts and artefacts.

A pattern or behavior of one entity can be applied to explain another, and collectively, the organization will have a set of knowledge elements that can be used across the organization.

This knowledge is then stored in the organizational knowledge base for further use.

Usually, the knowledge base is a software implementation that can be accessed from anywhere through the Internet.

You can also buy such knowledge base software or download an open-source implementation of the same for free.

Step 6: Decision Making

At this stage, the knowledge is used for decision making. As an example, when estimating a specific type of a project or a task, the knowledge related to previous estimates can be used.

This accelerates the estimation process and adds high accuracy. This is how the organizational knowledge management adds value and saves money in the long run.

8.7. E-COMMERCE

E-commerce also known as Electronic Commerce, refers to buying and selling of products or services over the Internet. Normally e-commerce is used to refer to the sale of physical products online, but it can also describe any kind of commercial transaction that is facilitated through the internet.

The first ever online sale was in 1994 when a man sold a CD by the band Sting to his friend through his website Net Market, an American retail platform. This is the first example of a consumer buying a product from a business through the World Wide Web or e-commerce as we commonly know it today. After that e-commerce has evolved to make products easier to discover and purchase through online retailers and marketplaces. All freelancers as well as small and large businesses have been benefited from e-commerce which enables them to sell their goods and services at a scale that was not possible with traditional offline retail.

8.7.1. Types of E-commerce model

There are basically 4 main types of e-commerce models that can describe almost every transaction that takes place between consumers and businesses.

1. Business to Consumer (B2C):

When a good or service is sold to an individual consumer by a business, e.g., we buy a pair of shoes from an online retailer.

2. Business to Business (B2B):

When a good or service is sold by a business to another business, e.g., a software-as-a-service is sold by a business for other businesses to use.

3. Consumer to Consumer (C2C):

When a good or service is sold by a consumer to another consumer, e.g., we sell our old furniture on eBay to another consumer.

4. Consumer to Business (C2B):

When a consumer's own products or services is sold to a business or organization, e.g., an authority offers exposure to their online audience in exchange for a fee or a photographer licenses their photo for a business to use.

8.7.2. Business Application of E-commerce

- Conversational commerce: e-commerce via chat
- Digital Wallet
- Document automation in supply chain and logistics
- Electronic tickets
- Enterprise content management
- Group buying
- Instant messaging
- Newsgroups
- Online banking
- Online office suites
- Online shopping and order tracking
- Pretail
- Print on demand
- Shopping cart software
- Social networking
- Teleconferencing
- Virtual assistant (artificial intelligence)
- Domestic and international payment systems

8.7.3. Advantages of E-commerce

- E-commerce enables fast and secure shopping.
- It is making digitalized world.
- E-commerce also enables to choose different goods and services according to your choice.
- It is a simple way of selling and buying products and services.
- E-commerce replaced the paper work as all transactions are through internet today.
- It provides better management system, as it has a centralized database.
- E-commerce via internet covers a large number of customers worldwide.

8.7.4. Disadvantages of E-commerce

- E-commerce has no universal standard for quality and reliability.
- E-commerce works through internet, it is possible that navigation on internet itself may be slow.
- Strong security is required in e-commerce as all transactions are through internet.
- There is high risk of buying unsatisfactory products through e-commerce.
- It uses public key infrastructure which is not safe.
- Customers also trap in banking fraud which is quite frequent.
- Hackers also try to get access of data or to destroy data in e-commerce.

8.8. E- Business and M- Commerce

E-Business is the trading in products or services using Internet. E-business draws on technologies such as mobile commerce, electronic fund transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange etc.

Mobile commerce or simply M-Commerce means engaging users in a buy or sell process via a mobile device. For instance, when someone buys an Android app or an iPhone app, that person is engaged in m-commerce. There are a number of content assets that can be bought and sold via a mobile device such as games, applications, ringtones, subscriptions etc.

8.8.4. Benefits of M-Commerce

The major benefit of engaging in m-commerce is the sheer size of potential sales. The probability of your potential customers owning a Smartphone is very high, so you can safely assume that you will get much more positive response from mobile devices than your website. M-commerce is recommended for every business irrespective of its type, scale, and size.

8.9. DIGITAL BUSINESS

In today's work-from-home world, it feels like everyone is running a digital business. But the reality is that top business leaders have different definitions of what it means to go digital. As a result, priorities vary when it comes to technology adoption and transformation.

Generally speaking, digital businesses rely on technology to operate and grow. Depending on your industry, that might look like:

- Using productivity apps and task management systems to automate workflows
- Leveraging AI to improve customer experience
- Capturing data to improve business intelligence
- Or, for online-only companies, doing 100 percent of your work via digital platforms

8.9.1. Concepts of Digital Business

Becoming a digital business is a foundational shift, so it's important to consider the key concepts guiding your transformation.

What are businesses looking to achieve by going digital? Most organizations cite the following four concepts:

1. Flexibility

Our world is constantly changing, and companies are looking for a business model that allows them to be more flexible. During the COVID-19 pandemic, for instance, businesses realized that technology could help them pivot from on-site to work-from-home and back again without creating a logistical nightmare. Going digital allows you to adapt to change quickly without the dead weight of time-consuming manual processes.

2. Scalability

With scalability, processes match fluctuations in your workload. Digital businesses can quickly scale up or down to meet the needs of the organization. As an example, a scalable business can efficiently

onboard new employees during periods of growth or expand their data storage when taking on a large client.

3. Culture

Digital business requires changing how you operate, and this starts with changing how you think. To truly become a digital business, you need your staff to be on board. Though tech leaders in your organization may be at the forefront of this work, building a philosophy of productivity, efficiency, and automation into every department's mission is vital to success.

4. Quality

Our final digital business concept seems straightforward, but it's important to keep in mind that quality is key as you make big changes. Often, we become swept up in innovation for innovation's sake. But this won't add value to your business. If your new processes aren't enhancing quality, you need to rethink your strategy.

8.9.2. Examples of Popular Digital Businesses

Digital business isn't just a transformative trend for major companies like Home Depot and GE. Many digital businesses start online (and remain online) with 100 percent of their operations existing in a digital space. Online-only digital businesses often have low startup costs and can quickly scale to meet the demands of the market, making them a popular choice for both experienced and fledgling entrepreneurs.

Sellers on Etsy, the popular ecommerce platform offering handmade goods, are a common example of the digital business trend. Etsy reported in 2017 that 97 percent of the business owners selling on their platform ran their business from home, and more than 75 percent were one-person operations. Despite being considered a "microbusiness," many successful digital business owners on Etsy said it was their sole occupation – about 32 percent of sellers.

8.10. E-GOVERNANCE

Electronic Governance or E-Governance is the application of Information and Communication Technology (ICT) for providing government services, interchange of statics, communication proceedings, integration of various independent systems and services.

Through the means of e-governance, government services are made available to citizens in a suitable, systematic and transparent mode. The three main selected groups that can be discriminated in governance concepts are government, common people and business groups. E-governance is the best utilization of information and communication technologies to mutate and upgrade the coherence, productivity, efficacy, transparency and liability of informational and transnational interchanges

within government, between government agencies at different levels, citizen & businesses. It also gives authorization to citizens through access and use of information. Generally, E-governance uses information and communication technologies at various levels of the government and the public sector to enhance governance. Theoretical studies state that E-Governance is the procedure of change of the correlation of government with its ingredients, the citizens, the businesses and between its own organs, using tools of information and communication technology.

The UNESCO states, E-governance is the public sector's use of information and communication automation in order to upgrade information and service delivery, stimulating resident involvement in the decision-making process and making government more liable, unambiguous and productive.

8.10.1. Elements of E-Governance:

Basic elements of e-governance are:

1. Government
2. Citizens
3. Investors/Businesses

8.10.2. Types of E-Governance:

E-governance is of 4 types:

1. Government-to-Citizen (G2C)

The Government-to-citizen mentions the government services that are acquired by the familiar people. Most of the government services come under G2C. Similarly, the primary aim of Government-to-citizen is to supply facilities to the citizens. It also helps the ordinary people to minimize the time and cost to carry out a transaction. A citizen can retrieve the facilities anytime from anywhere.

Similarly, spending the administrative fee online is also possible due to G2C. The facility of Government-to-Citizen allows the ordinary citizen to outclass time limitation. It also focuses on geographic land barriers.

2. Government-to-business (G2B)

The Government-to-business is the interchange of services between Government and Business firms. It is productive for both government and business firms. G2B provides access to pertinent forms needed to observe. It also contains many services interchanged between business sectors and government.

Similarly, the Government-to-business provides timely business information. A business organization can have easy and easy online access to government agencies. G2B plays a important role in

business development. It upgrades the efficiency and quality of communication and transparency of government projects.

3. Government-to-Government (G2G)

The Government-to-Government mentions the interaction between different government departments, firms and agencies. This increases the efficiency of government processes. In G2G, government agencies can share the same database using online communication. The government departments can work together. This service can increase international discretion and relations.

G2G services can be at the local level or at the international level. It can convey with both global government and local government. It also provides safe and secure inter-relationship between domestic or foreign government. G2G builds a universal database for all members to upgrade service.

4. Government-to-Employee (G2E)

The Government-to-Employee is the internal part of G2G section. It aims to bring employees together and improvise knowledge sharing. It provides online facilities to the employees. Similarly, applying for leave, reviewing salary payment record and checking the balance of holiday. The G2E sector yields human resource training and development. So, G2E is also the correlation between employees and government institutions.

8.10.3. Advantages of E-Governance

The supreme goal of the e-governance is to be able to provide an increased portfolio of public services to citizens in a systematic and cost-effective way. It allows for government transparency because it allows the public to be informed about what the government is working on as well as the policies they are trying to implement.

The main advantage while executing electronic government will be to enhance the efficiency of the current system.

8.10.4. Disadvantages of E-Governance

The main disadvantage regarding e-governance is the absence of fairness in public access to the internet, of trustworthy information on the web and disguised agendas of government groups that could have impact and could bias public opinions.

8.11. CONCLUSIONS:

Most of all IT helps in searching new and interesting jobs. Information technology is a vast area and used in broader term but most commonly it is used in context of computers and telecommunication equipment's which are useful in every organization. Organizations and individuals around the world spend billions of dollars each year providing and using information

technology. New capability, standards, and products appear every day. Initially the computer work stands alone with one terminal now it is working with several terminals. World Wide Web has made the life easier. Similarly social networking sites have become an important part of our lives. By means of this people can connect with their dear ones and share their ideas with others. On the other hand, cyber-crimes, system viruses and worms have created harm to all the available information. In today's work-from-home world, it feels like everyone is running a digital business. Enterprise Resource Planning is a software solution that tackles the needs of an organization, taking into account the process view to meet an organization's goals while incorporating all the functions of an organization.

There are a number of content assets that can be bought and sold via a mobile device such as games, applications, ringtones, subscriptions etc.

E-governance is the best utilization of information and communication technologies to mutate and upgrade the coherence, productivity, efficacy, transparency and liability of informational and transnational interchanges within government, between government agencies at different levels, citizen & businesses.

EXERCISE:

1. What is Internet? State its evolution.
2. Explain the applications of ICT in corporates
3. Explain the role of Information Technology in the development of corporates.
4. Explain the following along with their applications. a) Artificial Intelligence b) Machine Learning
5. Explain advantages and disadvantages of SCM.
6. Explain the concept of Customer relationship management.
7. Explain the model of ERP.
8. Explain difference between E-Commerce and Mobile Commerce.
9. Define Datawarehouse. State its features.
10. Write a note on Business Intelligence
11. Explain the role of digital transformation for the growth of E-Governance.

IMPACT OF INFORMATION TECHNOLOGY IN BUSINESS SECTOR

Unit Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 E-Infrastructure in India
- 9.3 Impact of information on business
- 9.4 Business alignment across the function and sectors and society
- 9.5 Conclusion

9.0 OBJECTIVES

- Study and impact of digitization on Business sector
- Developmental aspects of Information Technology
- Revolution of digitization on society

9.1 INTRODUCTION

Information Technology (IT) is among the relevant factor assisting the business to penetrate in a new market for being innovative and generating new product and services which help the growth of the business and company. 21st century has come to be known as the era of Information Technology; it is the key driver of economic growth of not only a nation, but rather the whole world. The growth and progress of every sector of the country today depends on the level of Information Technology. Likewise, Information Technology is one of the essential features for the overall development of a country.

The revolution of IT and internet facilitates the outstanding performance of the economy in business sector, through the exchanges of information by using internet and electronic devices facilitate accessibility of doing business between companies globally.

9.1.1. Important Features of Information Technology

Following are the major features as well as advantages of Information Technology –

- The development of Information Technology has made education system simpler, easier, and widespread. Now, people of remote areas

can also use technology for their children's education and also avail the benefits of adult education.

- Diffusion of e-governance on a large scale.
- Participation of public in governance and policy making.
- Fast economic development.
- Development of remote areas.
- Technology helps the police in nabbing the criminals.
- The judiciary and other administrative services can also take the help of technology to make work easier and faster.
- Highly beneficial for the common people, as they can access their rights and can take legal action against the person who violates his/her rights.
- It increases the happiness and prosperity of not only an individual, but rather the society as a whole.

9.1.2. Demerits of Information Technology

Information Technology is like a boon on the society. However, it comes with its own disadvantages –

- As discussed above, with the help of technology, police can arrest criminals and criminal activities; at the same time, technology has also opened the door for criminals as well to practice smart criminal activity.
- There are chances that children can misuse technology and take a wrong path.
- Some distorted and perverted minds use technology to demean or defame someone unethically and also illegally.
- These are basically not demerits but rather the misuse of technology.

9.1.3. Information Technology Act, 2000

By understanding the growing demand and applications of Information Technology, the Government of India passed the bill of Information Technology in 2000, which came to be known as the Information Technology Act, 2000.

- The major features of the Act are –
- It facilitates e-governance and e-commerce by providing equal legal treatment to users.
- It made provision to accept electronic records and digital signature.
- It gave legal approval to electronic business transactions.

- The Act instructs banks to maintain electronic record and facilitate electronic fund transfer.

9.2 E-INFRASTRUCTURE IN INDIA

E-infrastructure facilitates competent equipment and favourable resources and opportunities that are essentially needed to for the safety, security, and development of a society. Further, e- infrastructure helps to integrate various technologies including different computer systems, internet broadband channels, computing power, data storage, data sharing, and many more.

To meet the growing challenges of globalization and cope-up with the sustainable growth of information and communication technology, it is essentially required to integrate these systems by developing better e-infrastructure.

9.2.1. Initiatives

By understanding the growing demand and challenges, the Department of Information Technology formulated a ‘National Policy on Universal Electronic Accessibility’.

The policy was approved by the union cabinet in 2013.

The major strategies adopted in the implementation of the policy have been taken from the Press Information Bureau Government of India Cabinet October 3, 2013 –

- Creating awareness on universal electronics accessibility and universal design.
- Capacity building and infrastructure development.
- Setting up of model electronics and ICTs centres for providing training and demonstration to special educators and physically as well as mentally challenged persons.
- Conducting research and development, use of innovation, ideas, technology etc. whether indigenous or outsourced from abroad.
- Developing programme and schemes with greater emphasis for differently abled women/children.
- Developing procurement guidelines for electronics and ICTs for accessibility and assistive needs.

9.2.2. ITIR

For the exclusive growth of E-infrastructure in India, the Government of India has formulated the policy on ‘Information Technology Investment Regions (ITIRs) in 2008.

As per the policy, ITIRs will be self-contained integrated township with the purpose to accelerated growth of Information Technology, Information Technology Enabled Service, and Electronic Hardware Manufacturing units.

Further, the policy has recommended to assign minimum area of 40 sq. km for ITIR. However, out of the total demarcated area, 40% should be reserved for the processing zone and the remaining area for the non-processing zone.

The processing zone will include –

- Information Technology/Information Technology Enabled Services
- Electronic Hardware Manufacturing Units
- Logistics and other services and required infrastructure.

On the other hand, the non-processing area will include –

- Residential area
- Commercial area
- Other social and institutional infrastructure

9.2.3. National Knowledge Network

In 2009, in order to create an infrastructure that can fulfil the future requirements, the concept of ‘National Knowledge Network’ (NKN) is conceptualized.

The concept of NKN is designed to Encourage, Enable, Enrich, and Empower the user community to test and implement the innovative ideas without any restrictions.

Further, the NKN will provide better –

- Network design
- Security requirements
- Service requirements
- Operational requirements

9.2.4. Dot Bharat

The concept of developing the domain and website in ‘Devnagri’ (native script) was launched in August 2014.

This script will cover the following Indian languages –

- Hindi
- Marathi
- Boro

- Dogri
- Maithili
- Sindhi
- Gujarati

9.3. IMPACT OF INFORMATION ON BUSINESS

The rise of information technology has paved the way for various innovations. With the digitization of information, more and more businesses are increasingly leveraging the benefits of digital tools to improve their prospects. Information technology has been crucial in turning this process into a complete success. Advancement in communication and information technology has further strengthened the role of the internet in business. The internet is widely used in organization for marketing and promotion of products and services. The internet is used to deliver customer support, share information and provide training to employees.

Information technology has dramatically transformed the lives of individuals. It provides businesses the scope to analyze data and plan business strategies accordingly. Utilizing information technology means that the data analysis is accurate, thus optimizing profits.

Information technology has had a major impact on various aspects of businesses. Let's take a look at some of these here.

1. Cloud Computing

The concept of cloud computing is immensely popular among businesses owing to the efficiency in business operations that it provides. Cloud computing utilizes information technology to capitalize on its ability to provide improved agility and time and resource management for businesses.

Increasingly, businesses are shifting to the cloud to leverage its many benefits. It has been predicted that more than \$1 trillion will be impacted in IT spending by the transition of businesses to cloud computing by 2020.

“Cloud-first strategies are the foundation for staying relevant in a fast-paced world,” Ed Anderson, research VP at the analyst firm, Gartner pointed out, “The market for cloud services has grown to such an extent that it is now a notable percentage of total IT spending, helping to create a new generation of start-ups and “born in the cloud” providers.”

A good Internet connection and a commendable WiFi connectivity are important to accomplish this.

2. Automation of Business Processes

The movement towards increased automation of business processes has gained traction over the years. It improves efficiency and increases workflow considerably.

Information technology helps in developing automated processes for businesses. This not only helps in reducing the cost of operation but also saves time. The time saved can be utilized to focus on other tasks, thus speeding up business processes significantly.

Processes like billing, tracking metrics, collecting customer data, monitoring certain processes etc. can be automated easily. There are numerous automation software that can be utilized for this purpose.

3. Working Remotely

Implementation of information technology provides the ability to remotely access your company's network. As a result, it equips employees with the ability to get the work done even if they are not physically present at the workplace.

Such agility has a number of benefits. Therefore, it has gained massive popularity. In fact, according to a U.S. federal government resource, 47% of the employees are eligible to work remotely.

Ian Adams, head of strategic marketing development at the outsourcing company, Mitie pointed out, "We're seeing greater collaboration between HR, IT, property and facilities management and job titles like 'workplace director' making this agile workplace happen."

4. Mobile Technology

Mobile technology has picked up momentum owing to its convenience, efficiency and speed. With the rise in the popularity of information technology, implementation of mobile technology has gained ground quickly.

The trend of BYOD (Bring Your Own Device) is on the rise owing to increased employee satisfaction. As many as 74% of the organizations are already utilizing this trend or plan on doing so in the future. In fact, the BYOD market is estimated to reach \$181.39 billion by 2017.

Mobile technology takes business communication to a whole new level. A mobile team can improve the workplace productivity considerably. There are numerous ways to integrate mobile technology in the workplace. In fact, chances are, your employees are already using it.

5. Protecting Information

Every organization has a mammoth database comprising various information related to business transactions, client details and so on. Such information is extremely valuable to a business and can cause a host of legal issues if it is lost. This is where information technology becomes relevant. It provides the right resources to store the information in a way that ensures maximum protection.

Virtual storage systems can keep information safe by allowing a limited number of users to access these. Increased protection also ensures that these systems are not hacked and the information is not wiped out owing to some problems. Therefore, information technology helps in upholding business integrity.

6. Providing Customer Satisfaction

Customer experience and satisfaction are crucial aspects of all businesses. The key to customer satisfaction is a strong customer support team and its availability to cater to the requirements of the customers.

Information technology provides the best tools for communicating with customers and solving their problems in real time. It has unlocked the facilities like Email, social media and other messaging platforms for this purpose.

A happy customer-base is important for the growth of a business. Various cloud-based communication channels have made customer experience more improved.

Help desk software can also improve the support experience. A ticketing system can streamline the entire process and not only improve employee workflow but also provide more accurate and timely support. An automated system is the ideal solution for handling tickets as it eliminates common errors, delays, and misdirected requests by turning service requests and alerts into tickets. Even the most dedicated representatives can handle only so much. High volumes, coupled with limited resources, can result in poor experiences for your internal customers. It seems clear that help desk technology is a worthwhile investment for any organization. Additionally, you can also pick and choose which features are most relevant to monitoring performance, ticket status, as well as satisfaction. All of this allows you to modify the software to integrate seamlessly into your existing strategy.

7. Management of Resources

A business has a variety of resources. These may include financial resources, human resources and so on. For large organizations, managing resources becomes quite difficult. Information technology

plays a vital role in managing these resources effortlessly by introducing a wide range of feasible solutions.

For example, the integration of Enterprise Resource Planning (ERP) has improved the efficiency of various business processes. ERP is a business management software that enables an organization to use a series of integrated applications that can manage and automate various business operations.

Information technology is at the core of such software. The implementation of ERP is progressing at a rapid rate with more and more businesses implementing this efficient technology to make certain business processes hassle-free.

8. Open Source Software

Information technology has paved the way for various open source software that allow free usage of certain tools for various organizations. The primary benefit of open source software is its flexible license. This allows modifications to the source code. This means that you have the facility to customize its functions according to your requirements.

Almost every software that businesses use has open source variants that are widely available on the Internet. Utilizing these could mean multiple benefits at reduced expenses.

Such benefits of the increased implementation of information technology have provided businesses with competitive advantages.

9.3.1. Internet and the way business is conducted

The internet has changed the face of business. It has opened up new avenues of conducting business. Below are some impacts of the internet on business:

Communication: communication technology combined with the internet has given a new dimension to connectivity and dispersion of information. Employees are in constant touch through email, instant messaging, office intranet, etc.

Collaboration: The internet has facilitated collaboration among employees of organization. Geographical boundaries no longer hamper project work and sharing of information.

Business Transaction: The internet has encouraged the culture of online business or e-commerce. In recent years many players have opened shops through e-commerce. Internet banking, payment gateways, etc. are part of normal supply chain transaction.

Work Flexibility: The internet has enabled workers to log in from remote location and home. It has helped on the move employees by remaining in touch with happenings of work.

Web based application: The internet has facilitated the development of concept like cloud computing, which has enabled process and storing of data in large proportion. The internet has helped reduce infrastructure cost of the company.

The internet thus has made a big impact in the way the business gets conducted in both positive as well as a negative way. The internet has made many business obsolete example post offices. Online security issues like hacking, identity theft, etc. are a constant threat to internet users.

9.4. BUSINESS ALIGNMENT ACROSS THE FUNCTION AND SECTORS AND SOCIETY

In this digital age with fierce competition, it is essential that managers within organization are completely aware and receptive to evolving changes. One the quickest evolving change is within information systems. This change in information systems is contributed to advances in computing and information technology. Enterprise officers that have aligned IT with business strategies argue that the integration is crucial to a firm's survival and success. However, the critical market positioning with its potential outcomes has launched technical projects into the organizational domain. The enlargement of information resources within businesses has led to internal realization, development, structural modifications, and managerial actions. Applying a concept that information system is strictly under the purview of IT department can lead to adverse situation for the company. Therefore, it is essential for organization to recognize information systems contribution in business effectiveness.

1. Systems and Innovation Opportunities

Development in information systems has brought opportunities but also threats. The onus is on the organization to identify opportunity and implement it. Organization needs to develop strategies, which can best utilize information systems to increase overall productivity.

The most common practice with regards to information systems is automation. Though automation is helpful, innovation using information systems give the organization a competitive edge.

2. Systems and Customer Delight

Organizations are fully aware that proliferation of information systems has reduced product life cycle, reduced margin and brought in new products. In such scenario customer satisfaction alone will not suffice, organization needs to strive for customer delight.

Information systems with data warehousing and analytics capability can help organization collect customer feedback and develop products, which exceed customer expectation. This customer delight will lead to a loyal customer base and brand ambassador.

3. Systems and Organizational Productivity

Organizations require different types of information systems to mitigate distinctive process and requirements. Efficient business transaction systems make organization productive. Business transaction systems ensure that routine process are captured and acted upon effectively, for example, sales transaction, cash transaction, payroll, etc.

Further, information systems are required for executive decision. Top leadership requires precise internal as well as external information to devise a strategy for organization. Decision support systems are designed to execute this exact function.

Business transaction systems and executive decision support systems contribute to overall organizational productivity.

4. System and Workers Productivity

Information systems have facilitated the increase in workers' productivity. With introduction of email, video conferencing and shared white board collaboration across organization and departments have increased. This increased collaboration ensures smooth execution and implementation of various projects across geographies and locations.

5. Information systems as a Value Add for Organization

Organization use information systems to achieve its various strategy as well as short-term and long-term goals. Development of information systems was to improve productivity and business effectiveness of organization. Success of information systems is highly dependent on the prevalent organization structure, management style and overall organization environment.

With correct development, deployment and usage of information systems, organization can achieve lower costs, improved productivity, growth in top-line as well as the bottom-line and competitive advantage in the market.

The readiness of workers into accepting the information systems is the key in realizing the full potential of them.

Development and deployment of information systems have revolutionized the way business is conducted. It has contributed to business effectiveness and increased in productivity.

9.5. CONCLUSIONS

In today's information and communication age, there is a constant reference to information systems and management of information systems. In the digital age data, storage and retrieval are done through various systems and interfaces. Current global and competitive business environment constantly asks for innovation, existing knowledge base is getting obsolete, continuously thriving for advancement in process improvement. The learning curve is always put to test, and every company is striving to remain ahead of the curve. Due to this shift in the way business is getting conducted has thrown out new reality of ever shortening product and service life cycle. More and more companies are coming out with customized products and finding ways to differentiate from competition. Business Process Outsourcing involves contracting one or many front end (customer related) or back end (finance, HR, accounting, etc.) activities within a company to a third party service provider. The number of jobs within BPO industry has increased exponentially in last decade. BPO is one of the new faces in business environment. The recent explosion of information technology has seen few but significant emerging trends, for example, mobile platform for doing business, cloud computing, technology to handle a large volume of data

EXERCISE

1. Explain Information System in brief.
2. Explain the feature of Information Technology.
3. State the highlights of IT act 2000.
4. Explain some technologies that makes the impact on Business Sectors.
5. Explain the role of Internet in conducting the business.
6. Comment, Investment on Information systems as a Value addition for Organization
