UNIT-1

SYLLABUS:

Introduction: MIS importance, definition, nature and scope of MIS, Structure and Classification of MIS, Information and System Concept, Types of Information, Information System for competitive advantage.

INTRODUCTION:

MIS is a planned system of collecting, processing, storing and disseminating data in the form of information needed to carry out the functions of Management. A management information system (MIS) is a subset of the overall internal controls of a business covering the application of people, documents, technologies, and procedures by management accounts to solve business problems such as costing a product, service or a business wide strategy.

MIS lives in the space that intersects technology and business. MIS combines technology with business to get people the information they need to do their jobs better/ faster.

MEANING AND DEFINITION:

MEANING:

The term MIS is not a new one but only its computerization is new. Before the uses of computers, Management Information System:, techniques existed to supply managers with the information. These information would permit them to plan and control operations.

DEFINITION:

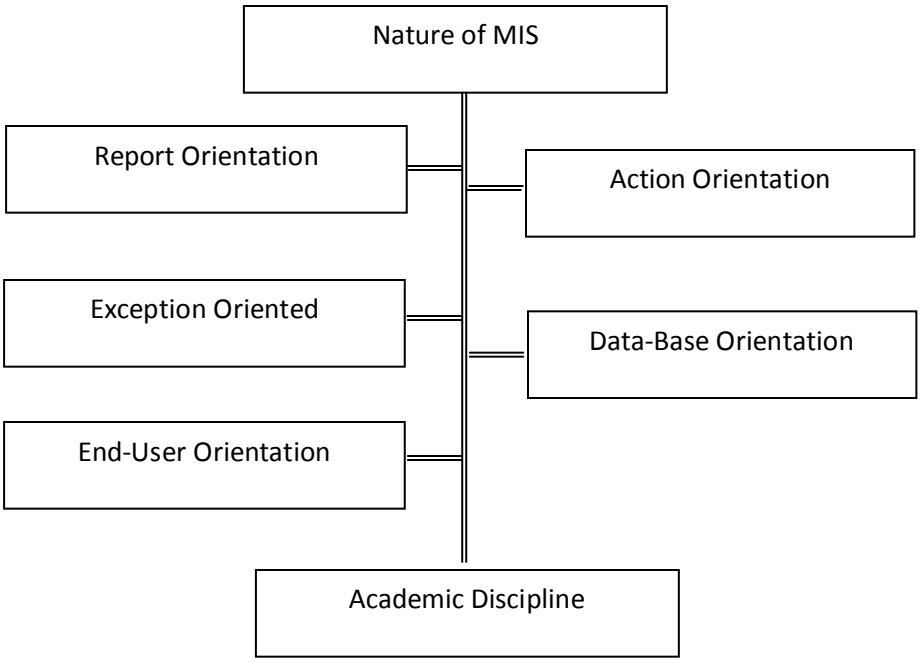
According to Kimball and Kimball, "Management may be broadly defined as the art of applying the economic principles that underlie the control of men and materials in the enterprise under considerations".

According to Jerome Kanter, "MIS is a system that aids management in making, carrying out, and controlling decisions."

CHARACTERISTICS OF MIS:

- MIS is an Integrative system
- MIS is a sub-system concept
- MIS provides Relevant information to management
- It is flexible
- MIS is a feedback system

NATURE OF MIS:



Report Orientation:

The concept of Management Information System is modified, so, that information rather than voluminous data has become the requirement of the user.

Action-Oriented:

This concept was further modified due to the need that information should be such that it leads to some action, decision or investigation or research.

Exception Oriented:

After having action oriented nature of Management Information System it was realized that there must be some specific or selective approach to the action or the analysis of data.

Data-base Orientation:

As we know our environment is dynamic in nature so the change in every system is must. So the concept of Management Information system based on bata-base is emerged and proven to be effective.

End-user Orientation:

After successfully implementing these changes, the concept of end user computing using multiple data bases emerged. This concept brought a basic change in the nature of management

information system that is decentralization of system and independency of user over computer professionals or experts.

Academic Discipline Orientation:

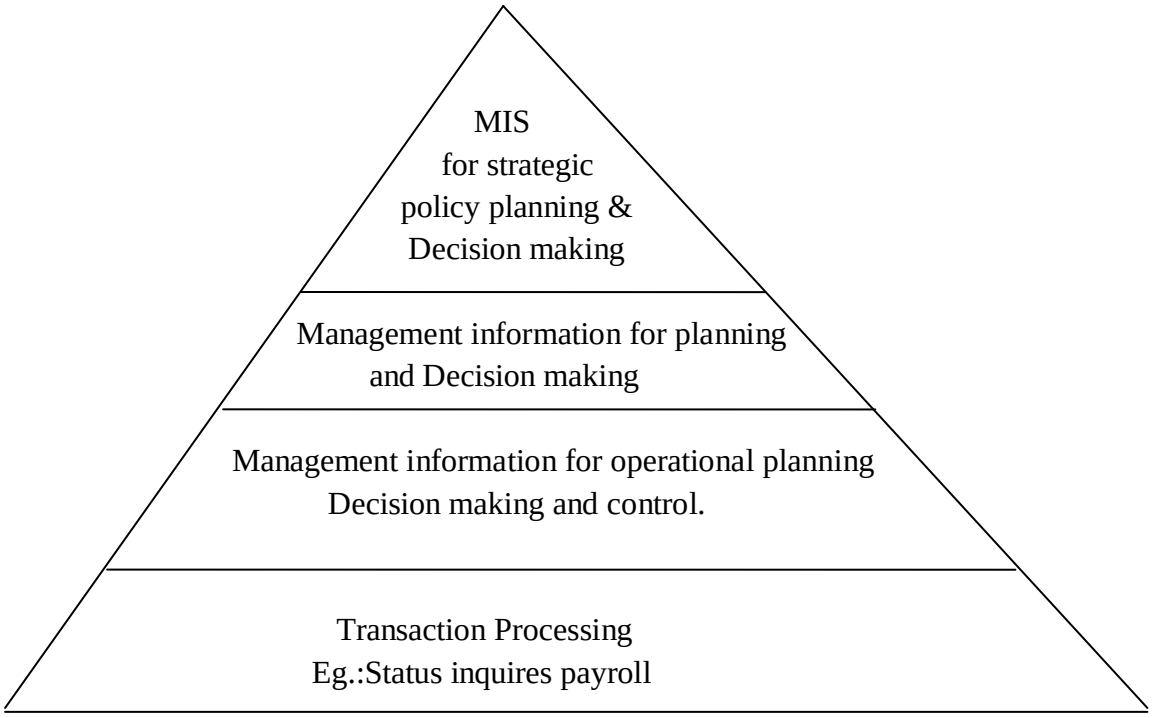
Management Information System is based on the information gathered for analyzing the data. While analyzing the data it relies on many academic disciplines like theories, Principles, and concepts from management, organization behavior, computer science, psychology and human behavior.

SCOPE OF MIS:

1. MIS is an integrated system for providing information to support:

- ✓ The operations
- ✓ Management
- ✓ Decision-making functions in an organization

2. MIS utilizes computer hardware/ software, manual procedures, management and decision models and a data base.
3. MIS as a pyramid structure



MIS and planning Decision making and control

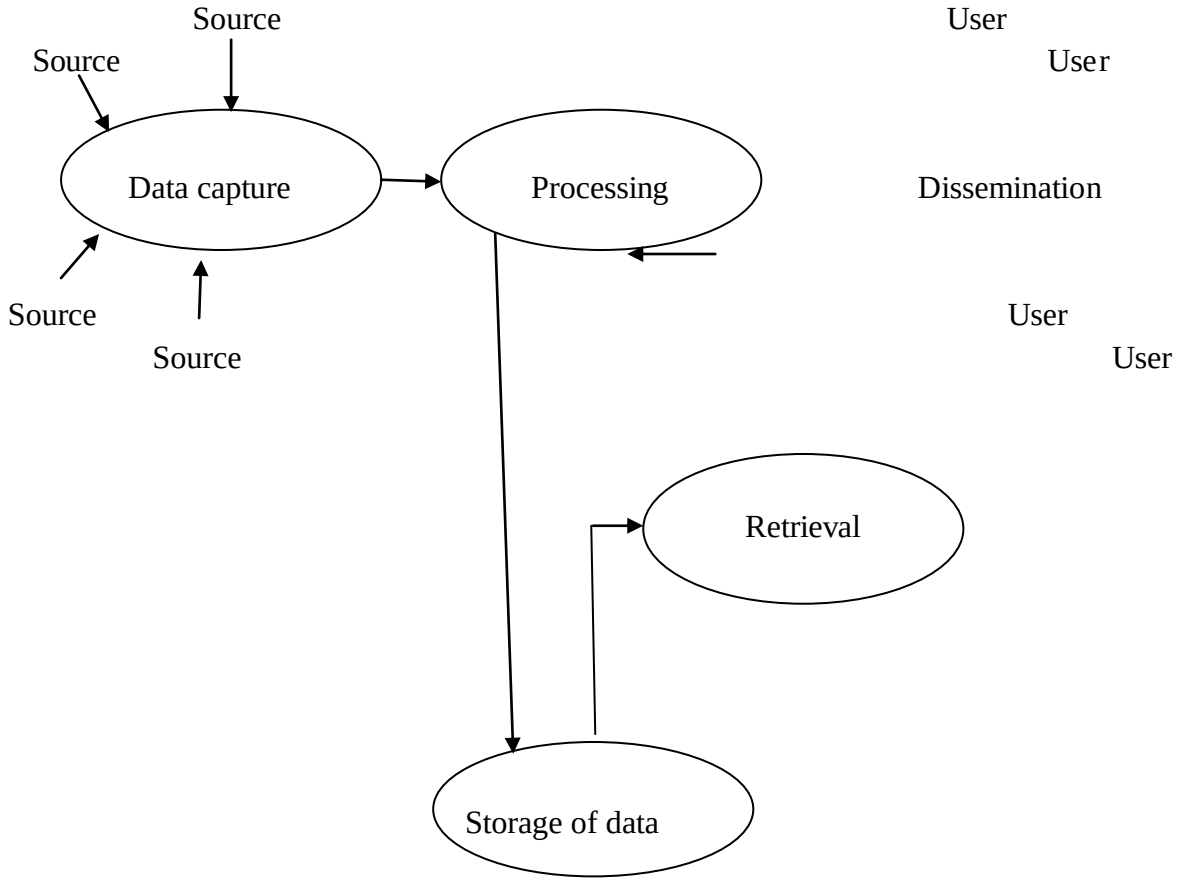
IMPORTANCE OF MIS:

MIS is important in business because of the following reasons:

1) It helps in minimizing risk in decision-making
2) It processes the data and derives information out of them
3) It provides information about the various aspects of business
4) It helps the executives to avail the information regarding the functional areas quickly
5) It helps the HRD manager in finding out the requirement of the human resource, their wages and salary, performance appraisal, training, promotion, absenteeism and employees, turnover, which is useful in drafting sound HRD policies.

FUNCTIONS OF MIS:

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



- ✓ **Data Capturing**: MIS captures data from various internal and external sources of an organization. Data capturing may be manual or through computer terminals. End users typically record data about transactions on some physical medium, such a paper form, or enter it directly into a computer system.
- ✓ **Processing of Data**: The captured data is processed are convert it into the required management information. Processing of data is done by such activities as calculating, comparing, sorting, classifying and summarizing. These activities organize, analyze and manipulate data using various statistical, mathematical, operations research and/ or other business models.
- ✓ **Storage of Information**: MIS stores processed or unprocessed data for future use. If any information is not immediately required, it is saved as an organizational record. In this activity, data and information are retained in an organized manner for later use. Stored data is commonly organized into fields, records, files and databases, all of which will be discussed in detail in later chapter.
- ✓ **Retrieval of information**: MIS retrieves information from its stores as and when required by various users. As per the requirements of management users, the retrieved information is either disseminated as such or it is processed again to meet the exact MI demands.
- ✓ **Dissemination of information**: Information, which is a finished product of MIS, is disseminated to the users in the organization. It could be periodic through reports, or on-line through computer terminals.

STRUCTURE OF MIS:

Structure of MIS is a difficult concept to understand because there is no standard or universally accepted framework for describing management information system. MIS structure may be described by following a variety of different approaches, such as:

- ➔ Physical Components
- ➔ Information system processing functions
- ➔ Decision support
- ➔ Levels of management activities and
- ➔ Organizational functions

Physical Components:

Structure of MIS may be understood by looking at the physical components of the information system in an organization.

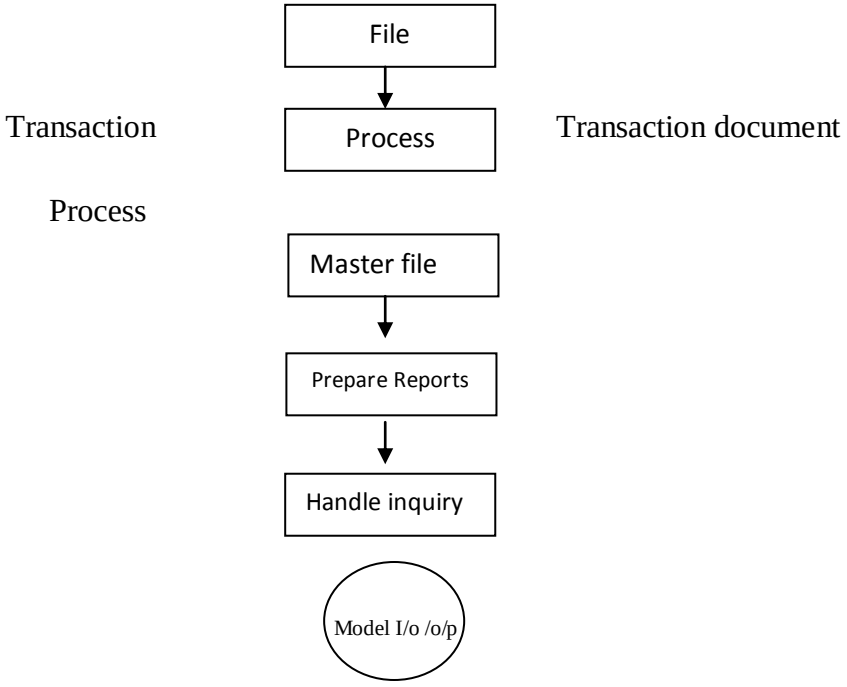
- Hardware
- Software
- Database
- Procedures

- Operating personnel
- Input and Output

Information system processing functions:

Information system structure can also be understood in terms of its processing functions. The functions of an MIS explain what the system does. The main processing functions of information systems are described below.

- **To process transactions**: Information systems process transactions. Where transaction may be defined as an activity taking place in an organization.
- **To maintain master file**: Information systems create and maintain master files in an organization. A master file stores relatively permanent or historical data about organizational entities.
- **To produce report**: Reports are significant products of an information system. Many reports are produced on a regular basis, which are called scheduled reports. An information system also produces reports on adhoc (special) requests.
- **To process enquires**: An information system is used to process enquiries. For processing such queries, the information system uses its database. These may be regular enquiries with a pre defined format or adhoc enquiries.
- **To process interactive support application:** The information system contains applications designed to support systems for planning, analysis and decision-making. Various types of models are used for processing.



DECISION SUPPORT:

Structure of MIS can also be described on the basis of its support in decision-making in an organization. Decisions vary with respect to the structure that can be provided for making them. A highly structured decision can be preplanned, whereas a highly unstructured decision cannot. However, it should not be taken to necessarily mean that the decision is automated, although many programmable decisions are automate.

LAVELS OF MANAGEMENT ACTIVITIES:

Management information systems support various management activities in an organization. This implies that the structure of an information system can be categorized in terms of levels of management activities. Anthony, on the basis of activities, has classified the management hierarchy into three levels. These are:

- Strategic Planning Level
- Management Control Level
- Operational Control Level

Strategic Planning deals with long-range considerations.
Management Control Level includes acquisition and organization of resources, structuring of work, and acquisition and training of personnel.
Operational Control *is related to short-term decisions for current operations*

ORGANISATIONAL FUNCTIONS:

The structure of management information system can also be described in terms of the organizational functions. Though there is no standard classification of functions, a typical set of functions in a manufacturing organization includes production, sales and marketing, finance and accounting, materials, personnel and information systems.

Activities:

- Strategic planning
- Management control
- Operational control
- Transaction processing

Organizational Function:

- Production
- Finance
- Personnel
- MIS etc.

MIS CLASSIFICATION:

The discipline of MIS is in its evolutionary stage. MIS is a concept which is a matter of degree rather than an absolute one. In management, there are perhaps few other areas other than MIS which have evoked such a controversy.
Though it lacks clear lines of demarcation and is classified in several different ways; for the sake of clarity, we have categorized information systems on the basis of their roles in the operations and management of a business. Accordingly information systems have been primarily categorized as under:

1) Operation Support System
2) Management Support System

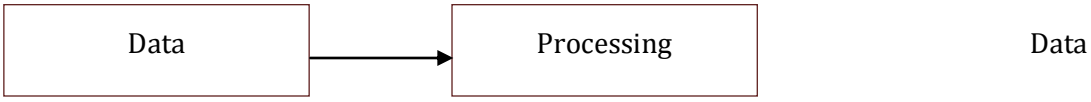
OPERATION SUPPORT SYSTEM:

As and when any transaction takes place in an organization, data which is a by-product of a transaction, is generated. Also, business operations are carried out using data. In order to process such data, information systems are required which are called operations support systems. The role of operations support system is to efficiently process business transactions, control industrial process support organizational communication and update company's databases.

Transaction Processing System:

As the name indicates transaction processing system (TPS) records and process data and produces reports. It represents the automation of the fundamental, routine processing used to support business operations.

For example: point-of-sale (POS) systems at many retail stores use electronic case register terminals to electronically capture and transmit sales data over telecommunications links to head office computer centre for immediate (real-time) or weekly (batch) processing.



Input Output

Previously, TPS was known as *Management Information System*. Prior to computers, data processing was performed manually or with simple machines. However, nowadays, data processing is mainly done with the help of computers. In many organizations, TPS is also known as a Data Processing System.

For example: Transferring work in process from one stage of production to the next, recording depreciation on equipment, making routine file changes such as adding or deleting records or changing an employee's address and correcting errors in previous input data are all examples of internal transactions.

Processing Control System:

The systems which monitor and control physical processes are known as Process Control System.

For example: Pharmaceutical manufacturing company ruses electronic sensors linked to computers to monitor chemical processes and make the required adjustments.

Office Automation System:

Office automation refers to the application of computer and communication Technology to office functions. Office automation systems are meant to improve the productivity of managers at various levels of management by providing of hardware, software and people in information system, that process offices transactions and support office activities at all levels of the organization. These systems include a wide range of support facilities, Which include word include word processing, electronic filing, electronic mail message switching, data storage, data and voice communication, etc.
Office activities may be grouped under two classes, namely:

- Typing
- Mailing
- Scheduling of meetings and conferences
- Retrieving documents

The following is a list of activities in the second category (managerial category):

- *Conferencing*
- *Production of information*
- *Controlling performance*

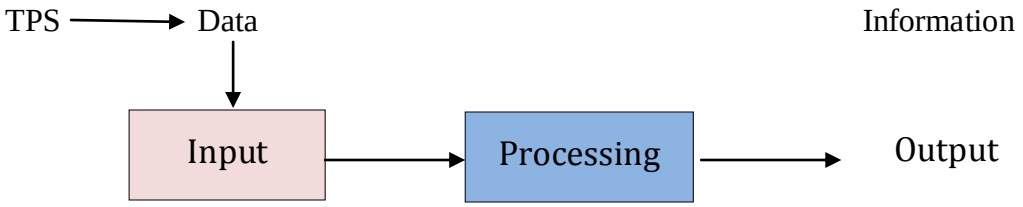
As already discussed, information technology facilitates both types of activities. A wide variety of office automation devices like fax machine, phones etc., are used in offices.

MANAGEMENT SUPPORT SYSTEM:

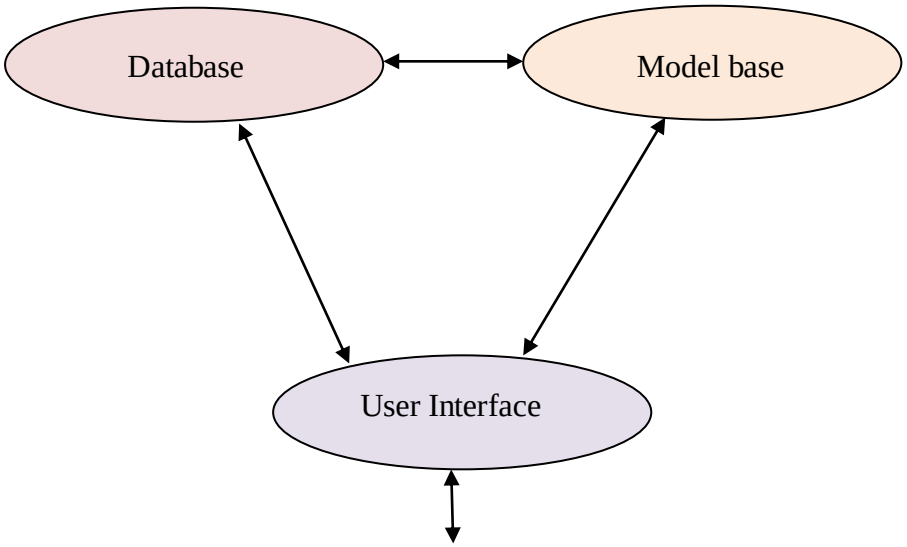
Management Support System (MSS) are the information systems' applications that focus on providing information and decision support for effective decision making by manager. There are various types of information systems that support a variety of decision-making process.

For Example: Management Information System, Decision Support System, Executive Support System.

Management Information System: Management Information System (MIS) is an information system which processes data and converts it into information. A management information system uses TPS for its data inputs. The information generated by the information system may be used for control of operations, strategic and long-range planning, short-range planning, management control and other managerial problem solving.

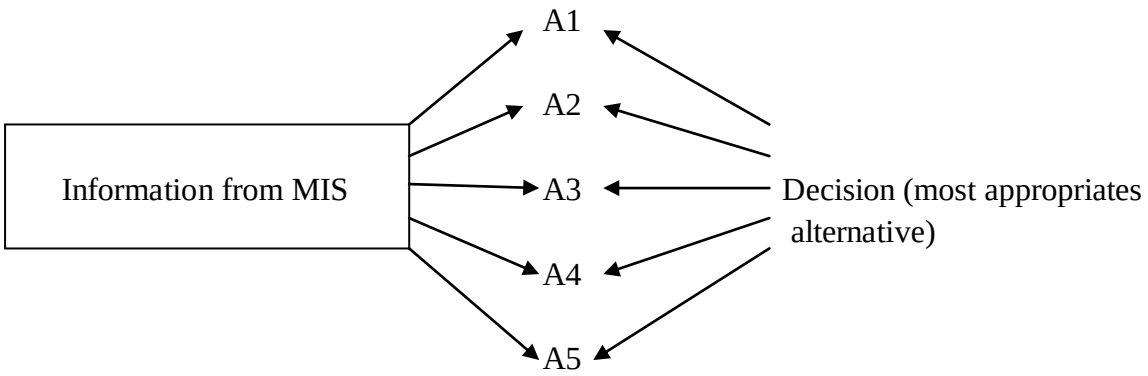


Decision Support System: A decision support system (DSS) is an information system application that assists decision making. DSS tends to be used in planning, analyzing alternatives, and trial and error searching for solution. Decision Support Systems, although created and used by managers, are nevertheless a part of the organization's MIS. As decision support system is tailored to a specific managerial task or special problem, its use is limited to that task or problem. The second component of the DSS is a library of models to manipulate and analyze the data in the desired ways. A user interface is the third component. Through this, the user can communicate with the DSS. The physical interface generally consists of a terminal, hooked up to the mainframe computer, either directly or by telephone.



DSS

DSS can be differentiated from MIS in terms of its processing capabilities. Whereas MIS processes data to convert it into information; DSS processes information to support the decision-making process of a manager.



Decision Support System
Alternative Processing

For example, a salary information system provides information to every employee regarding his basic salary, allowances and deductions, if any, etc. However, if an employee wants to make deposits in some schemes for availing income tax rebates, he can make use of DSS.

Executive Support System: Executive Support System (ESS) is an extension of the management information system, which is a special kind of DSS and provides critical

information from various inter and intra-sources in easy to use displays. As ESS is specially tailored for the used of the chief executive of an organization to support his decision-making.

Enterprise Systems: Enterprise systems integrates all facets of the organization including its planning, manufacturing, sales human resource management, customer relations, inventory control, customer order tracking, financial management and marketing-i.e. all aspects of business organization.

General Support System:

The above-mentioned categories of information systems have been defined on the basis of their role in operations and management of a business. However, there are many other applications of information systems which fall in both the categories, as they provide support in operations as well as managing of the business. For example:

(i) Business Expert Systems:

Business expert system, which are based on artificial intelligence (AI), are advanced information systems. Artificial intelligence may be referred to as the capability that makes computers display intelligent, human-like behavior. For example, reasoning, drawing inferences, learning and problem-solving are such acts of intelligence.

Business Expert System are advanced information systems based on artificial intelligence, which may be referred to as the capability that makes computer display intelligent, human like behavior.

The main advantages of using expert systems may be outlined as follows.

i) The knowledge/ capabilities of many experts can be used to build a single expert system.
ii) Decision-making in critical times can be more reliable, as these systems are not affected by emotional factors or fatigue.
iii) Multiple hypotheses can be considered simultaneously.

The expert system is interactive in nature, which enables it to ask questions of the user. On the basis of these questions, an expert system searches its knowledge base for facts and rules, explains its reasoning process when asked and comes out with expert advice to the end user in the subject area being explored.

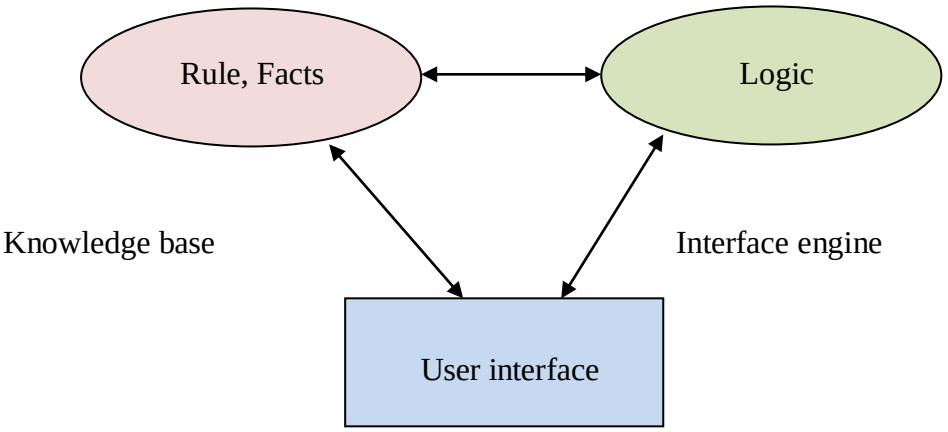
The main components of an expert system include:

i) Knowledge base
ii) Inference engine
iii) User interface

Knowledge base contains the facts about the specific expert area and heuristic (rules of thumb) that describe the reasoning procedures of an expert on the subject.

Inference engine contains the logic of reaching an inference from the stored data and rules (knowledge base)

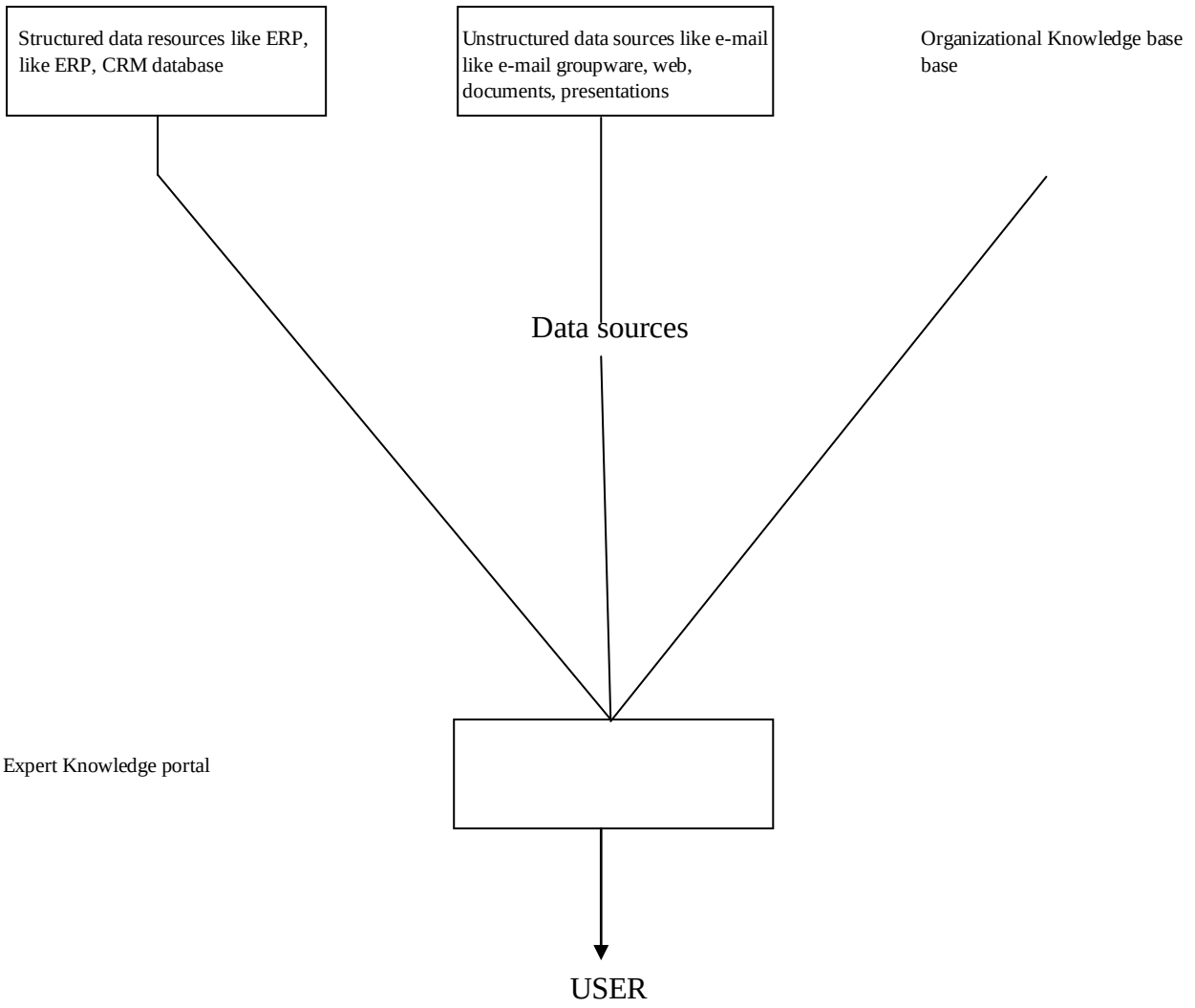
Expert systems may be developed by using either programming languages, such as LISP, PROLOG or C by using expert system packages (expert system shells). Using the expert system packages, which are like application generators, one can design an expert system that combines the features of a DSS and an expert system.



Main components of an Expert system

(ii) Knowledge Management Systems:

Knowledge Management System are information systems that are knowledge based and, thus, support the creation, organization and dissemination of business knowledge to managers and other employees of the organization, for example, Intranet access to the best practices and solutions to various business problems. Nowadays many companies are building knowledge management systems to manage organizational learning and business know-how. They are developed to provide quick feedback to knowledge workers, encourage behavior changes by employees and improve business performance.



Knowledge Management System

(iii) Strategic Information System:

Strategic Information Systems apply information technology to the products, services or business processes of an organization to help the organization gain a strategic advantage over its competitor. Thus strategic information system can be any kind of information system (TPS, MIS, DSS, ESS etc) that uses IT to help an organization gain a competitive advantage, reduce a competitive disadvantage, or meet other strategic enterprise objectives (Bowles, Jerry, 1997).

(iv) Functional Business System:

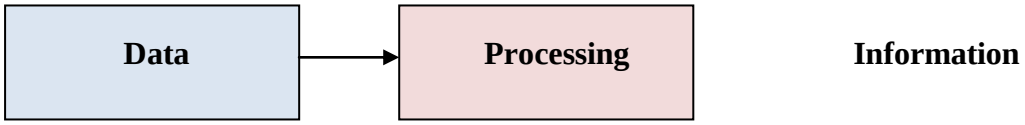
One of the most widely used bases for organizing activities in almost every organization is the business function. Business activities are grouped around functions such as production, marketing, finance and personnel, etc resulting in the respective department or an area of the business organization. These departments or functional areas are commonly known as the functional areas of business.

(i) Production
(ii) Marketing
(iii) Finance and accounting
(iv) Materials and
(v) Personnel systems

INFORMATION AND SYSTEM CONCEPTS:

Information:

Information is a necessary and vital input in any decision-making process in an organization. However, it is not available in ready in ready form; rather it has to be generated from data which acts as a raw material that needs some processing.



Information Generation

Thus, information in its unprocessed form is called data, which is generated as a by-product of transaction taking place in the organization. Information, on the other hand, is a processed data and has an element of surprise. Information reduces uncertainty and triggers action.

TYPES OF INFORMATION:

Broadly speaking, information could be classified on the basis of the purpose for which it is utilized, into three main categories; namely

(i) Strategic information

(ii) Tactical information

(iii) Operational information

(i) Strategic information: Strategic information is required by the managers at the strategic level of management for the formulation of organizational strategies. This relates to long-term planning policies of the organization as a whole.

For example: Information pertaining to new technologies, new products, competitors etc.

(ii) Tactical information: Information in this category is used in short-term planning and is of use at management control level.

(iii) Operational information: Operational information applies to short periods which may vary from an hour to a few days. It is generally used by decision makers at the operational level. It is often required for taking immediate action.

For example: information may include current stocks-in-hand, work-in-progress level, outstanding orders from customers, etc.

INFORMATION QUALITY:

Quality of information refers to its fitness for use, or its reliability. Some of the attributes of information, which influence the quality of information are discussed as follows.

- **Timeliness**
- **Accuracy**
- **Relevance**
- **Adequacy**
- **Completeness**
- **Explicitness**
- **Exception-based**

Timeliness: It means that information must reach the recipients within the prescribed timeframe. B.K.Chatterjee (1974) said "information delayed is information denied.

Accuracy: Accuracy is another key-attribute of management information. As per Jhon G Burch and Gary Grudnitski (1986), accuracy means more than just one plus equals two. It means that information is free from mistakes and errors, is clear and accurately reflects the meaning of data on which it is based.

Relevance: Relevance is yet another key attribute of management information: Information is said to be relevant if it answers specifically for the recipient what , why, where and when, who and Why? In other words, the MIS should serve reports to managers which are useful and the information helps them make decisions.

Adequacy: Adequacy means information must be sufficient in quantity, i.e., MIS must provide reports containing information which is required in the deciding processes of decision-making. The report should not give inadequate or for that matter, more than adequate information, which may create a difficult situation for the decision-maker.

Completeness: The information which is provided to a manager must be complete and should meet all his needs. Incomplete information may result in wrong decisions and thus may prove costly to the organization.

Explicitness: A report is said to be of good quality if it does not require further analysis by the recipient for decision-making. On the other hand, a poor quality report requires further analysis or processing of its contents.

Exception-based: Today, more and more organization are being run on the principle of management by exception. Top managers need only exception reports regarding the performance of the organization. Exception reporting principle states that only those items of information which will be of particular interest to a manager are reported.

DIMENSIONS OF INFORMATION:

Information may be understood to have various dimensions. However, for our purpose, the following three dimensions of information will be of interest.

(i) Economic dimension
(ii) Business dimension
(iii) Technical dimension

(i) Economic dimension: This dimension of information refers to the cost of information and it benefits. Generation of information costs money. To decide about the money to be spent on information generation in an organization, a cost benefit analysis should be undertaken.

Cost of information
It may include:

(a) cost of acquiring data
(b) cost of maintaining data
(c) cost of generating information and
(d) cost of communicating information

Value of information

As mentioned earlier, information has a cost for its acquisition and maintenance. Thus, before a particular piece of information is acquired, decision makers must know its value. In decision theory, the value of information is the value of the change in decision behavior because of the information.

(ii) Business dimension: Information can also be understood from its business dimension. Different types of information are required by managers at different levels of the management hierarchy. The information needs of managers at strategic planning level are altogether different than those of operational control managers. It is because managers at different levels are required to perform different functions in an organization.

(iii) Technical dimension: This dimension of information refers to the technical aspects of the database. Various aspects of the database, which are considered under this dimension, include the capacity of database, response time, security, validity, data interrelationship, etc. Technical dimension is covered under design of information systems and under the topic of database management system.

SYSTEM:

The word 'System' is used quite often in our everyday life. We talk about an educational system, political system, economic system, circulatory system, solar system, computer system and so on.

Definition:

"A System may be defined as a set of elements, joined together to achieve a common objective".

KINDS OF SYSTEMS:

Different kinds of systems may be understood as:

(i) abstract and physical systems
(ii) deterministic and probabilistic system
(iii) Open and closed systems and
(iv) user-machine systems

Abstract and Physical Systems: Systems can be categorized as abstract systems and physical systems. There can be misunderstanding if one person talks about an information system as asset of concepts, ideals, or characteristics (abstract) and his listener perceives it as an operational system of people, equipment and reports (physical). An abstract or conceptual system is an orderly arrangement of interdependent ideas or constructs, which may or may not have any counterpart in the real world.
Physical systems are concrete operational systems made of people, materials, machine, energy and other physical things.

Deterministic and Probabilistic System: A deterministic system is one in which the occurrence of all events is known with certainty. In such a system, given a description of the system state at a particular point of time of its operation, the next state can be perfectly predicted.

A Probabilistic system is one in which the occurrence of events cannot be perfectly predicted. Through the behavior of such a system can be described in terms of probability, a certain degree of error is always attached to the prediction of the behavior of the system.

Open and Closed System: An open system is one that interacts with its environment and thus exchanges information, material, or energy with the environment, including random and undefined inputs. Open systems are adaptive in nature as they tend to react with the environment in such a way, so as to favour their continued existence. Such systems are 'self organizing', in the sense that they change their organization in response to changing conditions. All living systems (e.g. human, plants and cell etc.) are open systems. They attempt to maintain equilibrium by homeostasis, i.e the process of adjusting to keep the system operating within prescribed limits.
A closed system is one which does not interact with its environment. Though relatively can man, such systems are rare in business world.

User-Machine Systems: Most of the physical systems are user-machine system. It is difficult to think of a system composed only of people who do not utilize equipment of some kind to achieve

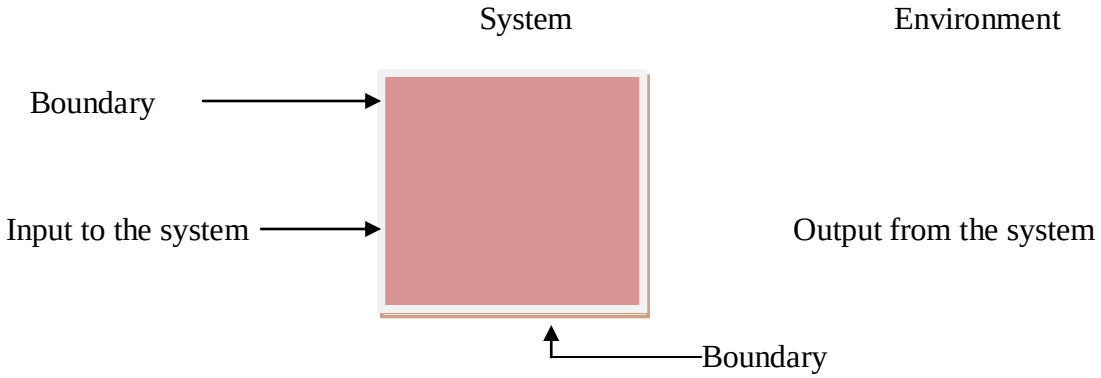
their goals. In user-machine systems both, i.e. human as well as machine, perform some activities in the accomplishment of a goal.

SYSTEM RELATED CONCEPTS

(i) Boundary, Interface and Black box
(ii) System Decomposition
(iii) Integration of Sub-systems

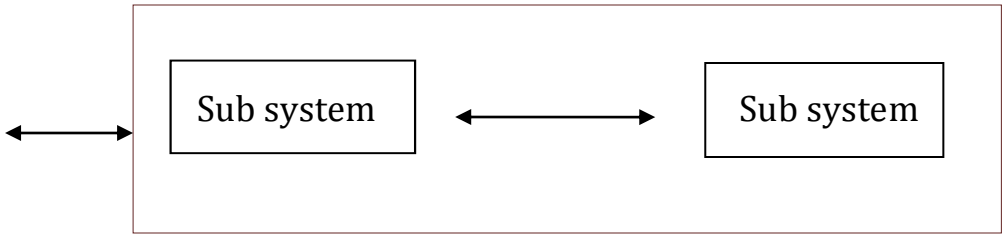
Boundary:

In order to focus on a particular system, users need to define or describe the system under study. This is done with the help of a boundary. The boundary of a system may exist either physically or conceptually. In other words, the boundary is a feature of the system which defines and delineates it. The use of a boundary concept enables a systems analyst to define any on-going process as a system. It further enables him to look at the problem as a whole and to set up the framework to look at its various sub-system.



Interface

Each system can have sub-system which, in turn, are made up of units. The interconnections and interactions among the sub-system are called interfaces.



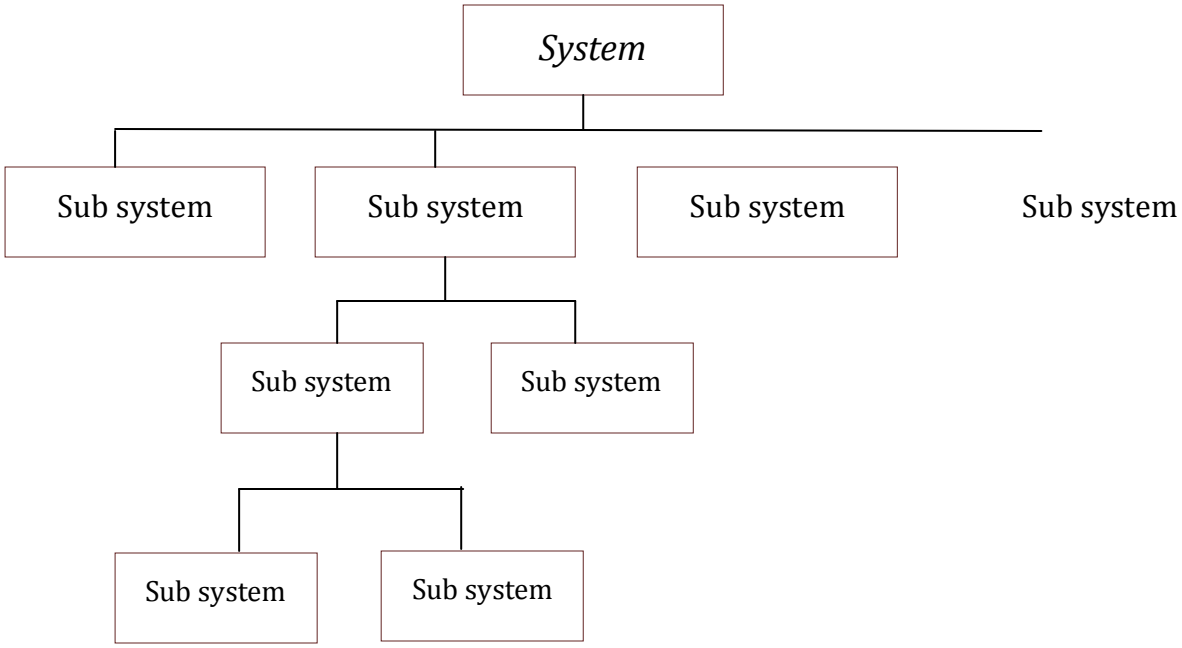
Black box

The transformation process in certain sub-systems, especially at the lowest level may not be defined. However, the inputs and outputs are known. Such a sub-system whose processes are not defined, is called a black box system.

Process (transformation) not defined

System Decomposition:

Any system can be divided into smaller systems known as subsystems and a sub systems can further be divided into still smaller systems called sub sub systems, which in turn, can be divided into still smaller systems. This process continues until the smallest sub systems are of manageable size. The concept of sub systems is an important aspect and is basic to the analysis and design of information system, because it is difficult to comprehend a complex system when considered as a whole. The process of dividing or factoring a system into smaller systems is known as decomposition.

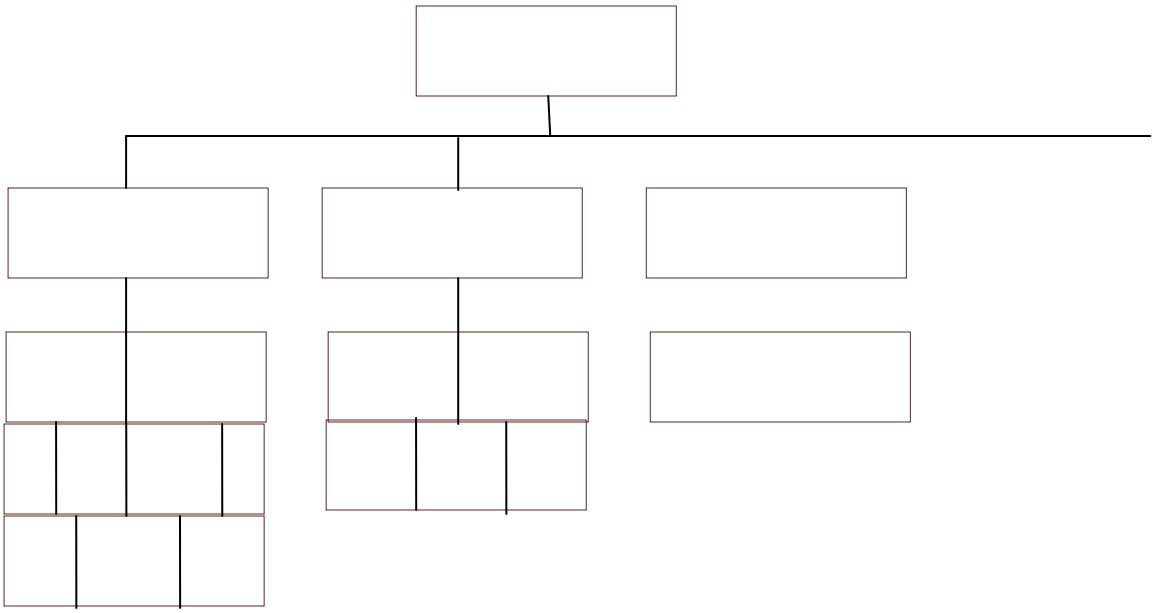


The process of decomposition into smaller systems is used both to analyze an existing system and to design and implement a new system.

Integration of Sub-system:

A system is divided into smaller systems only for the sake of clarity. However, it is the whole which dictates the role of the sub-system.

The concept of integration draws attention to the primary importance of the whole system. The whole system is a system, which behaves as if it is a single entity. Thus, one should not get lost amongst the smaller systems. In other words, the whole should not be overlooked while trying to understand it through its parts.



ELEMENTS OF A SYSTEM:

To understand a general system, let us take an example of a system in which certain data is processed with the objective of converting it into information for decision-making.

Input may be defined as the start-up component on which the system operates.

Output is defined as the result of an operation.

The process is the transformation activity that converts input into output.

INFORMATION SYSTEMS FOR COMPETITIVE ADVANTAGE:

There is no denying the fact that information systems contribute to organizational efficiency and effectiveness. However, until recently, information system have not played a major role in the production, marketing and services. It is in the last few decades that there has been a revolutionary change in the use of information and information system in organizations. Today many organizations are using information and information systems as tools for gaining and sustaining competitive advantage.

Concepts of Information System:

The concept of Information System has passed through several stages. In 1950, information was considered a necessary evil, whereas today information is regarded as an important strategic resource.

- ➔ Information as a necessary evil
- ➔ Information for General Management Support
- ➔ Information for Decision-making
- ➔ Information as a strategic Resource

Information as a necessary evil: Information was regarded as a necessary evil, associated with the development, production and marketing of products or services. Information was thus merely considered as a by-product of transactions in the organizations.

Information for General Management Support: By mid 1960's, organizations began recognizing information as an important tool which could support general management tasks.

Information for Decision-making: In the early 1980's information was regarded as providing special-purpose, tailor-made management controls over the organization. Decision Support

System and Executive Support Systems were important advancements, which took place during this period.

Information as a strategic Resource: In the revolutionary change pattern, the concept of information changed again by the mid-eighties and information has since then been considered as a strategic resource, capable of providing competitive advantage or a strategic weapon to fight the competition.

COMPETITIVE ADVANTAGE:

Information and information system, can be used to gain and sustain competitive advantage in organizations. Competitive Advantage is an advantage over competitors in some measure such as cost, quality, or speed. A Competitive Strategy is a broad-based formula for how is business is going to compete.

Changing Concepts of Information System:

Time Period	Concept of Information	Information Information	Aims of Information System
1950-65	Necessary evil: A by-product	Electronic Data A by-product	Fast paper processing
1966-70	General Purpose support	Management Reporting System	Speedy general report requirement
1971-85	Specific management control Support Systems	Decision Support Systems, Executive	Improvement, tailor made
1986	Strategic resources; Competitive weapon	Strategic Information System	Promote survival and growth of organization

An organization that performs better than others is said to have a competitive advantage over others. The organizations having a competitive advantage perform better in terms of revenue, profitability, or productivity.

For example:

Google.com is a leader in web search; Amazon.com is a leader in online retail; Apple's itune is regarded as a leader in online music.

PORTER'S FIVE FORCES MODEL

Porter has suggested five major forces that could pose a threat to a given industry. In other words, these five forces shape the strategy of competition in an industry. Though the details of

the model may differ from one industry to another, its general structure remains the same and is universal. The five forces can be generalized as follows:

1. The threat of entry of new competitors

2. The bargaining power of suppliers

3. The bargaining power of customer (buyers)

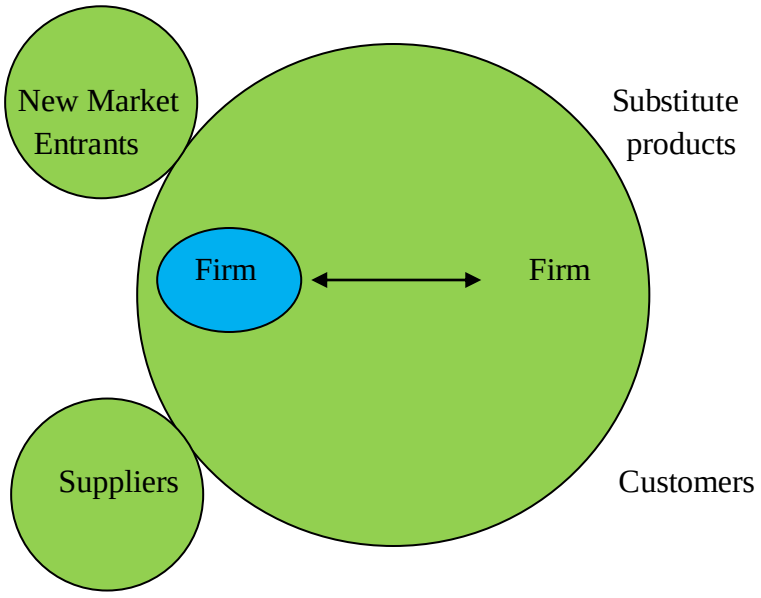
4. The threat of substitute products or services

5. The rivalry among existing competitors (firm)

These five forces explain the general business environment of an organization. The following sections briefly discuss how these forces shape the competitive position of an organization.

New Market Entrants:

Because of free economy, new companies are always entering in the marketplace. The entry of these organizations is difficult in some of the industries, whereas it is easy in some other industries. The new companies have many advantages like they start with latest technology/ infrastructure; recruit young and motivated people; and not have a legacy system to unlearn and relearn the experiences. But these advantages, many a times become disadvantages.



Porter's Competitive Forces Model

Substitute Products and Service

There are substitutes for almost every product, which might be used in the case of high prices or non availability of the products. New researches produce substitutes for the existing products which may be more efficient, less costly or eco-friendly.

For example:

Ethanol can be used as a substitute for gasoline in cars; vegetable oil for diesel fuel in trucks; and wind , solar, coal and hydropower for industrial electricity generation.

Customers

The bargaining power of customers increases if they can easily switch to a competitor's products and services. For example, the online purchases have increased the bargaining power of the customers as they can know all the available products/services offered by different suppliers and they also know the prices of these products.

For example:

Online booking of an air ticket offers a number of facilities to its customers and thus online customers have a great advantage over offline air ticket firms.

Suppliers

The supplier's power can also influence the company in a big way, especially when the firm can not increase prices as fast as its supplier can. If the number of suppliers for a given industry is large, the organization can have a greater control over its suppliers and can negotiate in a better way in terms of prices, quality and delivery schedules.

For example:

Automotive company generally has multiple competing suppliers of key components.

Traditional Competitors

In order to attract new and to retain the existing customers, the competitors are always finding new ways of doing business which are more efficient. They are also improving their products/ services and try to increase the loyalty of their customers to their organizations.

INFORMATION SYSTEMS STRATEGIES FOR DEALING WITH COMPETITIVE FORCE:

To counteract various competitive forces, an organization can use information systems to its advantage. There are three generic strategies, each of which often is enabled by using information technology and systems. These strategies are:

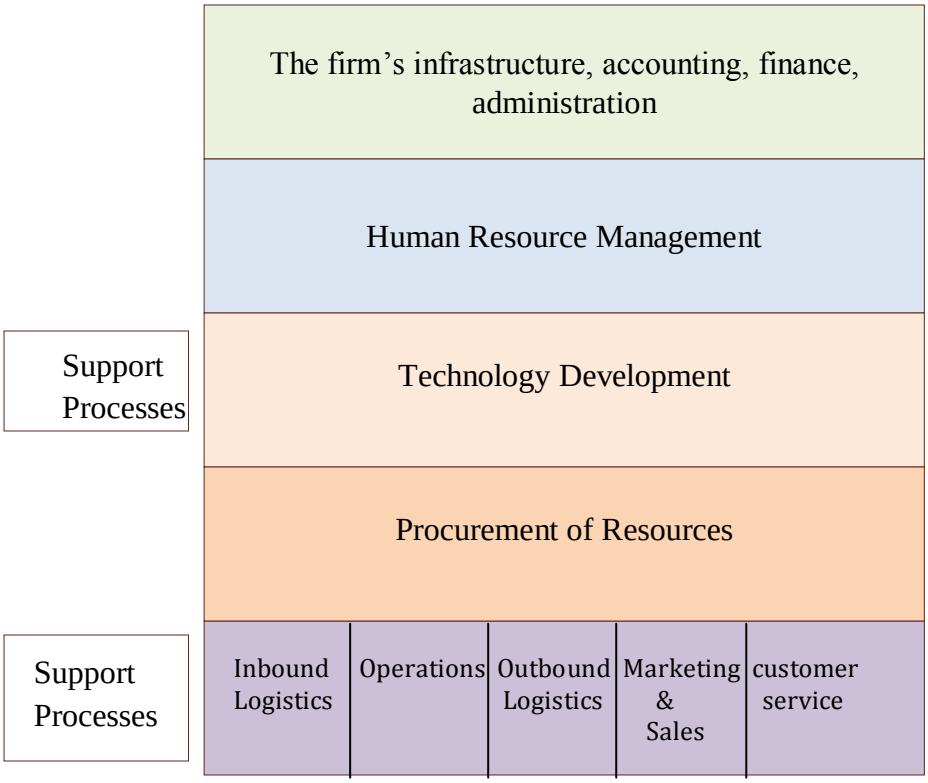
(a) low-cost leadership
(b) product differentiation and
(c) focus on market niche

Low-cost leadership:
To get a competitive advantage, an organization wants to achieve the lowest operational cost. Information system can help an organization in achieving this goal.

For example: Wal-Mart was able to become the leading retail business in the United States because of its legendary inventory replenishment system which enabled the company to keep its prices low.

Product Differentiation:
Another strategy to gain competitive advantage is product differentiation. Information systems are used to enable new products and services, or greatly change the customer convenience in the existing products and services. A new and unique search service on its website by Google is a good example of product differentiation.

Focus on Market Niche:
An organization can focus on a small market niche so as to serve this narrow target market better than its competitors. Information systems can support this strategy by analyzing data and providing information for sales and marketing activities with the help of information systems companies. These can analyze customer buying patterns, tastes, and preferences so and thus focus on smaller and smaller target markets for their advertising and other marketing related activities.



Value Chain of the Organization

PORTER'S VALUE CHAIN MODEL

The value chain model, which was developed by Michael Porter in 1985, highlights specific activities in the business where competitive strategies can best be applied and where information systems are most likely to have a strategic impact. The model views an organization as a series, chain or network of basic activities that add value to its products or services and thus add a margin of value both to the organization and its customers.

According to the model, the activities conducted in a typical manufacturing organization can be categorized into two main categories.

(a) Primary activities
(b) Support activities

Primary activities as the name suggests, include the activities in which materials are purchased, processed into products and delivered to customer. These activities are:

1. Inbound logistics (input)
2. Operational (Manufacturing)

3. Outbound logistics (storage and distribution)
4. Marketing and sales
5. Services

The Primary activities are supported by the following support activities:

1. the firm's infrastructure (accounting, finance, administration)
2. Human resource
3. technology development (improving product and production and
4. Procurement (purchasing input)

The Value Web

The value web is a collection of various organizations that use information technology to coordinate their value chains to produce a product or service.

STRATEGIC INFORMATION SYSTEMS (SIS)

These systems change the goals, operations, products, services or environmental relations of an organization to help it gain an organization to help it gain an edge over the competitors. It can be used at al level of an organization.

Strategic Information System for Competitive Advantage:

a. creating barriers to competitors' entry into the market
b. generating databases to improve marketing techniques
c. 'locking in' customers and suppliers
d. lowering the costs of the products and
e. leveraging technology in the value chain

UNIT-2

Introduction:

- The advent of Internet technologies has really revolutionized the business world today.
- Internet is reshaping the way information systems are being used in business
- Internet has eliminated many technical, geographic, and cost barriers that use to obstruct the global flow of information.
- E-commerce refers to the use of the Internet and the web to transact business.
- The concept of e-commerce started in 1995.
- The Netscape.com started to publish advertisements from many organizations on its web portal. It showed the web may also act as new media.
- Unfortunately, this exponential growth in e-commerce created a market bobble called "Dot.com", bubble which burst in March 2001.
- On the positive, despite the bubble burst a few of e-commerce Amazon, e-bay and google not only survived but also hada good growth and thus continued.

E-Commerce:

- E-commerce today, is not just about buying and selling products online as it was perceived a few years before.
- It encompasses the entire online process of developing, marketing, selling delivering, servicing and paying for products and services transacted through the Internet.
    - Providing information about a product
    - Defining the requirements of the customer
    - Performing the purchase transaction
    - Electronic delivery of the product (for Eg: Software, music, video or any information based product)
    - Providing customer service electronically
- It is a major driving force
- It provides number of benefits

- Due to failures they learnt more

Advantages of E-commerce:

- Reduce the transaction costs
- Improve customer services
- Speed up the flow of information
- Coordination among manufactures
- Suppliers and customers.

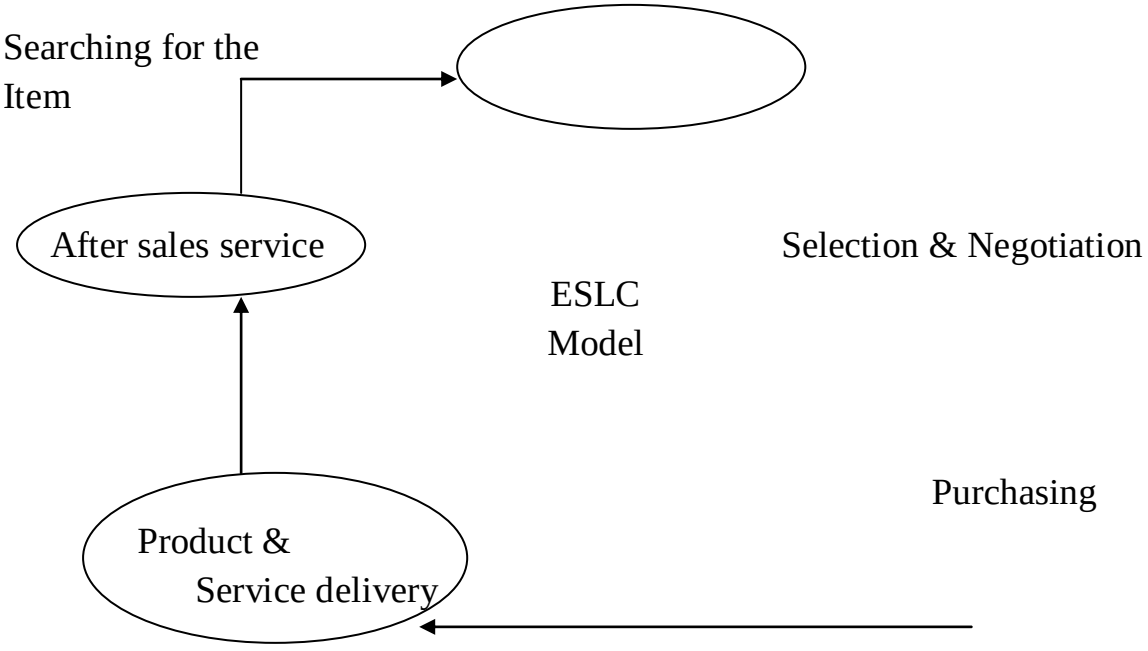
Disadvantages of E-commerce:

- Main threats to e-commerce
- Payments, wrong posting, Hacking

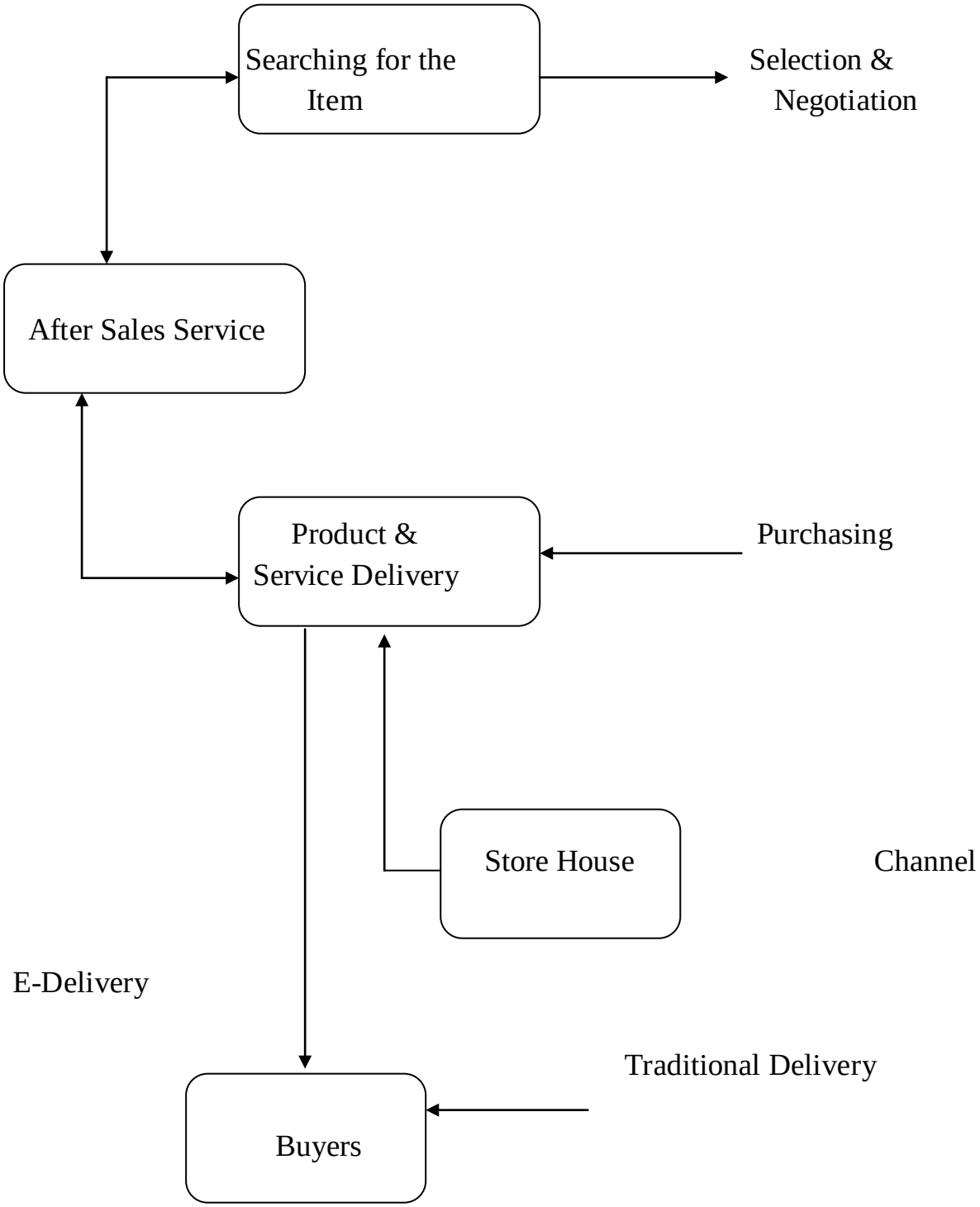
Categories of E-Commerce:

1. Business to Consumer (B2C) e-Commerce
2. Business to Business (B2B) e-commerce
3. Consumer to consumer (C2C) e-commerce

E-Commerce Sales Life Cycle (ESLC) Model:

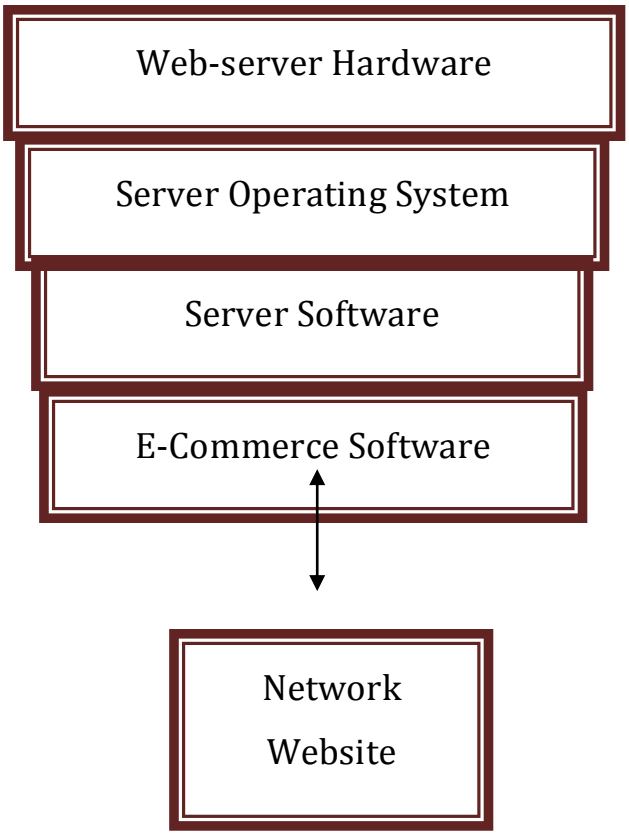


ESLC Process Model


Searching for the Item
Selection & Negotiation
After Sales Service
Product & Service Delivery
Purchasing
Store House
Channel
E-Delivery
Traditional Delivery
Buyers

E-Commerce Infrastructure:

E-Commerce technology infrastructure is the key to successful e-commerce.



Hardware:

- ✓ A web-server hardware platform is one of the main e-commerce technology infrastructure components.

- ✓ The various features of the web server like the storage capacity & computing power, etc., depend upon the software that runs on the server and the volume of the e-commerce transactions to be processed.

Software:

Web-server software

e-commerce software

Web-server software:

To perform a large number of functions like:

- Security
- Identification retrieval
- Sending of web pages
- Website tracking
- Website development
- Website development

The website must have web server software

E-Commerce Software:

Locate or built to a host server, one can start to investigate and install the e-commerce software.

- Catalog management
- Product configuration
- Shipping chart
- E-commerce transaction processing
- Web traffic data analysis

E-Commerce Application:

- ✓ Retail and wholesalers
- ✓ Marketing
- ✓ Finance

- ✓ Manufacture
- ✓ Auction

Management challenges and opportunities:

- ❖ New business model
- ❖ Required changes in Business process
- ❖ Channel conflicts
- ❖ Legal & Regulatory environment for e-commerce
- ❖ Security & privacy
- ❖ Managerial Opportunities

ERP SYSTEM

Introduction:

The Enterprise Resource Planning (ERP) system is a set of application software/ package that provides operational, managerial and strategic information for an enterprise. The ERP systems serves as a cross functional enterprise backbone that integrates all the process of the business and help plan the resources of the organization. These systems help in focusing on production capacities, logistics management and working out financial implications of each decision rather than just come costs.

The basic philosophy of an ERP system is that business processes are to be integrated at all levels and all the resources of the organization are to be treated as common resources that are to be used most efficiently to satisfy its customers.

These systems also offer flexibility to business processes as the process itself instead of some functions in the process is automated. **For Example:** SAP-R3, an ERP Software packages provide more than 700 processes that are automated and integrated with each other.

ERP system involves the purchase of pre written software modules from third party suppliers, rather than bespoke production of software requirements.

Definition:

Enterprise Resource Planning [ERP] system may be defined as "a highly integrated information system, which provides information system, which provides information for all the functional areas as well as all the management levels of an organization."

Evolution of ERP:

- ERP systems have evolved from the Materials Requirements Planning (MRP) system [1970's].
- In 1980's MRP-II [Manufacturing Resource Planning]
- In natural evolution from the first generation MRP systems was the Manufacturing Planning System [MRP-II] that addressed the entire manufacturing function and not just a single task within the manufacturing functions.
- Both MRP systems and MRP-II systems were fairly successful in Industry.
- In 1990's unprecedented global competition was seen.
- Customer focus and shortened PLC.
- To meet the demands of customer corporations had to move towards agile manufacturing of products
- Continuous improvement in process and business process reengineering.
- Integration of manufacturing with other functional areas including accounting, marketing, finance and Human Resource Development.
- The business wants to meet the choice of customers.
- In 1990's truly called for integration of all the functions of management and ERP systems are integrated.

Information system perspective of ERP:

- ERP system are the extension of
  - EDP [Electronics Data Processing]
  - MIS [Management Information System]
  - DSS [Decision Support System] and
  - KBS [Knowledge Based System]

EDP: It concentrated like payroll, calculation, Inventory reports or census reports generated faster and more accurately

MIS: It addressed the operational Information

DSS: DSS used extensive modeling tools such as optimization, simulation and statistical analysis to reveal patterns in the information generated by MIS system.

KBS: This systems went beyond data, information and models to capture the knowledge of the decision maker and to use the captured knowledge to propose far superior solutions.

ERP Life Cycle:

The different phases of the ERP implementation are given below [Alexis Leon]

- ✶ Pre-evaluation screening
- ✶ Package Evaluation

Cross function:

- ➢ It is a group of people with different functional expertise working towards a common goal.
- ➢ It may include the people from finance, marketing, operations, human resources.
- ➢ Cross-functional enterprise system often function as self-directed enterprise systems responding to broad but not specific directives.

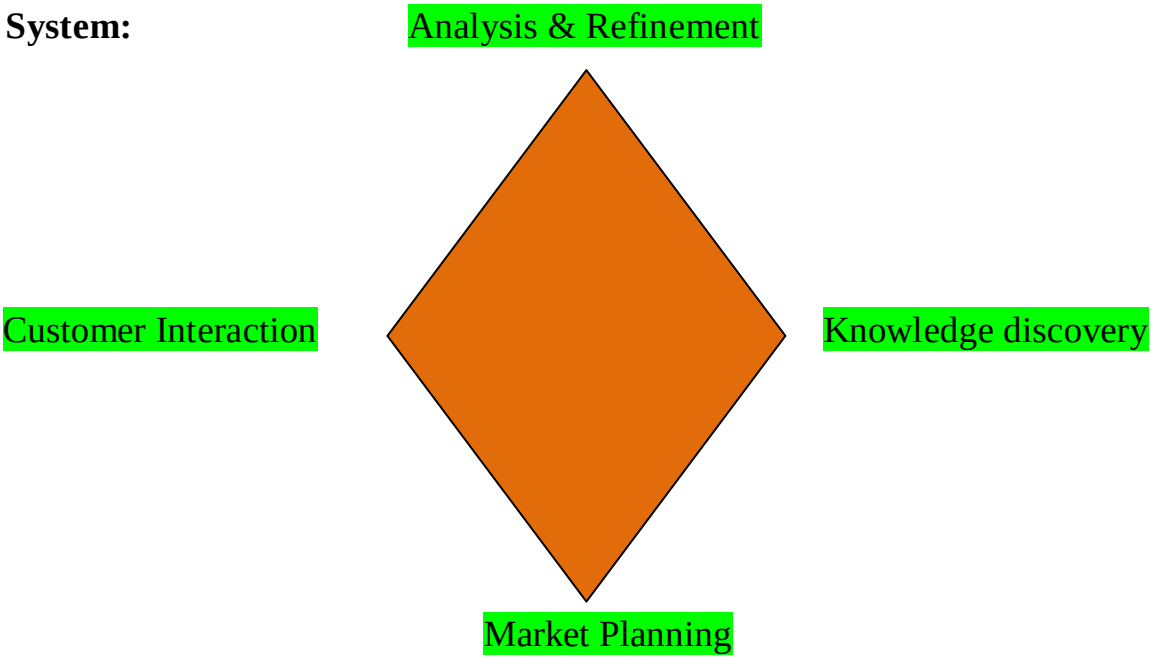
ENTERPRISE INFORMATION SYSTEM:

Information technology is being used to develop integrated cross-functional enterprise information system that cut across the traditional functional areas of a business organization with an objective to reengineer and improve vital business processes all across the organization.

Thus, instead of having functional mainframe-based legacy systems, organization are shifting to integrated cross functional client/ server applications.

For Ex: ERP, SCM (Supply Chain Management) and CRM (Customer Relation Management)

CRM System:



"CRM is an iterative process that turns customer information into positive customer relationship."

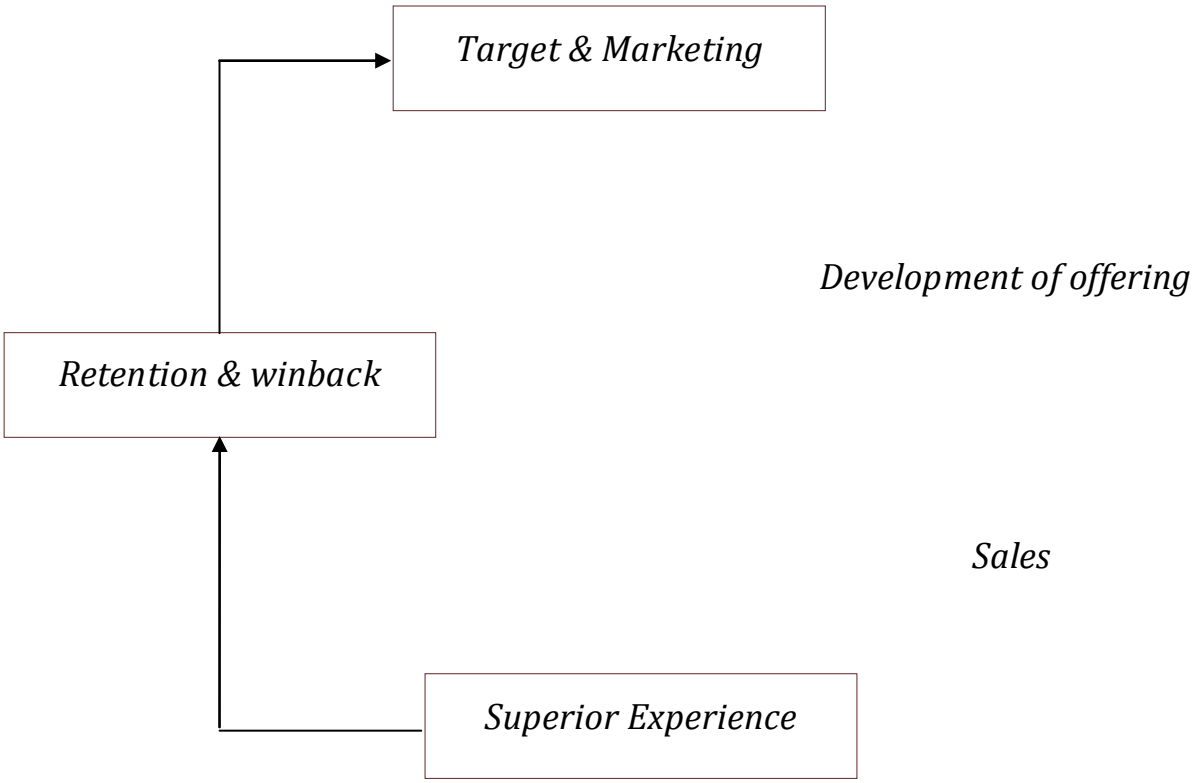
Introduction:

CRM is the new mantra which uses intelligent methods in the form of data mining techniques to get better in sights of customer needs.

CRM Cycle:

The CRM cycle was developed by Rigby and Ledingham in the year 2004. It consists of five process stages.

CRM Cycle:



Vendors of CRM Software:

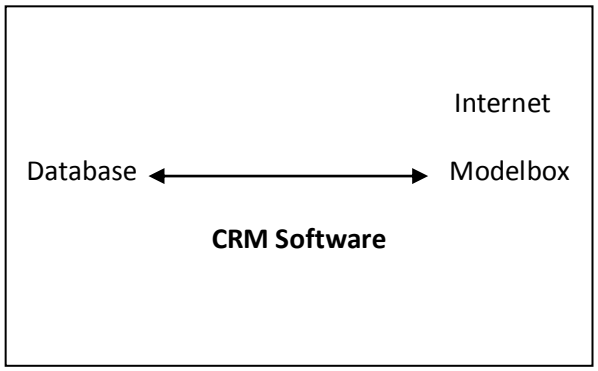
- Siebel system
- Oracle
- People Soft
- SAP AG

CRM Process:

CRM Process

Sales	*Marketing*	*Service*

CRM Software



Application Components in a Typical CRM System:

Customer Focus: This components of CRM system assists sales, Marketing Service employees in capturing and tracking all data about existing and prospective customers.

Sales: CRM system provides the software tools and information to all sales people, which is required to support and manage the sales activities.

Marketing: The CRM system helps marketing professionals capture and manage customer response data in the CRM database and analyze the customer and business value of a company's marketing campaigns.

Customer Service and Support: CRM system also provides service people with software tools and real time access to the customer database.

Data Mining for CRM:

Data mining attempts to formulate analyze and implement basic induction processes that facilitate the extraction of meaningful information and knowledge from unstructured data.

Data mining is not a Universal panacea for CRM success but its critical criteria include tools selection, business objective matching, data discovery, preparation & delivery.

Successful data mining in a CRM environment is far more than the application of algorithms to data. Data mining supports CRM mainly in the following two ways.

- Automated prediction of trends and behaviours.
- Automated discovers of previously unknown patterns.

Data mining sequence steps:

1. Data Cleaning: Remove noise & inconsistent data

2. Data Integration: Where multiple data sources may be combined

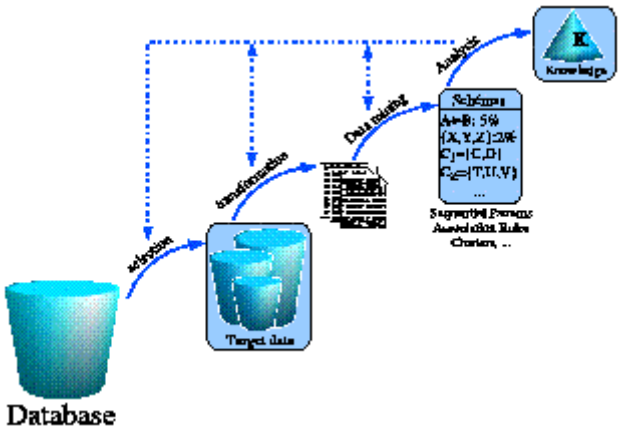
3. Data Selection: Data relevant to the analysis task are retrieved from the data Base

4. Data Transformation: Data are transformed

5. Data mining: Process where intelligent methods are applied in order to extract data pattern.

6. Pattern Evaluation: To identify the truly inserting patterns.

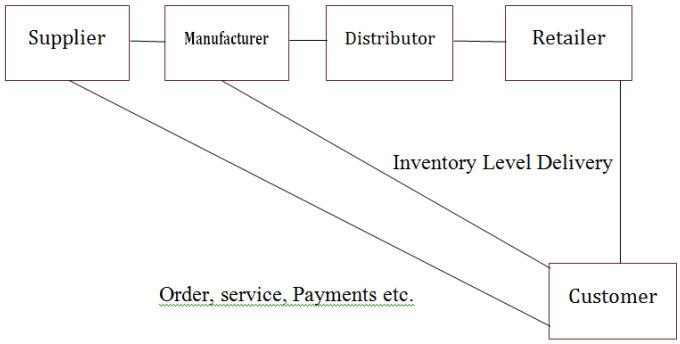
7. Knowledge Presentation: Visualization and knowledge representation technique are used



Supply Chain Management:

Supply chain Management is regarded as a competitive tool and it is a business strategy that creates many new and innovative opportunities for organization.

The supply chain is a network of organization and business process for procuring material, transforming raw materials into finished goods and distributing these products to the customers.



- ✶ The organization would be able to decide when and what to produce store and move.
- ✶ Orders can be communicated quickly
- ✶ Organizations can track the status of order
- ✶ Inventory availability
- ✶ Inventory, transportation and warehousing costs can be reduced
- ✶ Shipments can be tracked
- ✶ Production can be planned

The following SCM implementation framework suggesting guiding steps, can be adopted by organizations:

- ➢ Understand your business and supplier
- ➢ Define SCM system strategy for your organization
- ➢ Make your organization business process Re-engineering ready
- ➢ Plan implementation of SCM system
- ➢ Top management support
- ➢ Develop a performance scorecard

DECISION SUPPORT SYSTEM [DSS]:

Introduction:

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

DSS is a specialized MIS designed to support an executives skill at all stages of decision making i.e problem identification, selecting relevant data, picking the approach to be used in decision making and evaluating the alternative courses of action.

Definition:

According to Scott Morton, "Decision Support System [DSS] as Interative computer based system, which help decision-makers utilize data and model to solve unstructured problems."

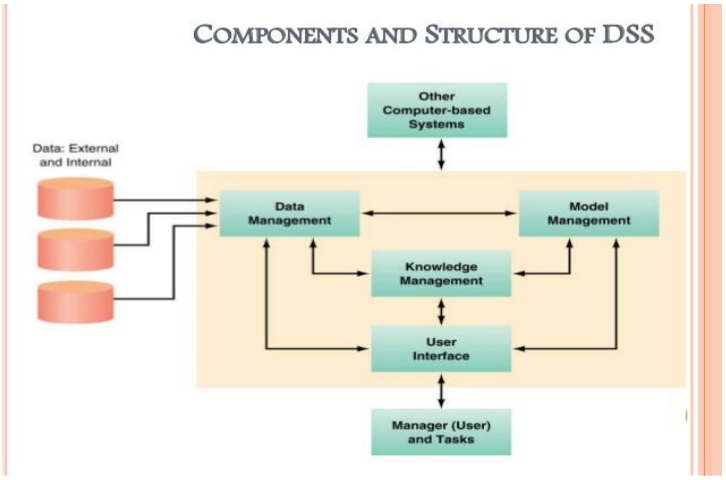
Example of DSS:

1. Group Decision Support System [GDSS]
2. Computer Supported Co-operative Work [CSCW]
3. Logistics system
4. Financial Planning System

Decision Support System:

DSS is a class of system which supports the process of making decisions to solve and structured problems. DSS use analytical models specialized data base individuals own insights and judgments.

Components of DSS



Characteristics of DSS:

- Provide rapid access to information
- Handle large amounts of data from different source
- Provide report & presentation flexibility
- Offer both textual & graphical orientation
- Support drill-down analysis
- Perform complex, sophisticated analysis & comparison using advanced software packages.

Benefits of Decision Support System:

- Improving personnel efficiency
- Improving problem solving
- Facilitating communications
- Promoting learning training
- Increasing organizational control

Functions/ Roles of DSS in Business:

- What-if analysis
- Goal oriented
- Risk analysis
- Model building
- Graphical analysis

Types/ class of Decision Support System:

- File drawer system
- Data Analysis system
- Analysis Information System
- Accounting Models
- Representational models
- Optimization models
- Suggestion models

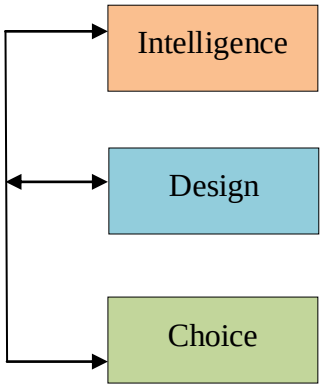
Application of DSS:

Application of a DSS can be classified into following three categories:-

- ❖ Independent problem
- ❖ Interrelated problem
- ❖ Organizational problem

SIMON'S MODEL OF DECISION-MAKING:

Decision-making in organization is regarded as a rational process. Herbert A Simon has given a model to describe the decision-making process. The model comprises of three major phases, namely



Intelligence Phase: In this phase, the decision-maker scans the environment and identifies the problem or opportunity, it may be continuous or intermittent.

For example: 1) A production manager reviews the daily scrap report to check for problems relating to quality control (continuous scanning).

2) A sales executive periodically visits key customer to review possible problem and to identify new customer needs (intermittent scanning).

In the intelligence phase of the decision-making process involves:

a) problem searching

b) problem formulation

Design Phase: In this phase, the decision maker identifies alternative course of action to solve the problem.

Choice Phase: At this stage, one of the alternatives developed in design phase is selected and is called a decision. For selecting an alternative, a detailed analysis of each and every alternative is made. Simon's model of decision making suggests three phases and the flow of activities is from intelligence to design to choice.

TYPES OF DECISION:

Organizational decision differs in a number of ways. These difference affect the development of alternatives and the choice among them. They also affect the design of information system support for decision activities. The following bases are important to classify decision.

- ✶ **Purpose of Decision-making**
- ✓ Strategic planning decision
- ✓ Management control decision
- ✓ Operational control decision

- ✶ **Level of Programmability**

Simon (1965) on the basis of the level of the programmability of a decision, proposed two types of decision.

- ➔ Programmed
- ➔ Non-programmed also known as structured and unstructured decision.

Structured:		
Operational Control	**Management Control**	**Strategic Control**
Order processing Accounts receivable	Budget Analysis	Warehouse Location
Semi-structured:		
Inventory control Production scheduling	Analysis of variance	Introduction of new product
Un-structured:		
Cash management Long-term forecast	Budget formulation	R & D planning

- **Knowledge of out comes**

Another approach of classifying decisions is the level of knowledge of outcomes. When there are more than one alternative, the knowledge of outcome become important.

- Decision under certainty : Decision-making under certainty takes place when the outcome of each alternative is fully known
- Decision under risk: Decision making under risk occurs when there is a possibility of multiple outcome of each alternative and a probability of occurrence can be attached to each outcome.
- Decision under uncertainty: Decision making under uncertainty takes place when there are a number of outcomes for each alternative and the probabilities of their occurrence are not known.

METHODS FOR CHOOSING AMONG ALTERNATIVES:

A decision maker makes uses of various methods for choosing among alternatives. These methods generally assume that all alternative are known.

A brief explanation is given:

- Decision theory or decision analysis
- Decision tree
- Optimization Techniques

Decision theory or Decision Analysis:

The decision Theory (Decision Analysis) refers to the techniques for analyzing decisions under risk and uncertainty. In the process of decision-making, the decision-maker wants to achieve something which may be called his goal, purpose or objective.

The decision-maker may choose one particular alternatives, which is called strategy of the decision-maker from among various alternatives. There are certain factors which affect the outcome for different strategies. But these factors or conditions, also called 'state of Nature', are beyond the control of the decision-maker.

A measure of achievement of the goal is called the 'pay-off matrix'. A pay-off matrix is used as a method of presenting data in decision-analysis. A pay off matrix is a good representation of the decision problem because the alternatives or strategies available to the decision maker may be represented by rows and conditions [state of nature] by columns. Each cell, which is an intersection of a strategy and a state of nature, contains the pay-off.

- Maximax rule (or) Criterion of optimism
- Maximin rule (or) Criterion of pessimism
- Criterion of minimize regret
- Criterion of rationality

Maximax or Criterion of Optimism: In this case, the decision maker is of optimistic attitude and thus would select the strategy which will provide him the greatest [max] pay off under the most favourable or the best condition [max].

Maximin rule (or) Criterion of pessimism: As the name of the criterion indicates, the decision-maker is of pessimistic attitude and thus will select the strategy which will give him the highest pay-off (max) if the worst condition [min] occurs. Here, the decision-maker, being of pessimistic view, will not like to take any risk and thus will think about the safest position in the worst situation.

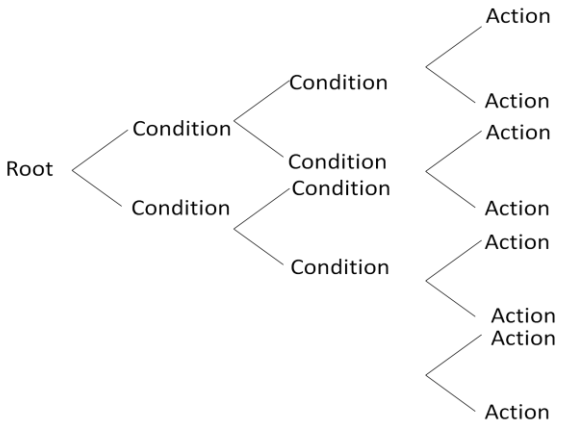
Criterion of Regret: Under the criterion of regret, a decision-maker selects the strategy which minimizes the maximum regret for each decision. The decision-maker might experience regret if he has not selected the appropriate strategy in term of the particular state of nature that may actually take place, which is the difference between the pay-off he could have received for the best strategy, had he known the state of nature that was going to occur.

Criterion of Rationality: Criterion of rationality is also known as Laplace criterion, which assumes equal probabilities of various states of nature. Thus, it is considered a rational approach of decision making. Once equal probabilities are attached to the states of nature, it becomes a decision problem under risk and the expected pay-off for each strategy is calculated. The strategy which has the greatest expected pay-off is selected.

Decision Tree:

Decision tree is a graphic representation of a sequence of decisions and actions. It is an important method for presenting the analysis. The analysis is called a decision tree because it resembles branches of a tree. The root of the tree is the starting point of the decision sequence. The decision tree helps both in structuring the problem, that is to understand the process logic of a problem as well as in its analysis.

For example:



Decision Tree Sequence

The decision tree sequence is again divided into two 1. Problem structuring and 2. Decision tree for discount policy.

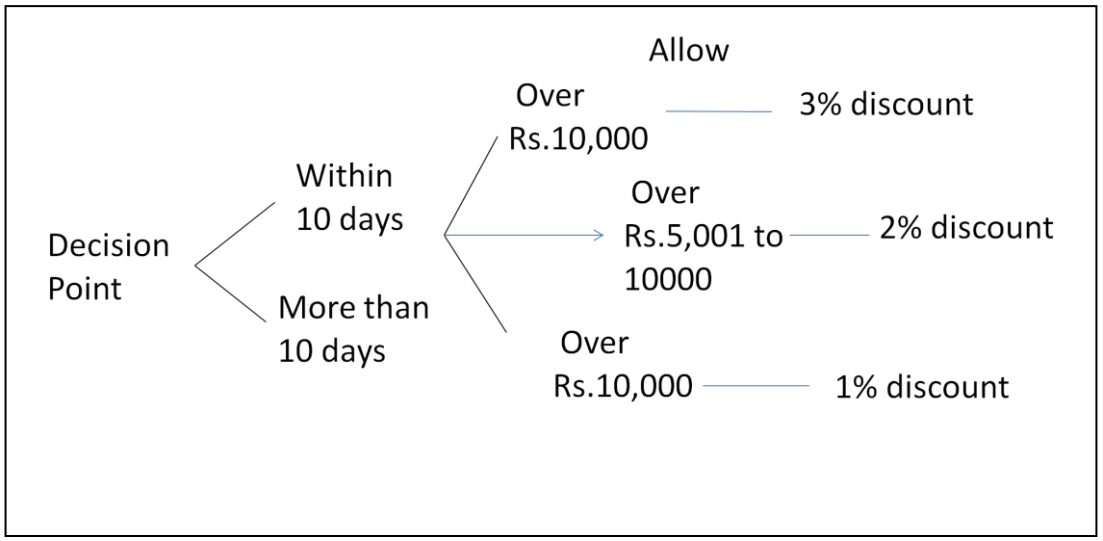
1. Problem Structuring: Consider the case of a computer firm that offers the following discount policy to its customers.

If the payment is made within 10 days:

3% discount is allowed on orders above Rs.10,000/-

2% on orders upto Rs. 5,001 to Rs. 10,000/-

1% on orders up to Rs.5000



2. Decision Tree for Discount Policy: However, if the payment is made in more than 10 days, no discount is allowed. The above discount policy can be portrayed with the following decision tree.

3. Problem Analysis: Suppose XYZ company want to make distribution channel decision from marketing of its products. There are two alternative channels available to the company.

(a) Direct sales and

(b) Selling agents

The company may have high or low market penetration and market share. The probabilities and net gains are as follows:

Channel	**High Penetration**	**Low Penetration**
Direct Sales	0.60	0.40
Net gains	Rs.40 Lakh	Rs.30 Lakhs
Selling Agent	0.80	0.20
Net gains	Rs.45 Lakhs	Rs.20 Lakhs

The decision tree and the analysis is as follows.

Expected pay-off for direct sales = (0.60) (40) + (0.40) (30) = 36 lakhs

Expected pay-off for selling Agent= (0.80) (45) + (0.20) (20) = 40 Lakh

Decision: As selling through agent would give a higher pay-off, the company should select this channel for marketing its products.

Optimization Techniques:

Modern management science offers a number of optimization techniques for reaching a decision. These techniques assume that all alternatives and their outcomes are known.

DECISION-MAKING AND MIS:

Up to now understood the process and concept of decision-making, let us now discuss the role of an information system in providing information to support decision-making in an organization. We will also explore the relevance of this knowledge of decision-making for the design of an information system.

- ➔ Information support for decision making process
- ➔ Techniques used in Decision-making

Information support for decision-making process:

The role of an information system is providing information to support decision-making in an organization is very important.

SIMON's Model: * Intelligence Stage

* Design Stage

* Choice stage

Techniques used in Decision-making:

The following are some of the techniques often used in decision-making.

- **Simulation**: In this approach, a mathematical model of the situation is created. Main decision variables are defined and the model is operated under different assumptions or with different starting condition to help explore alternative paths for the real situation.
- **Optimization**: In Optimization technique a mathematical model of the situation is developed.

- **OLAP and Data mining**: It uses statistical techniques to analyze the business results and find hidden relationship
- **Expert System**: Here an expert's view of an area of knowledge in terms of facts and rules are summarized and then the facts and rules to a particular situation are applied to help someone else decide what to do.
- **Neural Networks:** It starts with a large set of coded examples that represent the range and frequency of possibilities in the situation being studied.
- **Fuzzy Logic:** In this approach, decision processes are controlled using logic systems that replace 'either' or 'logic' with logic based on relative degree of inclusion in sets.
- **Case based reasoning:** This approach creates a database of examples that may help in making decision.
- **Intelligent Agents:** In this technique, decision parameters are specified for a computerized 'agent' that searches one or more database to find a specific answer, such as the lowest price for a particular mobile set.

BUSINESS INTELLIGENCE AND KNOWLEDGE MANAGEMENT SYSTEM:

BI (Business Intelligence) enables the organization to make effective decision and decision having strategic implications for the business. In other words, BI enables an organization to extract the right meaning of information to take creative and important steps to get the competitive advantage. The purpose of BI is to improve the timeliness and quality of the input for decision making; it helps the manager to understand the following:

- Internal capabilities of the organization
- Trends and future direction in the markets
- External environment like economic, political, social technological and demographic environment and
- Behavior of the competitors

BI encompasses both internal & external information, which is stored in various databases. An organization may have separate database for different applications.

Definition:

Business Intelligence System [BI] may be defined as Knowledge-knowledge about your customers, your business partners, your competitive environment and your own internal operations.

Data warehouse and Data mining:

A data warehouse is a logical collection of information, gathered from many different database and thus a data ware house may be called as a large database containing historical transaction and other data. The data warehouse would deal with granular (small particulars) data, information in its raw form.

The purpose of data ware is permanent storage of detailed information. Data entered into a data ware house needs to be processed to ensure that it is clean, complete, and in the proper format. Many a time, a data warehouse is subdivided into smaller repositories called data marts. A data mart is a subset of a data warehouse, in which only the required portion of the data warehouse information is kept. To make data warehouses useful organizations must use BI tools to process data from this huge database into meaningful information. There database are used for data mining and online analytical processing.

Data mining quarries are more advanced and sophisticated than those of traditional quarries.

Data mining has four main objectives:

a. sequence or path analysis: Finding patterns

b. Classification: Finding whether certain facts fall into predefined group

c. Clustering: Finding groups of related facts not previously known

d. Forecasting: Discovering patterns in data that can lead to reasonable predictions.

ON-LINE ANALYTICAL PROCESSING [OLAP]:

On-line analytical processing [OLAP] systems allow analysts to display data in one or more of a number of different dimensions, such as time, geographic region, product, organizational department. Customer, or other factors. The data

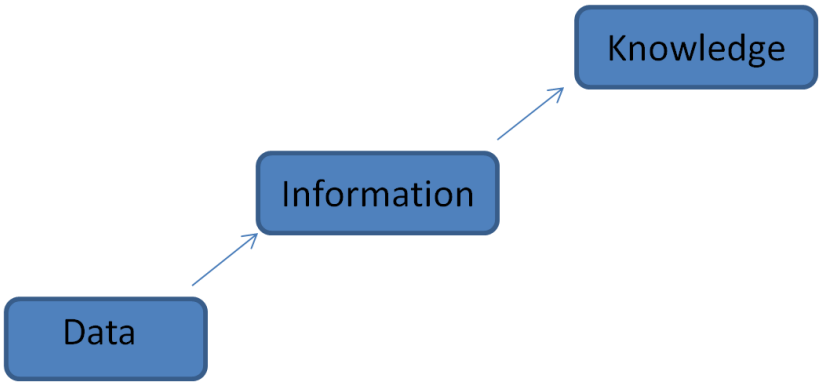
used by OLAP applications usually comes from a data warehouse. OLAP is an extension of the structured query language [SQL] frame work to accommodate queries that are not feasible on relational database.

KNOWLEDGE MANAGEMENT SYSTEM:

We have realized that business organization need business intelligence or knowledge to compete in this competitive world. Knowledge Management System, in its broadest sense may be defined as strategy, or a system that is designed to help organization create, capture, analyse apply and reuse knowledge to improve its performance and to achieve competitive advantage.

Thus, knowledge is at the highest level in a hierarchy with information at the middle level, and data to be at the lowest level. The concept of knowledge has been: Data, information, knowledge.

Hierarchy of knowledge:



When a pattern relation exists a midst the data and information, the pattern has the potential to represents knowledge. It only become knowledge when one is able to relies and understand the pattern and their implication. Thus one needs to understand that.

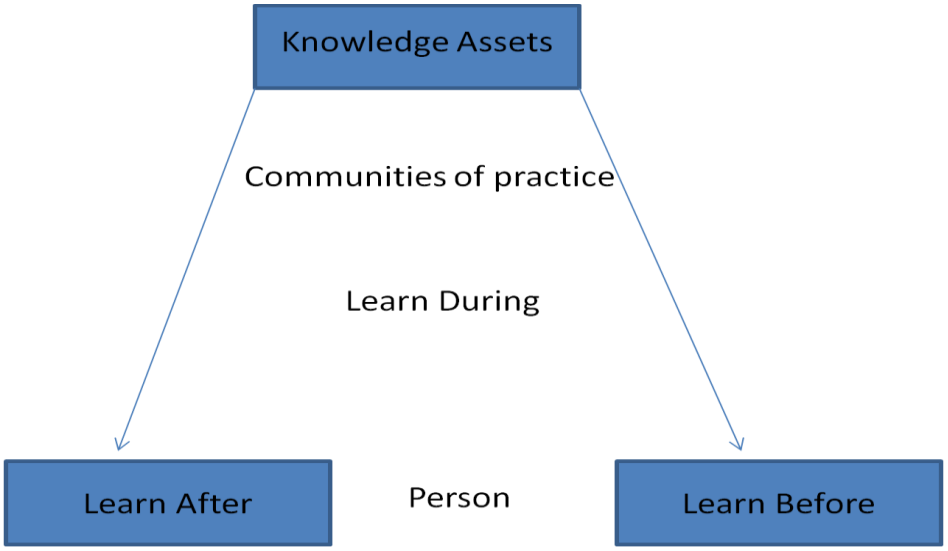
a. Collection of data is not information

b. Collection of information is not knowledge

c. Collection of knowledge is not wisdom

d. Collection of wisdom is not truth

CONCEPT OF KNOWLEDGE MANAGEMENT:



A Knowledge Assets: It is validated knowledge, captured and stored

Learning Before: Knowledge is accessed at the start of a project or a piece of work, to ensure that you start the work with a full knowledge base.

Learning during: New knowledge is identified and collected during implementation, while work is in progress so, that operational plans can be changed immediately as new knowledge becomes available.

Learning after: Upon completion of a task or at the end of a project cycle the knowledge is collected from all those who took part and collated for future use.

Communities of practice: These are networks dedicated to sharing knowledge among practitioners, in order to help them practice better.

Accountable knowledge Roles: They are represented by the face with in the business activity cycle of the bottom of the model picture.

The technologies for the knowledge management system include intranets and extranets, search and retrieval tools, content management and collaborations tools, data warehousing and mining tools, and groupware and Artificial Intelligence (AI) tools like expert system and knowledge base system [KBS].

--------X--------

UNIT-3

The NOLAN Stage Model:

Richard Nolan (1974) has discussed a frame word for IS (Information System) planning, popularly known as Nolan Stage Model. The basic premise of the model is that any organization will move through stages of maturity with respect to the use and management of IS. While progressing, an organization must go through each stage of growth before it can move to the next stage. The model has been called contingency model because it states: IF these features exists THEN the information system is in this stage.

The Nolan stage model has identified four stages of information system growth. A brief description of these stages is given below:

Stage: 1

Initiation Stage : This is the first stage. In this stage, the technology is placed in the organization. A few applications in the organization are computerized. There are only a small number of users.

Stage: 2

Expansion or contagion : This is second stage. During this stage rapid and uncontrolled growth in the number and variety of IT applications takes place. Many users adopt computers in solving their IT-related problems.

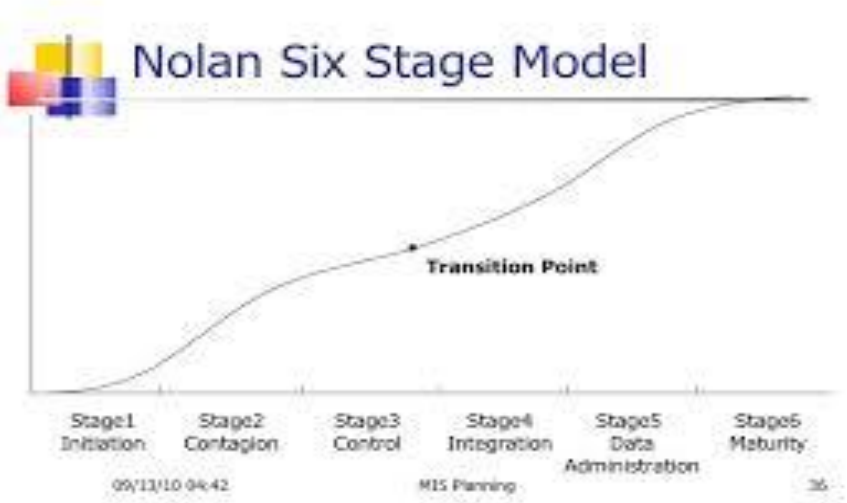
Stage: 3

Formulation or control stage : In this stage organizations gain control over the technology's resources by implementing formal control processes and standards. Thus, organization are able to apply cost-effectiveness criteria.

Stage: 4

Maturity or integration stage : The organization gain sufficient experience and maturity in IS/IT applications. In this stage application are integrated, controls are adjusted.

The shape of the IS growth curve is similar to sigmoid or 'S' curve. It describes growth phenomenon in organization and its activities, widely applied to the marketing of products.



STAGES OF NOLAN'S GROWTH MODEL

Nolan in the year 1979 enhanced his earlier model to six stages and advocated that four stages were not enough to describe the proliferation of IT in an organization and thus added stage 5 and 6 stages.

Stage: 5

Data Administration : This stage features a new emphasis on managing corporate data rather than IT. Thus, in this stage controls are further lowered to encourage development of system which contributes to strategic advantage to the organization.

Stage: 6

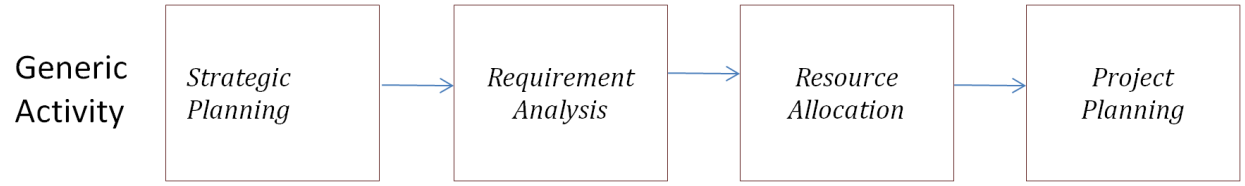
Maturity : This stage indicate that the application portfolio is complete and matches the objectives of the organization. In this sixth stage model, the IS growth curve takes the shape of double 'S'.

ASSUMPTIONS ON NOLAN'S MODEL:

- Organizational learning permits the movement through stages. The experimentation of stage 1 leads to the growth stage 2. It is the growth that 'teaches' the need for control in stages 3.
- Stages cannot or 'skipped' because every experience is necessary before the organization is ready for the next stage. So, if there is no experimentation in stage 1, there would be no early users to promote contagion, i.e stage 2 so, on.
- Although there is a 'natural' progression the transitions can be planned, co-ordinate and managed to allow painless movement. Recognition of the stage is recognition of a sequence for planned and managed change.

THE FOUR-STAGE MODEL OF IS PLANNING:

A wide variety of techniques are being applied for IS planning. However, organizations select these techniques based o the persuasive power of IS planning. However, organizations select these techniques based on the persuasive power of IS developers rather than on a sound logic. A four stage model of IS planning, which is an enhancement of the three-stage model developed by Bowman et al (1983).



STRATEGIC PLANNING:

As the name indicates, in the IS strategic planning stage, objectives, goals and strategies of information systems are aligned with the objectives, goals, and strategies of the organization.

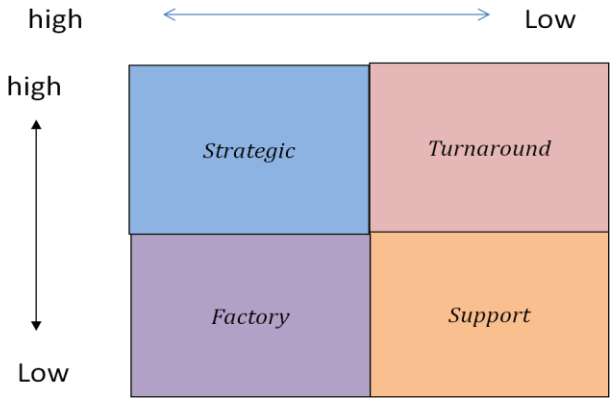
The following techniques are used at this stage:

- Derivation from the organizational plan.
- The strategic information system grid
- Strategic fit with organization culture
- Strategy set transformation

Derivation from the organizational plan: In this technique, IS objectives, goals and strategies are derived from the objectives, goals and strategies of the organization and an analysis is made of each objective.

For example: The objective of an organization may be to pay salaries to all the employees by the seventh day of every month. The derived IS plan may be to provide information support for processing payroll of all the employees before the due date.

Strategic Information System Grid:
This technique, known as Mc Farlan-MC Kenney strategic grid, provides four types of IS planning situation, arranged in the form of a grid.



Strategic Cell: It indicates the critical role of the information systems in the existing competitive strategy and in the future strategic directions of the organizations.

Factory Cell: It indicates the vital position of the existing information system. However, they are not considered part of the future strategic direction.

Support Cell: Points out that IS applications are useful in supporting the organizational activities. IS applications are not regarded as vital or critical, rather they are oriented towards the traditional data processing systems.

Turn around: It is understood as a state of transition from 'support' to 'strategic' stage. This cell indicates that the organization has had only support application but is now planning for IS application vital to strategic success of the organization.

Strategic fit with organizational culture:

In this technique, the organizational culture is understood and the information systems are developed in such a way that these fit into the organizational culture. This helps to avoid the risk of IS failures because of resistance from employees.

Strategy Set Transformation:

This approach has been proposed by William R. King, in which the overall organizational strategy is viewed as an IS set consisting of objectives, goals, and strategies.

Information Requirement Analysis:

This is the second stage or phase of the IS planning model starts and is known as Information Requirement Analysis. In this stage it does not deal with IRA. In deals with current and future needs for IS to support Decision-making and operations of the organization are assessed. IS is developed is formulated.

To undertake information requirement analysis the following:

Step 1: Define underlying organizational sub systems: This is done to sub-divide requirement determination by major organizational activity.

Step 2: Develop sub-system Matrix: the matrix thus prepared is known as manager by process or manager sub-system matrix. The matrix is developed by reviewing the major decision responsibilities of each middle to top manager and relating them to specific sub-system.

Step 3: Define and Evaluate Information Requirements for organizational sub-systems: For obtaining information requirements, managers with major decision-making responsibilities for each sub-system are interviewed in groups.

Step 4: Prioritization of Information System: As IS resources are limited and not all applications can be developed at once, it becomes important to identify which applications are to be developed and in what order.

Thus organizational readiness is seen in terms of

- People issues
- Data issues
- Integration
- Technology
- Other issues

Resource Allocation:

This stage provides the frame work for personnel planning, technology procurement and budgeting to provide services to users. There have been a number of methods for allocating scarce resource.

- ROI (Return On Investment)
- Charge out
- Portfolio Approach
- Steering committees

Project Planning:

Having decided the requirements of IS applications and the sequence in which these applications are to be implemented in the organization, management needs to take a decision whether to develop inhouse to get it from the vendors.

In this stage, an overall frame work for system acquisition planning, scheduling and controlling. A wide variety of tools of project Management are available which includes milestone, CPM and Gantt charts.

SELECTING A METHODOLOGY:

- The four-stage planning model provides an insight into the IS planning issues.
- The organization should determine the extent to which each stage of IS planning has been accomplished.
- This can be done by analyzing major activities.
- Appropriate methodologies should be selected.

Generic Activity	**Strategic Planning**	**Information Requirement Analysis**	**Resource Allocation**	**Project Planning**
Alternative methodology	Strategy Set	BSP	Charge out	CPM
	Strategic Grid	CSF	ROI	Milestone
	Strategic Fit		Portfolio	
	Derivation from organizational plan	E/M	Steering Committee	Gantt charts

FOUR STAGE MODEL WITH ALTERNATIVE IS PLANNING METHODOLOGIES

- It avoids confusion about competing planning methodologies.

INFORMATION RESOURCE MANAGEMENT (IRM):

Now-a-days, information is viewed as a resource of an organization and not as a by-product of transaction processing. Information is also seen as a resource of the entire organization, not of just the department that generates or receives it. Such thinking has given birth to a new concept which is known as Information Resource Management (IRM).

IRM is a concept that focuses on the information, its availability and its usage. The emphasis of IRM is on the efficient Management of information. The concept of IRM is as a key resource. Thus the IRM is a perspective, it is also an approach to organizing and integrating the diverse elements of an information system.

However, information is different from other resources in the following terms:

a) It can be reused
b) It is intangible
c) The marginal cost per additional usage is low

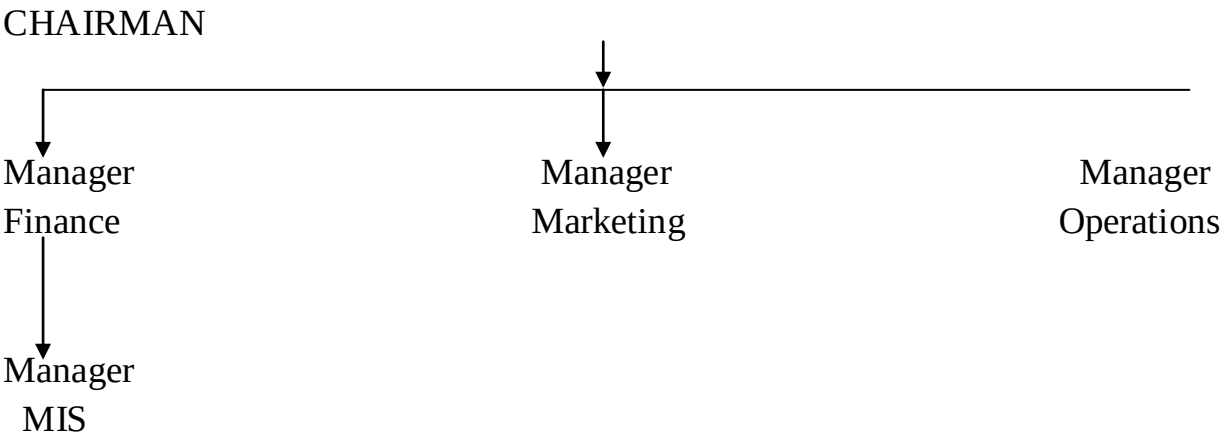
So, many organizations, having realized the significance of IRM, have started according a higher position to the chief information officer of the organization.

Organization Structure and location of MIS:

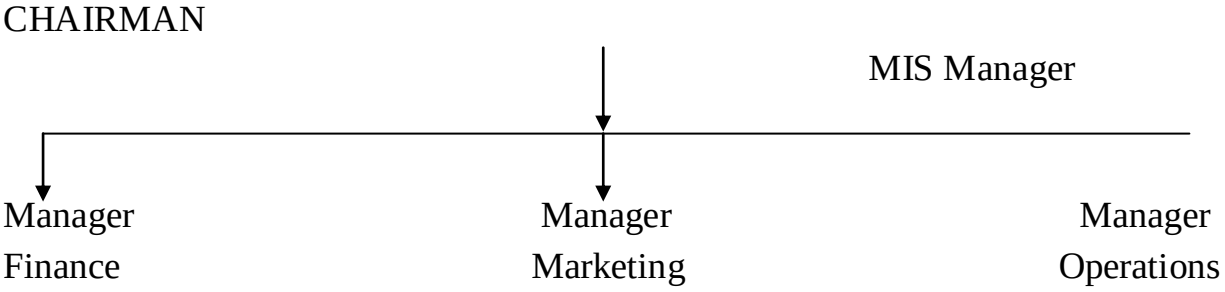
Location of MIS in the organization structure is another area which is quite an important issues that deserves the attention of the management. This requires proper planning at the organizational level.

- As part of Financial Department
- MIS under the Direct control of the Chairman/ Chief executive.
- MIS as a Distinct Function.

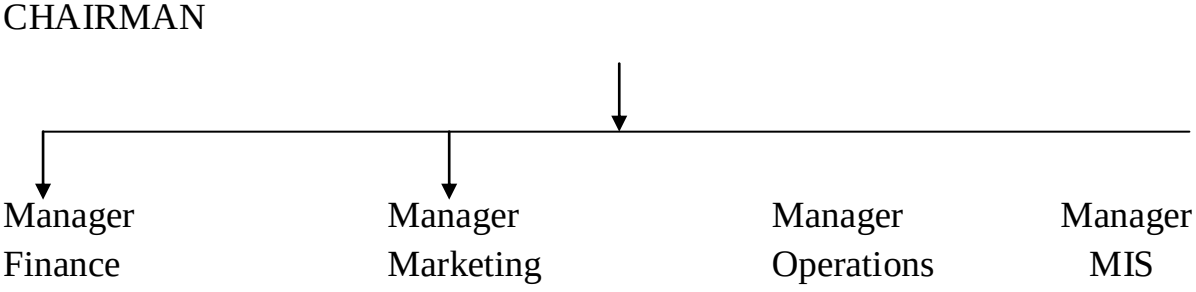
a) MIS Shows as part of Financial Department:



b) MIS under the Direct Control of the Chairman/ Chief Executive:



c) MIS as a Distinct Function



SYSTEM ACQUISITION:

Introduction:

Large companies may require suppliers to present bids and proposals based on system specifications developed during the design stage of systems development. Companies may used a scoring system of evaluation when there are several competing proposals for a hardware or software acquisition. They give each evaluation factor a certain number of maximum possible points. Then they assign each competing proposal points for each factor, depending on how well it meets the user's specifications.

Large companies frequently evaluate proposed hardware and software by requiring the processing of special benchmark test programs and test data. Users can then evaluate test results to determine which hardware device or software packages display the best performance characteristics.

Acquisition consists of bringing on site:

1) Hardware
2) Software
3) Personnel
4) Materials

1) **Hardware**:

When MIS team evaluates the hardware needed by a new business applications, one should investigate specific physical and performance characteristics for each computer system or peripheral component to be acquired capital expenditure analysis is also one of the many factors involved in this decision. The following are some of the hardware evaluation factors and questions are:

- Performance
- Cost
- Reliability
- Compatibility
- Technology

- Ergonomics
- Connectivity
- Scalability
- Software
- Support

2) **Software Acquisition:**

MIS team should evaluate software according to many factors that are similar to those used for hardware evaluation. Thus, the factors of performance, cost, reliability, compatibility, modularity, technology, ergonomics and support should be used to evaluate proposed software acquision.

- Quality
- Efficiency
- Flexibility
- Security
- Connectivity
- Maintenance
- Documentation
- Hardware
- Other factors

Acquiring Software: Make or Buy?

Application software can be acquire in Several ways like:

➔ It can be purchased from external developers (or)

➔ Developed in-house

This decision is often called the make or- buy decision.

➔ **Externally Acquired Software:**

A company planning to purchase or lease software from an outside company has many option commercial off-the-shelf (COTS) development process involve the use of commonly available products from software vendors. It combines fortware from various vendors into a finished system. In many cases, it is necessary to write some original software from scaratch and combine it with purchased or leased software.

➔ **In-house- Developed Software:**

Another option is to make or develop software internally. This approach requires the company's IS personnel to be responsible for all aspects of software development. The inhouse developed software include meeting user and organizational requirements and having more features and increased flexibility in terms of customization and changes.

If software is to be developed internally a number of tools and techniques can be used like.

- Chief programmer teams
- Structured programming
- CASE (Computer Aided Software Engineering) and object oriented approaches
- Cross-platform development
- Structured walk through
- Documentation

Comparison of off the shelf and Inhouse developed software:

Factor	Off the shelf (Buy)	Developed (Make)
Cost	Low cost	High cost
Needs	Might not get what you need	Custom software to satisfy your needs
Quality	Usually high quality	Quality can vary depending on the programming team
Speed	Can acquire it now	Can take years to develop
Competitive advantage	Other organizations can have the same software and advantages	Can develop a competitive advantage with food software

Acquisition of personnel:

- Implementation of an MIS offers the company an opportunity to upgrade and promote personnel after training. Jobs may be restructured at higher levels by using the computer.

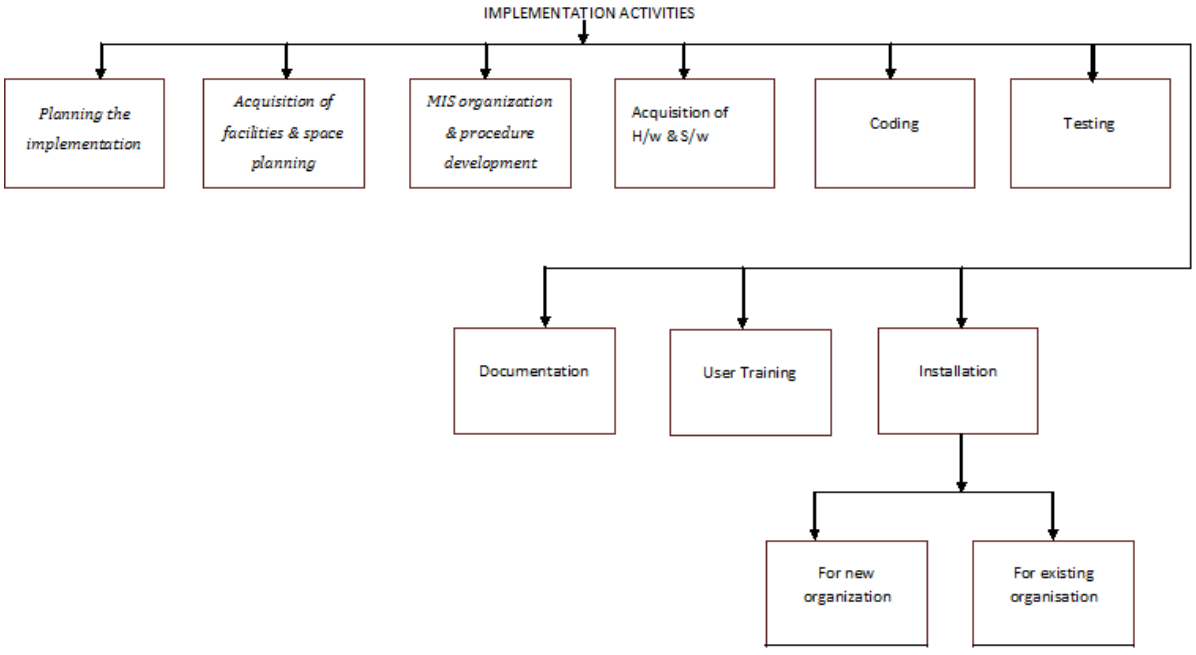
- A personnel planning chart should be prepared showing the number of individuals required in terms of skill.
- The sources (internal and external) and the date they will be required to report to work.

Acquisition of Material:

- Forms and manuals are the principal materials to be ordered for the MIS.
- It is an estimated demand so an adequate number may be ordered.
- The economic order size may be calculated to set the order size and minimize system costs.

SYSTEM IMPLEMENTATION:

Once the design of MIS is complete, it is ready for implementation. Implementation is a process of coding, testing, installation, documentation, training and support. Thus implemented system may be replacement of a manual system or a major modification to an already existing computer based information system.



Planning the implementation:

First step in the implementation of an MIS is to plan and is known as the pre implementation activity. In this step, various other estimates like time required for each activity and cost estimates are also obtained. To better describe the plan and implementation schedule, a system analyst should make use of various tools like Gantt charts, Network diagrams, etc.

Acquisition of Facilities and Space Planning:

For implementing MIS properly it requires acquisition of facilities like office, computer room, computer library etc. For proper implementation of the system, the MIS manager is required to prepare estimates of floor space requirements and also rough layouts. Space planning should take into account the space occupied by computer, terminals, printers etc. as also by people and their movement.

MIS Organization and Procedure Development:

It is also important that a manager be given the responsibility of guiding the task of implementation. The so-appointed MIS manager must make the role of line managers/ users clears and ensure their involvement in the system to the maximum extent possible.

Acquisition of Hardware and Software:

The process of acquiring the necessary hardware and software should, in fact, start immediately after the design specification of the system is over.

Coding:

During coding stage, the physical design specifications created by the system designer team are turned into working computer code by the programming team. Depending on the size and complexity of the system, coding can be an involved, intensive activity.

Testing:

Tests should be performed in accordance with the test specifications at each and every phase. However, it is more important at implementation because, testing at this stage is done under real operating conditions with factual data.

Creation of forms & database:

Forms are very important for transmitting data. They are also required for input to the system and output from the system. For implementation of MIS, the required forms should be generated, but care must be taken that these are generated in the context of the entire MIS.

Documentation:

Broadly speaking, documentation can be understood as of two types, namely, system documentation and user documentation. System documentation, which is intended primarily for maintenance programmers or technical persons, records detailed information about a system's design specification, its internal working, and its functionality.

User Training:

Adequate user training is very important for successfully implementing an information system. The users may be identified and classified differently on the basis of the operations/ functions performed by them.

Installation:

Installation or changeover is the event of switch-over from the old system to the new system, which takes place after the system is tested and found reliable. The existing system is replaced by the new system in this place.

Organizational Change:

The implementation of information system may result in many changes in the organization. It may affects the organizational structure, goals, work-design, values, competition between inserts groups, decision-making and day-to-day behavior.

- ✓ Organizational structure
- ✓ Centralization1 of Authority
- ✓ Job content
- ✓ Relationship
- ✓ Resistance to change

Management of Change:

The following three steps may be useful in managing the resistance to change.

1) Create a climate for change
2) Develop effective agents of change
3) Modify the 'required' organizational system

1) Create a climate for change: First of all, organizations should create a suitable climate for change. Such a culture may be created by getting the employees to feel dissatisfied with the present system.

2) Develop effective agents of change: To win the support of the employees, organizations should identify their informal leaders and they should be sent to workshops or seminars.

3) Modify the 'required' organizational system: A technically ideal organization is termed as the 'required' organization. However for achieving better working relationships of the users, rearrangement of the organization should be made to fit the anticipate emergent organization behavior.

EVALUATION & MAINTENANCE OF IS :

Introduction:

After the MIS has been operating smoothly for a short period of time, a evaluation of each step in the design and of the final system performance should be made.

Evaluation of MIS is an integral part of the management control process, in which the organizations determine or appraise the quality or worth of their information system. In other words, evaluation of MIS is a process and measuring performance of organizational information systems.

Evaluation Approaches:

There are different approaches to evaluate MIS in an organization. The MIS evaluation approaches provide different means to measure accomplishments of system objectives.

- ➔ **Quality Assurance Review:** Quality assurance reviews or technical reviews focus on assessing the information systems technical quality e.g. comparison to standards and operations acceptance procedures.

- ➔ **Compliance Audits: C**ompliance audits or application control reviews assess the adequacy and completeness of controls for the system inputs, outputs, processing, security and access. Compliance audit are typically performed by an autonomous internal audit function.

- ➔ **Budget Performance Review:** Evaluation of MIS budget performance concentrates on compliance with a predetermined budget expenditure level for the MIS development or operations process. Evaluation of users budget performance has its focus on MIS resource consumption by the users.

- **Computer Performance Evaluation:** The production capability of the computer hardware is typically evaluated in terms of performance efficiencies and bottlenecks that limit production.

- **Service Level Monitoring:** Service level monitoring focuses on assessing the information and support. Provided to the user, based on the terms established between the MIS and the user personnel.

- **User Attitude Survey:** User attitude survey method is used in operational evaluation. Operational considerations refers to whether the input data is adequately provided and the output is usable.

- **Post Installation Review**: The focus of a Post-Installation Review (PIR) is often on estimating whether the system meets the requirement definition, i.e., 'Does the system do what it is designed to do'? However, the scope of the development and operation processes, an examination of the information and support provided, an analysis of the actual use process, and cost/ benefit analysis of the system and its effects on the user performance.

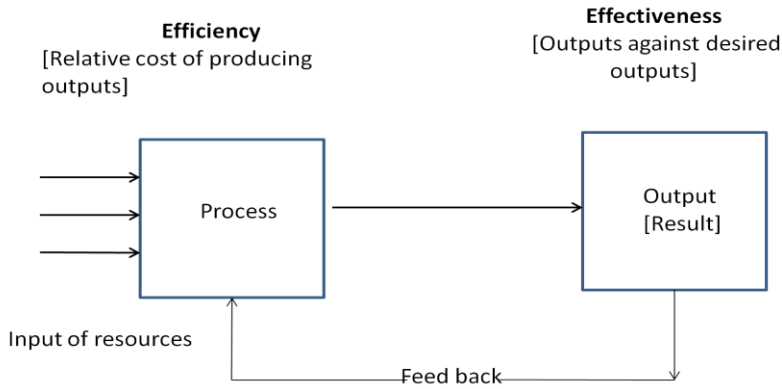
- **Cost/ Benefit Analysis:** Cost/ Benefit analysis is also known as economic evaluation. The analysis quantifies the system's effect on organizations performance in terms of dollars, e.g. direct cost saving or tangible financial benefits.

Evaluation Classes:

Evaluation of performance measurement consists of two major classes, as given below:

1) Effectiveness: This refers to the quality of the outputs from the system. Effectiveness means doing the 'right' thing in the right manner so that desired result may be achieved. Information system is said to be effective if its product (i.e output) is of quality, and the process of producing output is right (effective).

2) Efficiency: It is a measure of the amount of resource required to achieve the output, i.e., the use of system resource to get results. Being efficient implies the system is operating the 'right' way. The relationship between effectiveness and efficiency is that effectiveness is measure of 'goodness' of output, while efficiency is a measure of the resources required achieving the output. This relationship has also been shown as follows:-



RELATIONSHIP BETWEEN EFFICIENCY AND EFFECTIVENESS

Product-based MIS Evaluation:

The focus of the product-based evaluation is on the product [information support] or the output from the system, the evaluation may be termed as effectiveness evaluation. For assessing the effectiveness of output from MIS, the following model may be used.

***Model Structure*:**

The information attributer may be identified as components of a general model for evaluation of MIS effectiveness in an organization. Some of these attributes are listed below.

a. Timeliness
b. Relevance
c. Accuracy
d. completeness
e. Adequacy
f. Explicitness
g. Exception-based

Model Implementation

Various types of output/reports, being generated by MIS of the organization can be evaluated for their effectiveness in terms of the attributes of the management information. The attributes of information have been listed in the structure of the model as mentioned above. To employ this model, managers at different levels of management of the organization may be asked to rate the outputs/ reports on each of the information attributes.

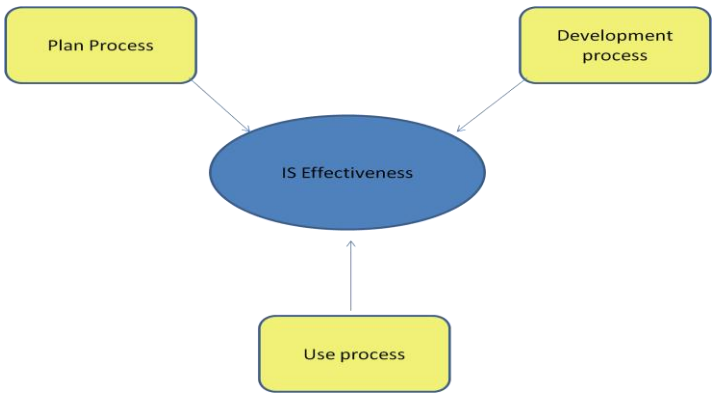
Cost/Benefit-Based evaluation:

In cost/Benefit evaluation, a thorough study of various expected costs, the benefits to be expected from the system and expected saving, if any, is done. For undertaking costs/ benefit evaluation, various estimates of costs as wel as benefits expected from the system are to be made.

- Initial development cost
- Capital cost
- Annual operating cost
- Identification of cost and benefits
- Classification of cost and benefits
- Tangibility
- Capital budgeting models used in evaluation

Process Based evaluation:

Process based evaluation focuses at the effectiveness of the processes [sub processes] that make it. The IS sub process are plan process, development processes and use process.



Contribution to IS process effectiveness

SYSTEM MAINTENANCE:

The result obtained from the evaluation process help the organization to determine whether its information systems are effective and efficient or otherwise. As the organization are existing in dynamic and competitive environment, evaluation is a continuing activity.

On the basis of the provided by the evaluation process, the organization, in order to keep its MIS at the highest levels of effectiveness and efficiency, of course, within cost constraints, must respond by taking corrective action.

Corrective action may include removing errors which may be due to design, due to environmental changes or due to organizational changes, or due to changes while enhancing the existing system.

"The process of monitoring, evaluating and modifying of existing information systems to make required or desirable improvements may be termed as "system Maintenance".

System maintenance is an ongoing activity, which covers a wide variety of activities, including removing program and design errors, updating documentation and test data and updating user support for the purpose of convenience, maintenance may be categorized into three classes, namely:

(i) Corrective
(ii) Adaptive and
(iii) Perfective

(i) Corrective Maintenance: This type of maintenance implies removing errors in a program which might have crept in the system due to faulty design or wrong assumptions. Thus, in corrective maintenance processing or performance failures are repaired.

(ii) Adaptive Maintenance: In adaptive maintenance, program functions are changed to enable the information system to satisfy the information needs of the users.

➔ Change in the organizational procedures

➔ Change in organizational objectives, goals, policies etc.,
➔ Change in forms
➔ Change in information needs of managers
➔ Change in system controls and security needs etc.

(iii) Perfective Maintenance: Perfective maintenance means adding new programs or modifying the existing programs to enhance the performance of the information system. This type of maintenance is undertaken to respond to the user's additional needs which may be due to the changes within or outside of the organization. These environmental changes include:

- Changes like governmental policies, laws etc.,
- Economic and competitive conditions and
- New technology

IS SECURITY AND CONTROL:

Introduction:

IS security is not a new concept. It started from the day the first mainframe computer was developed. Even when the IS were not computer based, organizations, to keep the confidentiality of their data, used coded language in transmitting message with the invent of computers and telecommunication systems, organization have started using more and more computer based information system, especially the networked systems.

IS Security Threats:

Some of the major threats to the information system are categorized as follows:

- Human errors or failures
- Manipulation of data/ systems
- Theft of data/ system
- Destruction from virus
- Technical failure/ errors of system
- Natural disasters like flood, fire, earthquake etc.

PROTECTING INFORMATION SYSTEM:

Avoiding, reducing and or managing IS threats is one of the challenging tasks for any IS manager. To do so, organizations need to formulate the right protection strategies, policies and implement appropriate controls.

- ✶ IS strategies
- ✶ IS controls

IS Strategies:

- ✓ Preventive strategy
- ✓ Detection strategy
- ✓ Minimum losses strategy
- ✓ Recovery strategy
- ✓ Corrective action strategy

IS Controls:

The organization can plan and implement various kinds of IS controls so, as to avoid, reduce and manage the risks of the potential threats to information systems. These controls can be understood under the following five categories, namely:

(i) Physical control
(ii) Technical control
(iii) Administrative control
(iv) General control
(v) Application control

IS SECURITY TECHNOLOGY:

In order to protect the IS resources, organization implement a number of technical solution as security measures. The technical solution to be implemented depended upon the criticality or the value of the IS resources. There are some of the technical solutions, which are implemented as IS security measures.

- ❖ Firewall
- ❖ Proxy servers
- ❖ Authentication and data encryption
- ❖ Digital signature
- ❖ Digital certificates

FIREWALL: A firewall refers to a protection device that selectively discriminates against data flowing out or into the organization based on the pre defined rules. A firewall protects unauthorized access to IS over the Internet.

PROXY SERVERS: A proxy server, as the name implies, acts as a representative of the true server of an organization. It is another approach of IS security measures which performs actions on behalf of another system.

AUTHENTICATION AND DATA ENCRYPTION: It is important to prove the identity of the user as well as to authenticate the message sent by an individual or an organization. Authentication is the validation of a user's identity for the authorized access, a user is given a password or personal identification number, which is a private word or combination of character.

The encryption is used to change the message in coded into an unreadable form to an interrupter as encryption uses mathematical algorithms to jumble information (coded) to be transmitted over the network.

DIGITAL SIGNATURES: Digital signature, which are analogous to physical signature, are used to authenticate the identity of the sender of a message and also guarantee that the sent messages has not been modified.

DIGITAL CERTIFICATES: A digital certificate is an electronic documents, which is attached to the message certifying that the message is from the sender it claims to be from and has not been modified from the original format. The digital certificate associates one's identity with one's public key.

----------x---------

UNIT-4
BUILDING OF INFORMATION SYSTEMS

Introduction:

The system approach can be applied to the solution of many types of problems when this involves the development of information system solution to business problems it is called information system development or applications development.

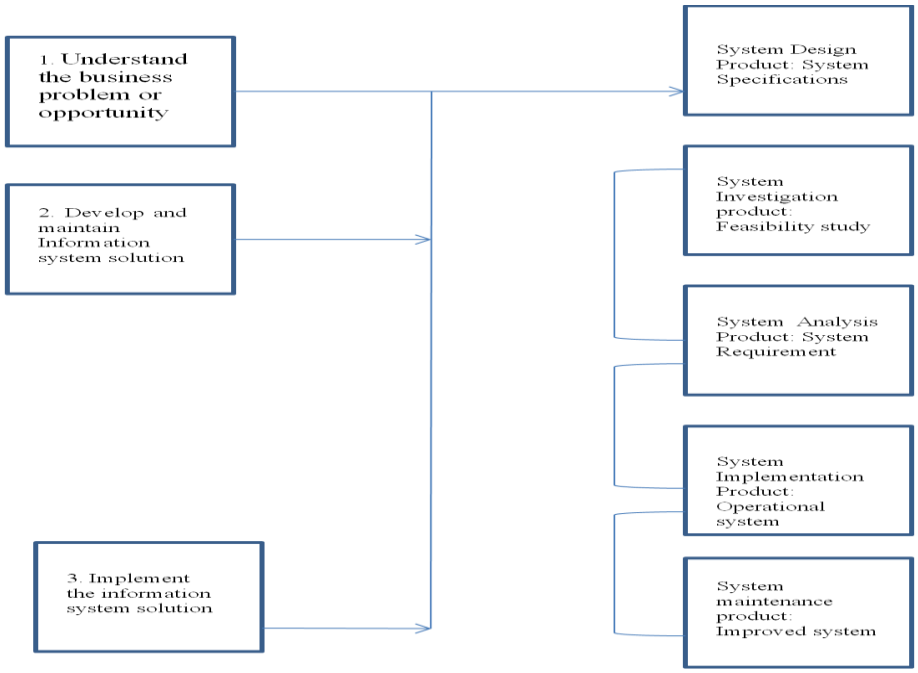
A system development project encompasses all the activities undertaken from the time at which a potential requirement is identified until the resulting system is fully implemented and accepted by the end user. The process can involve many stages over a long period.

- ➔ Understanding the problem
- ➔ Deciding a plan for a solution
- ➔ Coding the planned solution and
- ➔ Testing the coded program

SYSTEM DEVELOPMENT LIFE CYCLE [SDLC] SYSTEM LIFE CYCLE METHOD:

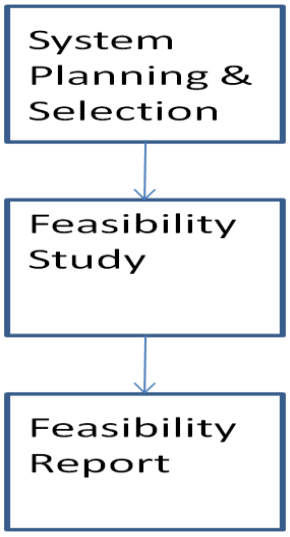
System approach is also used in the development of information systems which a multi step process is called the information System Development Cycle. IS are usually conceived, designed and implemented using a systematic development process in which end users and information specialists design information system base on an analysis of the information requirements of an organization.

Thus, a major part of this process is known as system analysis and design. When the systems approach is applied to the development of information system solution, a multi-step process or cycle emerges.



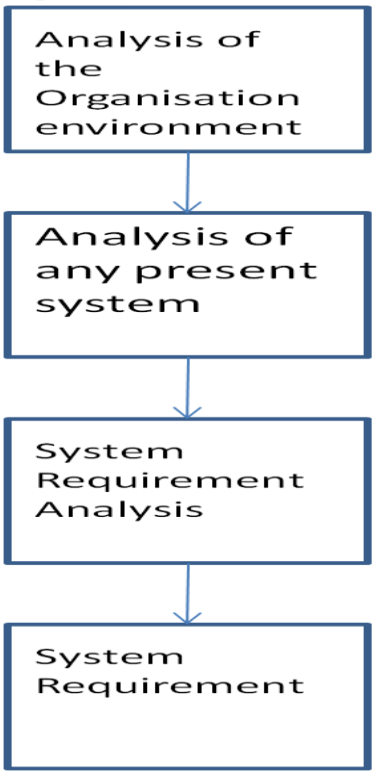
System Investigation: System investigation is the first step in the systems development process. This stage includes the screening, selection, and preliminary study of proposed information system solution to business problems.

Steps of system investigation:



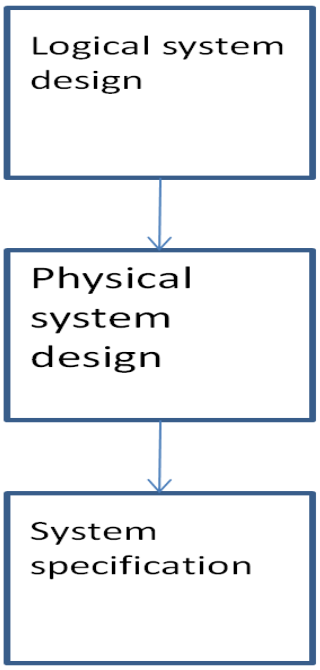
System Analysis: Analysis focuses on systems requirements specification and clarification and is the stage when system designers have to work at two levels of definition regarding the study of situational issues and possible solutions in terms of "what to do?' and "how to do".

Steps of system analysis:



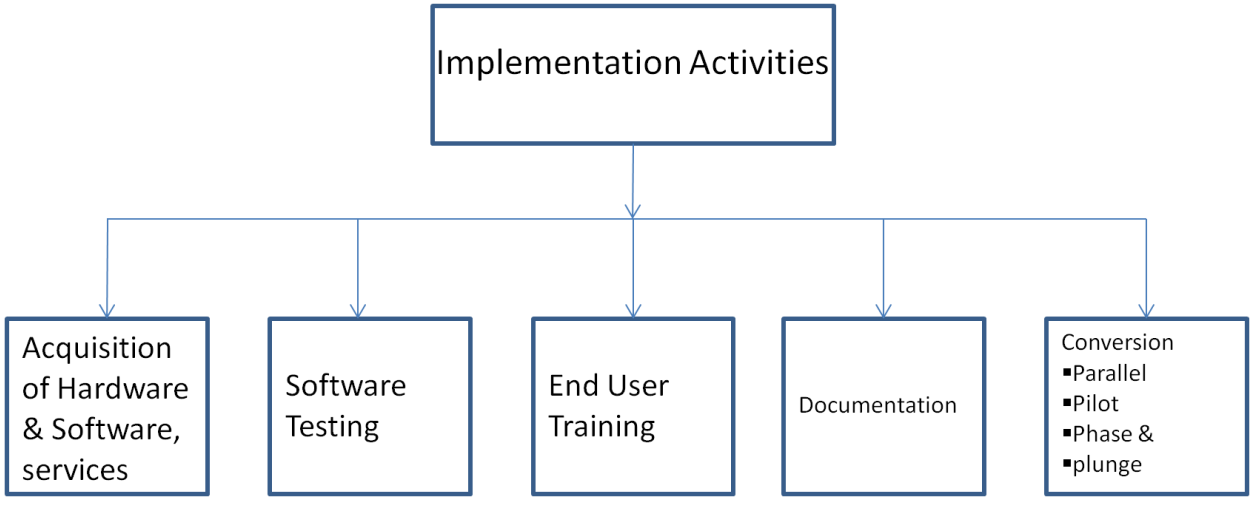
System design: System analysis describes what a system should do to meet the information needs of users. Systems design specifies how the system will accomplish this objectives.

Steps of system design:



System Implementation: The systems implementation stage involves hardware and software acquisition, software development, testing of programs and procedures, development of documentation and a variety of conversion alternatives.

Steps of system implementation:



Generally, System maintenance is performed for three reasons:

a. To correct errors
b. To keep system current
c. To improve the system

System maintenance may be under taken either by in-house maintenance team or the maintenance work can be assigned to the vendors or other system maintenance agencies.

System maintenance involved hardware maintenance and software maintenance:

Hardware Maintenance:

Hardware maintenance includes computer Hardware and its peripherals as well as network maintenance.

- Preventive maintenance
- Breakdown maintenance
- Replacement maintenance

Software Maintenance:

Software maintenance is more critical as compared to Hardware maintenance because there are many issue involved in software maintenance.

Software maintenance may be classified as:

- Corrective maintenance
- Adaptive maintenance
- Preventive maintenance

Advantages of SDLC:

a. Control
b. Accountability
c. Error detection
d. Systematic Approach
e. Formal documents & Procedures

Disadvantages of SDLC:

a. Inflexible
b. Time consuming
c. Lack of changes
d. Poor documentation
e. Implementation of user needs.

SYSTEM DEVELOPMENT APPROACHES:

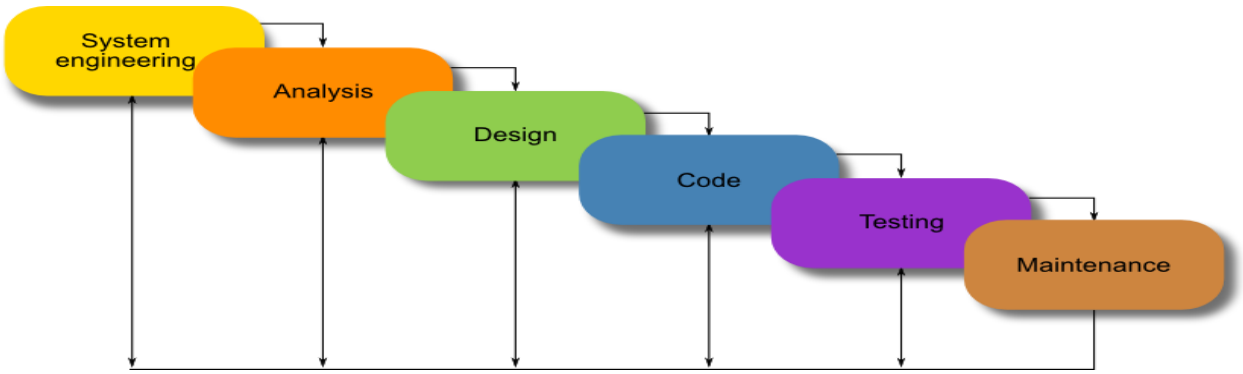
System development in general, is considered as a process consisting of various phases. In order to make sure that the systems are analysed and designed efficiently and effectively, it is essential to adopt a suitable model, for which a basic understanding of various system development approaches/ models currently in use, is a must. In a system development effort, the goal is to produce high quality software. As has already been discussed, the development process consists of various activities namely.

1. Investigation
2. Analysis
3. Design
4. Construction
5. Implementation
6. Maintenance

A system development model specifies how these activities are organized in the total system development effort.

WATERFALL MODEL:

Waterfall model also called as Classical Life Cycle Model, the Linear Sequential Model or Simply Waterfall model is a systematic, Sequential approval to Software development that begins at the system level and progresses through analysis, design, coding, testing and support. It follows the SDLC approach, became popular in 1970's.



WATERFALL MODEL

Advantages of Waterfall model:

- Enforced discipline through documents
  - ✓ No phase is complete until the documents are done and checked by SQA (Software Quality Assurance)
  - ✓ Concrete evidence of progress

- ✓ Makes which costly phase easier
- Testing is inherent in every phase
- Organized approach provides robust separation of phases.

Disadvantages of waterfall model:

- Waterfall model has limitations
- To set the objectives
- To state requirements explicitly
- To gather all the knowledge necessary for planning the entire project in the beginning.

PROTOTYPING:

In the prototyping approach, a prototype of the system is developed, instead of the complete system. A prototype is a comprehensive system and does not include all the requirements of the users. This model is based on the evolutionary method of system development.

Kinds of Prototypes:

1. Patched-up prototype
2. Non-operational prototype
3. First of a series prototype
4. Selected features prototype

1. Patched-up prototype: The first kind of prototyping has to do with constructing a system that works but is patched up or patched together. In engineering this approach is referred to as bread boarding: creating a patched-together, working model of an integrated circuit.

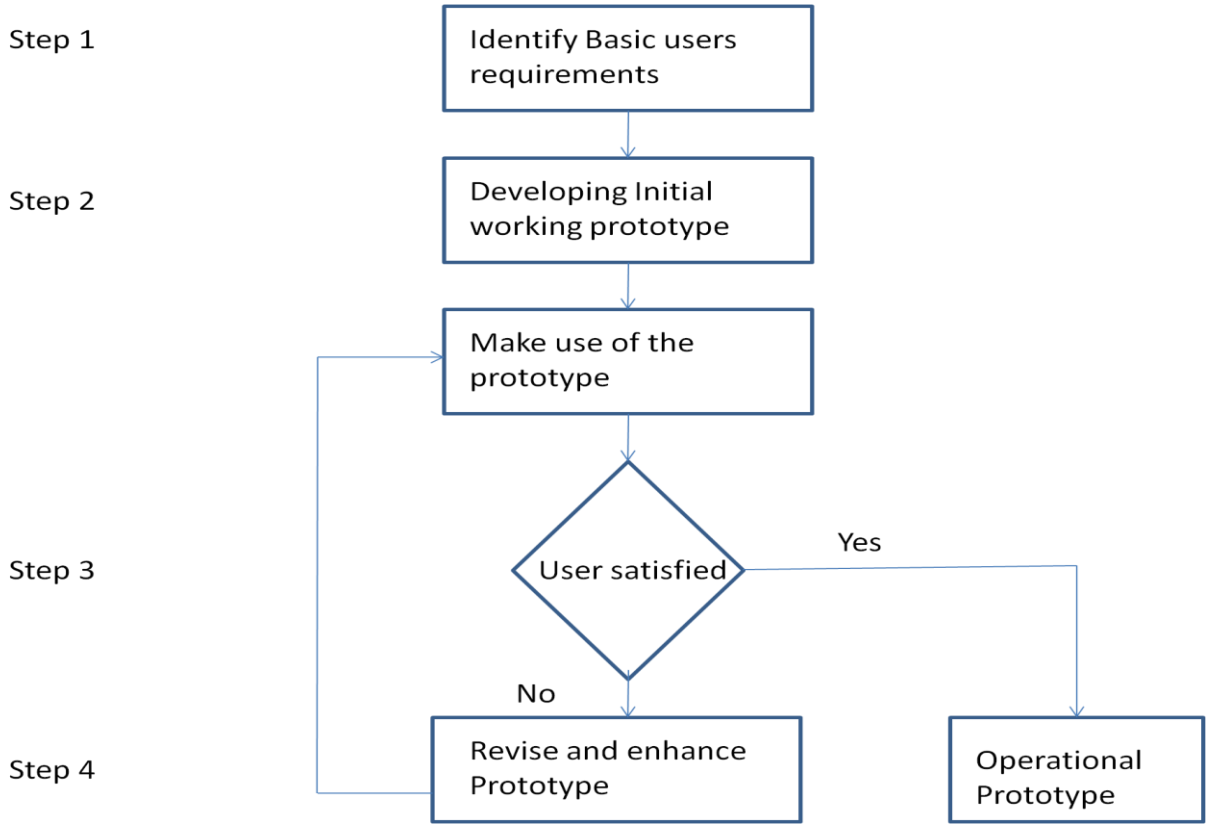
2. Non-operational prototype: The second conception of a prototype is that of a non-working scale model that is set up to test certain aspects of the design.

3. First of a series prototype: A third conception of prototyping involves creating a first full-scale model of a system, often called a pilot.

4. Selecting features prototype: A fourth conception of prototyping concern building an operational model that includes some of, but not all, the features that the final system will have. An analogy would be a new retail shopping mall that opens before the construction of all shops is completes.

PROTOTYPE PROCESS:

The various steps followed in prototyping are as follows:



Step 1: Identify the user's basic requirements: At this stage, the systems person works with the user to understand user's basic needs/ requirements and regards the output from the system.

Step 2: Develop the Initial/ working prototype: The systems person develops the initial working/ inter active prototype quickly, which meets the user's stated basic requirements.

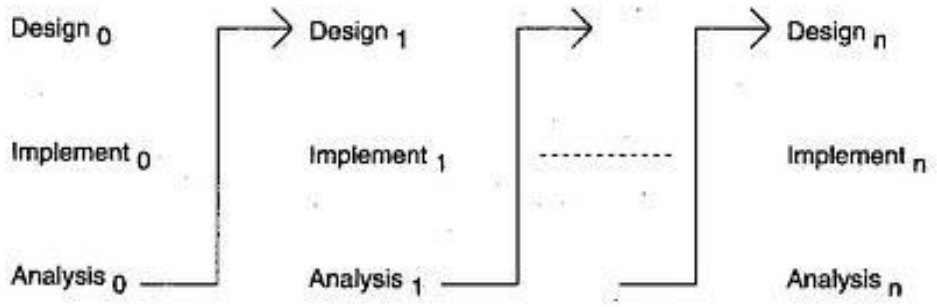
Step 3: Use the prototype for further refinements: This user has already received the initials prototype, which he now puts to use

Step 4; Revise and enhance Prototype: The system's person takes notice of the changes/ modification suggested by the user and revises, enhances and refines the prototype accordingly.

ITERATIVE ENHANCEMENT MODEL:

In an iterative enhancement model, the system is developed in increments and each increment adds some functional capabilities to the system, until the full system is developed. Additions and modifications can be done at each step. To begin with, only a subset of the overall problem is consider in developing the system.

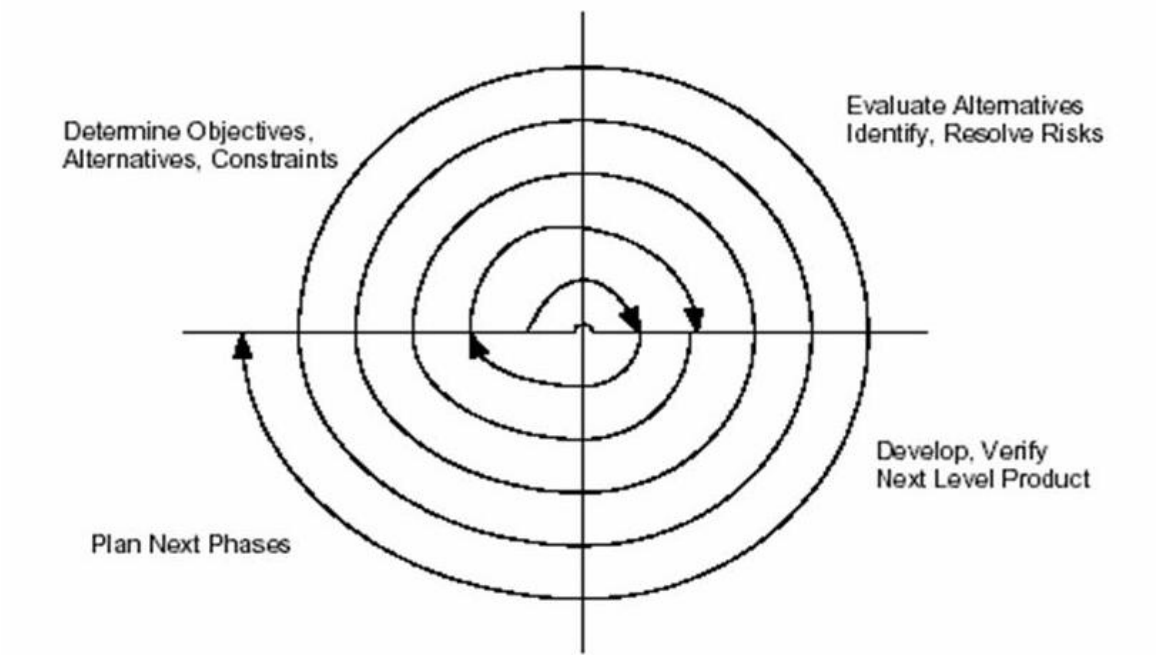
The iterative enhancement process model is understood t have only there phases, namely, analysis, implementation and design, as shown below.



SPIRAL MODEL

Spiral model combines of the waterfall life cycle and prototyping along with use of risk management technique. Barry Boehm has first described this model in 1986 "A Spiral Model of Software Development and Enhancement". Boehm proposed spiral model where each round of spiral.

- ✓ Identifies the sub problem which has the highest risk associated with it and finds a solution for that problem.
- ✓ Spiral model is a risk avoidance driven than document driven.
- ✓ Software engineering team moves around the spiral in clock wise direction beginning at centre
- ✓ Each loop represents the phase of the software process
- ✓ Inner most loop represent feasibility study.
- ✓ Next loop will be design phase
- ✓ In spiral model number of phases which the product is developed is not fixed, because design may under 3 or 4 loops (or) might be over in just one loop



Quadrants of spiral model:

In spiral model, each phase is split into four quadrants. In this quadrant we identify the objectives, alternatives, constraints of the phase.

Q1: In this quadrant the evaluate of different alternatives based on objectives and constraints and risk perception of the project.

Q2: It emphasizes on development strategies that resolve the uncertainties and risks

Q3: Reviewing the results of the phase and planning the next iteration around the spiral is covered in this quadrant

Q4: Finally spiral models is used for highly risky projects, by using risk reduction mechanism and following systematic sequential waterfall and iterative model.

SYSTEM ANALYSIS AND DESIGN:

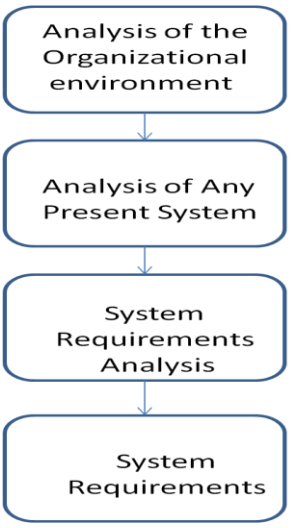
System Analysis: Analysis focuses on systems' requirements specification and clarification and is the stage when system designers have to work at two levels of definition regarding the study of situational issues and possible solution in terms of " how to do". It is actually the analysis of the role of a proposed system and the identification of the requirements that it should meet. It is the

analysis of requirements of a task and the expression of those requirements in a form that permits the assembly of computer hardware and software to perform the task.

General Definition

"System Analysis is a systematic investigation of a real or planned system to determine the functions of the system and how they relate to each other and to any other system".

Steps of system Analysis:



- ✓ Analyze in detail the information needs of an end user organization and its subsystem and environment systems.
- ✓ Analyze the resources, products, and activities of any information systems presently used.
- ✓ Determine the information system capabilities that will meet the information needs of end users.
- ✓ Document and communicate the logical input, processing, output storage, and control requirements of a proposed new or improved information system.

Analysis of the Organizational Environment: An organizational environment analysis is an important first step in systems analysis. How can you improve an information system if you know very little about the organizational environment in which that system is located?

Analysis of the Present System: Before you design a new system, it is important to study the system that will be improved or replaced.

System Requirements Analysis: This is one of the most difficult steps of the system. In it you must try first to determine your specific information needs.

System Requirement: The following are the few example of system requirement:

i) Input requirements
ii) Output requirements
iii) Processing requirement
iv) Storage requirement
v) Control requirement

SYSTEM DESIGN:

System analysis describes what a system should do to meet the information needs of users. System design specifies how the system will accomplish this objective.

System design consists of both logical design and physical design activities, which both produce system specification satisfying the system requirements developed in the systems analysis stage.

REQUIREMENTS DETERMINATION

Requirement determination, which is also termed as a part of Software Requirement Specification (SRS) is the starting point of the system development activity. This activity is considered as the most difficult and also the most error-prone activity because of the communication gap between the user and the developer. This may be because the user usually does not understand software and the developer often does not understand the user's problem and application area. The requirement determination is a means of translating the ideas given by the user, into a formal document, and thus to bridge the communication gap. A good SRS provides the following benefits:

(i) It bridges the communication gap between the user and the developer by acting as a basis of agreement between the two parties

(ii) it reduces the development cost by overcoming errors and misunderstandings early in the development

(iii) it becomes a basis of references for validation of the final product and thus acts as a benchmark.

Requirement determination consists of three activities, namely, requirement anticipation, requirement investigation and requirement specification. Requirement anticipation activities include the past experience of the analysis, which influence the study. Requirement investigation is at the centre of system analysis. In the Requirement specification activities, the data produced during the fact-finding investigation is analysed to determine requirement specification, which is the description of the features for a proposed system.

STRATEGIES FOR REQUIREMENT DETERMINATION

Collection of information is at the core of systems analysis. Information requirement determination (IRD) is frequently and convincingly presented as the most critical phase of information system (IS) development, and many IS failures have been attributed to incomplete and inaccurate information requirements. [13] System analysts must collect the information about the current system and how users would like to improve their performance with new information system. Accurately understanding the users' requirements will help the system developing team deliver a proper system to the end users in limited time and limited budget. If user just wants an "ant", definitely, an "elephant" is improper. There are many methods to collect information. This article will discuss some basic and widely adopted ones of them.

Interviewing is one of the primary ways to gather information about an information system. A good system analyst must be good at interviewing and no project can be conduct without interviewing. There are many ways to arrange an effectively interview and no one is superior to others. However, experience analysts commonly accept some following best practices for an effective interview:

- Prepare the interview carefully, including appointment, priming question, checklist, agenda, and questions.
- Listen carefully and take note during the interview (tape record if possible)
- Review notes within 48 hours after interview
- Be neutral
- Seek diverse views

Questionnaires have the advantage of gathering information from many people in a relatively short time and of being less biased in the interpretation of their results. Choosing right questionnaires respondents and designing effective questionnaires are the critical issues in this information collection method. People usually are only use a part of functions of a system, so they are always just familiar with a part of the system functions or processes. In most situations, one copy of questionnaires obviously cannot fit to all the users. To conduct an effective survey, the analyst should group the users properly and design different questionnaires for different group. Moreover, the ability to build good questionnaires is a skill that improves with practice and experience. When designing questionnaires, the analyst should concern the following issues at least:

- The ambiguity of questions.
- Consistence of respondents' answers.
- What kind of question should be applied, open-ended or close-ended?
- What is the proper length of the questionnaires?

The third one is **directly observing users**. People are not always very reliable informants, even when they try to be reliable and tell what they think is the truth. People often do not have a completely accurate appreciation of what they do or how they do it. This I especially true concerning infrequent events, issues from the past, or issues for which people have considerable passion. Since people cannot always be trusted to reliably interpret and report their own actions, analyst can supplement and corroborate what people say by watching what they do or by obtaining relatively objective measures of how people behave in work situation. However, observation can cause people to change their normal operation behavior. It will make the gathered information biased.

The fourth one is **analyzing procedures and other documents**. By examining existing system and organizational documentation, system analyst can find out details about current system and the organization these systems support. In documents analyst can find information, such as problem with existing systems, opportunities to meet new needs if only certain information or information processing were available, organizational direction that can influence information system requirements, and the reason why current systems are designed as they are, etc.

However, when analyzing those official documentations, analysts should pay attention to the difference between the systems described on the official documentations and the practical systems in real world. For the reason of inadequacies of formal procedures, individual work habits and preferences, resistance to control, and other factors, the difference between so called formal system and informal system universally exists.

The fifth one is **Joint Application Design (JAD)**. JAD is a facilitated, team-based approach for defining the requirements for new or modified information systems. JAD is started at IBM in the late 1970s. The main idea behind JAD is to bring together the key users, managers, and system analysts involved in the analysis of a current system. The primary purpose of using JAD in the analysis phase is to collect systems requirements simultaneously from the key people involved with the system. The result is an intense and structured, but highly effective, process. Having all the key people together in one place at one time allows analysts to see where there are areas of agreement and where there are conflicts.

The typical participants in a JAD are: JAD session leader, end users, business managers, sponsor, system analysts, IS staff, scribe, etc. The JAD team is a group of from six to sixteen individual who all have a stake in designing a high quality system. Approximately two thirds of the group members are functional experts the other one third are systems professionals. JAD sessions are usually conducted in a location other than the place where the people involved normally work, and are usually held in special purpose rooms where participants sit around horseshoe-shaped tables. Involving so many different kinds of people in one workshop makes how to effectively and efficiently organize the JAD session a big challenge.

When a JAD is completed, the final result is a set of documents that detail the workings of the current system related to study of a replacement system. These requirements definition document generally includes business activity model and definitions, data model and definition, data input and output requirements. It may also include interface requirements, screen and report layouts, ad hoc query specifications, menus, and security requirements. When used at a later point in the system development life cycle, a JAD session can also be used to refine a system prototype, develop new job profiles for system users, or develop an implementation plan.

However, to exploit full potential of JAD, the groupware tools should be applied in JAD workshop sessions. The use of groupware tools to support the joint Application Development technique increases the value of this technique dramatically. When groupware tools are used in an automated JAD workshop, they greatly facilitate the generation, analysis, and documentation of information. This is particularly valuable for JAD workshops conducted to define and build consensus on the requirements for new systems.

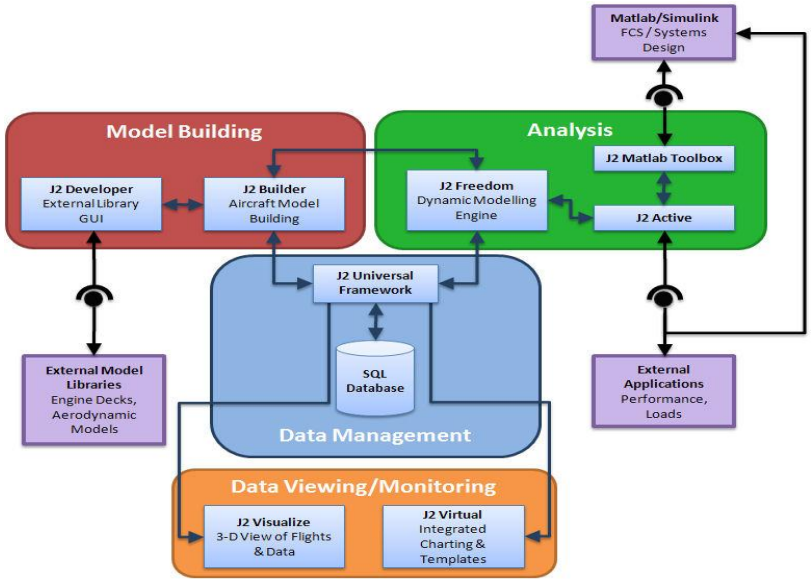
The Sixth one is **Prototyping**. Prototyping is a means of exploring ideas before you invest in them. Most system developers believe that the benefits from early usability data are at least ten times greater than those from late usability data. Prototyping allow system analysts quickly show users the basic requirement into a working version of the desired information system. After viewing and testing the prototype, the users usually adjust existing requirements to new ones. The goal with using prototyping to support requirement determination is to develop concrete specification for the ultimate system, not to

build the ultimate system from prototyping. Prototyping is most useful for requirements determination when user requirements are not clear or well understood, one or a few users and other stakeholders are involved with the system, possible designs are complex and require concrete form to fully evaluate, communication problems have existed in the past between users and analysts, and Tools and data are readily available to rapidly build working systems, etc.

When adopting prototyping, analysts should concern about the potential problems about this requirements determination method, such as informal documentation, ignored subtle but important requirements, etc.

When we choose requirements determination method for a specific project, there seven characters of them we should consider. They are Information Richness, Time Required, Expense, Chance for Follow-up and probing, Confidentiality, Involvement of Subject, Potential Audience.

SYSTEM DESIGN-DESIGN OBJECTIVES



Systems design implies a systematic approach to the design of a system. It may take a bottom-up or top-down approach, but either way the process is systematic wherein it takes into account all related variables of the system that needs to be created—from the architecture, to the required hardware and software, right down to the data and how it travels and transforms throughout its travel through the system. Systems design then overlaps with systems analysis, systems engineering and systems architecture.

The systems design approach first appeared right before World War II, when engineers were trying to solve complex control and communications problems. They needed to be able to standardize their work into a formal discipline with proper methods, especially for new fields like information theory, operations research and computer science in general.

Definition:

"Systems design is the process of defining the architecture, components, modules, interfaces, and data for a **system** to satisfy specified requirements. **Systems design** could be seen as the application of **systems** theory to product development".

Design Objectives:

Each design objective described herein is significantly important, yet it is just one aspect of what it takes to achieve a successful project. A truly successful project is one where project goals are identified early on and where the interdependencies of all building systems are coordinated concurrently from the planning and programming phase. Further, all WBDG design objectives: accessible, aesthetics, cost effective, functional/operational, historic preservation, productive, secure/safe, and sustainable and their interrelationships must be understood, evaluated, and appropriately applied. Each of these design objectives is presented in the context of the others throughout the WBDG web site.

A system is designed with the following main objectives:

- ***Practicality***: The system should be designed in such a way that it may be learnt and operated with ease by the users. Thus, the design should be user-oriented.
- ***Flexibility***: The business organization are dynamic in nature. Therefore, a system must be responsive to the change inevitably requested by its users.
- ***Efficiency***: A system must be efficient, i.e., it should perform jobs within their specified time. The efficiency of a system may be measured in terms of the following parameters.
  - ✶ Throughput: It is the ability to handle a specified number of jobs per unit of time
  - ✶ Response time: The ability to respond to a request made by the user within a given time limit.
  - ✶ Run time: It is the ability to undertake the complete job within a given time limit.
- ***Security***: This aspect relates to hardware reliability security of data and the detection and prevention of fraud and abuse of data.

CONCEPTUAL DESIGN:

It is in the conceptual design stages that alternative overall MIS design are conceived and the best one is selected by the system analyst in consultation with the top management. In the conceptual design, the feasibility of meeting the management objectives for the MIS is assessed and a broad-brush picture of the system is painted. In other words, a conceptual design is a prerequisite for the detailed design. Conceptual design involves the following steps:

(i) Define problem

(ii) Set system objectives

(iii) Identify constraints
(iv) Determine information needs
(v) Determine information sources
(vi) Develop various design
(vii) Document the conceptual design
(viii) Prepare report

DESIGN METHODS

There are a number of methods for designing information systems, following is a brief description of some of the popular methods.

Problem partitioning: The method is based on the principle of 'divide and conquer'. In this method, instead of solving the entire problem at once, the problem is divided into small manageable parts (modules) that can be solved separately. This problem partitioning method aims at reducing complexity because each module can be developed, coded and tested relatively independently of the other.

Structured Design: In this method, a structured chart is created, which can be used to implement the system. The chart depicts modules defining each module by the specific function. The aim is to produce a structure where the modules have minimum dependence on each other; and have a high level of cohesion, meaning all the statements within a module are functionally related.

Top-down design: The top-down design is based on the concept of a system which suggests that a system consists of sub-system, which have sub-systems of their own. In other words, a system may be termed as a hierarchy of sub-systems, the highest level sub-system corresponding to the total system.

DETAILED SYSTEM DESIGN

Conceptual design in itself is not the end of the design process; rather it serves as a basis for the detailed MIS design. The performance requirements specified by the conceptual design become inputs to the detailed design phase, in which these are further refined, detailed and finalized to be called the system specifications. Thus the main objectives of the detailed system design is to prepare a blue print of a system that meets the goals of the conceptual system design requirements. Detailed system design involves the following phases:

(i) Project planning and control
(ii) Involve the user
(iii) Define the detailed sub-system
(iv) Input/output design
(v) Feedback from the user

(vi) Database design
(vii) Procedure design
(viii) Design documentation
----------x----------

UNIT-V

INTRODUCTION TO CYBER CRIME

Introduction:

Cybercrime is defined as a crime in which a computer is the object of the crime (hacking, phishing, spamming) or is used as a tool to commit an offense (child pornography, hate crimes). Cybercriminals may use computer technology to access personal information, business trade secrets, or use the internet for exploitive or malicious purposes. Criminals can also use computers for communication and document or data storage. Criminals who perform these illegal activities are often referred to as hackers. Cybercrime may also be referred to as computer crime.

Common types of cybercrime include online bank information theft, identity theft, online predatory crimes and unauthorized computer access. More serious crimes like cyber terrorism are also of significant concern.

Cybercrime encompasses a wide range of activities, but these can generally be broken into two categories:

- Crimes that target computer networks or devices. These types of crimes include viruses and denial-of-service (DoS) attacks.
- Crimes that use computer networks to advance other criminal activities. These types of crimes include cyberstalking, phishing and fraud or identity theft.

The FBI identifies cybercrime fugitives who have allegedly committed bank fraud and trafficked counterfeit devices that access personal electronic information. The FBI also provides information on how to report cybercrimes, as well as useful intelligence information about the latest cybercriminals.
The FBI identifies cybercrime fugitives who have allegedly committed bank fraud and trafficked counterfeit devices that access personal electronic information. The FBI also provides information on how to report cybercrimes, as well as useful intelligence information about the latest cybercriminals.

Types of cyber-crimes:

1) Cyber space
2) Cyber squatting
3) Cyber punk and cyber warfare
4) Cyber terrorism

Cyber space:

The term cyber space is introduced by William Gibson.it is a world-wide network of computers that uses internet for communication, transmission and exchange of data,chatting,exploring,research and play.

Typically, cyber space is aunformulated place where humans interact over internet, the cyber space employs TCP/IP protocol

Cyber-squatting:

Cyber-squatting is a type of crime where in the hackers register sells and uses domain name of some company with the aim of gaining profit from the goodwill of its trademark.

It is the practice of buying the "domain names" of popular business names with the internet of selling it to the actual owner to earn profit.

Cyber punk and cyber warfare:

In terms of technology the cyber punk is coined as ‘cyber’ and ‘punk’.It signifies two primary aspects of cyber punk i.e., technology and individualism, but typically it signifies machine/computer rebel movement. The purpose of referring it as a cyber punk is to specify the side by side position of punk attitude and hightechnology.

Cyber warfare refers to a conflict based on internet. It includes malicious attacks on information and information systems. The cyber warfare attacks are capable of disabling official websites and networks and disrupting essential services.

Cyber Terrorism:

Cyber terrorism is an internet based attacks in terrorist activities.It is a controversial term and is referred to as a deliberate usage of computer networks and public internet in order to effect the personal objectives by using tools such as computer virus. These objectives include political or ideological in the form of terrorism.

Origins of the word cyber-crime:

Cybercrime is criminal activity done using computers and internet. This includes anything from downloading illegal music files to stealing millions of dollars from online bank accounts. Cybercrime also includes non-monetary offenses, such as creating and distributing viruses on other computers or posting confidential business information on the internet.

History of Cyber-crime:

The first recorded cyber-crime took place in the year 1820! That is not surprising considering the fact that the abacus, which is thought to be the earliest form of a computer, has been around since 3500 B.C. in India, Japan and China. The era of modern computers, however, began with the analytical engine of Charles Babbage.

In 1820, Joseph-Marie Jacquard, a textile manufacturer in France, produced the loom. This device allowed the repetition of a series of steps in the weaving of special fabrics. This resulted in a fear amongst Jacquard's employees that their traditional employment and livelihood were being threatened. They committed acts of sabotage to discourage Jacquard from further use of the new technology. This is the first recorded cybercrime!

Today computers have come a long way, with neural networks and Nano-computing promising to turn every atom in a glass of water into a computer capable of performing a Billion operations per second.

Cyber-crime is an evil having its origin in the growing dependence on computers in modern life. In a day and age when everything from microwave ovens and refrigerators to nuclear power plants is being run on computers, cybercrime has assumed rather sinister implications.

Major cyber-crimes in the recent past include the Citibank rip off. US $ 10 million were fraudulently transferred out of the bank and into a bank account in Switzerland. A Russian hacker group led by Vladimir Kevin, a renowned hacker, perpetrated the attack. The group compromised the bank's security systems. Vladimir was allegedly using his office computer at AO Saturn, a computer firm in St. Petersburg, Russia, to break into Citibank computers. He was finally arrested on Heathrow airport on his way to Switzerland

Cybercrime and Information Security:

Information security, sometimes shortened to **InfoSec**, is the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording or destruction of information. It is a general term that can be used regardless of the form the data may take (e.g. electronic, physical).

IT security:

Sometimes referred to as computer security, information technology security is information security applied to technology (most often some form of computer system). It is worthwhile to note that a computer does not necessarily mean a home desktop. A computer is any device with a processor and some memory. Such devices can range from non-networked standalone devices as simple as calculators, to networked mobile computing devices such as smartphones and tablet computers. IT security specialists are almost always found in any major enterprise/establishment due to the nature and value of the data within larger businesses. They are responsible for keeping all of the technology within the company secure from malicious cyber-attacks that often attempt to breach into critical private information or gain control of the internal systems.

Information assurance:

The act of providing trust of the information, that the Confidentiality, Integrity and Availability (CIA) of the information are not violated, e.g. ensuring that data is not lost when critical issues arise. These issues include, but are not limited to: natural disasters, computer/server malfunction or physical theft. Since most information is stored on computers in our modern era, information assurance is typically dealt with by IT security specialists. A common method of providing information assurance is to have an off-site backup of the data in case one of the mentioned issues arise.

Threats:

Information security threats come in many different forms. Some of the most common threats today are software attacks, theft of intellectual property, identity theft, theft of equipment or information, sabotage, and information extortion. Most people have experienced software attacks of some sort. Viruses,[2] worms, phishing attacks, and Trojan horses are a few common examples of software attacks. The theft of intellectual property has also been an extensive issue for many businesses in the IT field. Identity theft is the attempt to act as someone else usually to obtain that person's personal information or to take advantage of their access to vital information. Theft of equipment or information is becoming more prevalent today due to the fact that most devices today are mobile. Cell phones are prone to theft, and have also become far more desirable as the

amount of data capacity increases. Sabotage usually consists of the destruction of an organization′s website in an attempt to cause loss of confidence on the part of its customers. Information extortion consists of theft of a company′s property or information as an attempt to receive a payment in exchange for returning the information or property back to its owner, as with ransomware. There are many ways to help protect yourself from some of these attacks but one of the most functional precautions is user carefulness.

WHO ARE CYBER CRIMINALS?

A cybercriminal is an individual who commits cybercrimes, where he/she makes use of the computer either as a tool or as a target or as both.

Cybercriminals use computers in three broad ways:

- Select computer as their target: These criminals attack other people's computers to perform malicious activities, such as spreading viruses, data theft, identity theft, etc.
- Uses computer as their weapon: They use the computer to carry out "conventional crime", such as spam, fraud, illegal gambling, etc.
- Uses computer as their accessory: They use the computer to save stolen or illegal data.

Cybercriminals often work in organized groups. Some cybercriminal roles are:

- Programmers: Write code or programs used by cybercriminal organization
- Distributors: Distribute and sell stolen data and goods from associated cybercriminals
- IT experts: Maintain a cybercriminal organization's IT infrastructure, such as servers, encryption technologies and databases
- Hackers: Exploit systems, applications and network vulnerabilities
- Fraudsters: Create and deploy schemes like spam and phishing
- System hosts and providers: Host sites and servers that possess illegal contents
- Cashiers: Provide account names to cybercriminals and control drop accounts
- Money mules: Manage bank account wire transfers
- Tellers: Transfer and launder illegal money via digital and foreign exchange methods
- Leaders: Often connected to big bosses of large criminal organizations. Assemble and direct cybercriminal teams, and usually lack technical knowledge.

Clearly, there is much overlap between roles, but as cybercrime becomes a greater issue, more specialization is being seen as organized crime gets in the picture. For example, hackers were once more often than not hobbyists who broke into systems for personal gratification. While white-hat hacking hasn't disappeared, it's much more common now to see hackers as professionals who sell their services to the highest bidder.

CLASSIFICATION OF CYBER CRIMINALS:

When any crime is committed over the Internet it is referred to as a cyber crime. There are many types of cyber crimes and the most common ones are explained below:

Hacking: This is a type of crime wherein a person’s computer is broken into so that his personal or sensitive information can be accessed. In the United States, hacking is classified as a felony and punishable as such. This is different from ethical hacking, which many organizations use to check their Internet security protection.

In hacking, the criminal uses a variety of software to enter a person's computer and the person may not be aware that his computer is being accessed from a remote location.

Theft: This crime occurs when a person violates copyrights and downloads music, movies, games and software. There are even peer sharing websites which encourage software piracy and many of these websites are now being targeted by the FBI. Today, the justice system is addressing this cyber crime and there are laws that prevent people from illegal downloading.

Cyber Stalking: This is a kind of online harassment wherein the victim is subjected to a barrage of online messages and emails. Typically, these stalkers know their victims and instead of resorting to offline stalking, they use the Internet to stalk. However, if they notice that cyber stalking is not having the desired effect, they begin offline stalking along with cyber stalking to make the victims' lives more miserable.

Identity Theft: This has become a major problem with people using the Internet for cash transactions and banking services. In this cyber crime, a criminal accesses data about a person's bank account, credit cards, Social Security, debit card and other sensitive information to siphon money or to buy things online in the victim's name. It can result in major financial losses for the victim and even spoil the victim's credit history.

Malicious Software: These are Internet-based software or programs that are used to disrupt a network. The software is used to gain access to a system to steal sensitive information or data or causing damage to software present in the system.

Child soliciting and Abuse: This is also a type of cyber crime wherein criminals solicit minors via chat rooms for the purpose of child pornography. The FBI has been spending a lot of time monitoring chat rooms frequented by children with the hopes of reducing and preventing child abuse and soliciting.

Causes of Cyber Crime:

Wherever the rate of return on investment is high and the risk is low, you are bound to find people willing to take advantage of the situation. This is exactly what happens in cyber crime. Accessing sensitive information and data and using it means a rich harvest of returns and catching such criminals is difficult. Hence, this has led to a rise in cyber crime across the world.

Categories of Cyber Crime

Cyber crimes are broadly categorized into three categories, namely crime against

1. Individual
2. Property
3. Government

Each category can use a variety of methods and the methods used vary from one criminal to another.

Individual: This type of cybercrime can be in the form of cyber stalking, distributing pornography, trafficking and "grooming". Today, law enforcement agencies are taking this category of cyber crime very seriously and are joining forces internationally to reach and arrest the perpetrators.

Property: Just like in the real world where a criminal can steal and rob, even in the cyber world criminals resort to stealing and robbing. In this case, they can steal a person's bank details and siphon off money; misuse the credit card to make numerous purchases online; run a scam to get naïve people to part with their hard earned money; use malicious software to gain access to an organization's website or disrupt the systems of the organization. The malicious software can also damage software and hardware, just like vandals damage property in the offline world.

Government: Although not as common as the other two categories, crimes against a government are referred to as cyber terrorism. If successful, this category can wreak havoc and cause panic amongst the civilian population. In this category, criminals hack government websites, military websites or circulate propaganda. The perpetrators can be terrorist outfits or unfriendly governments of other nations.

CYBERCRIME: LEGAL PERSPECTIVES

According to Indian legal perspective a computer crime can be defined as "any illicit act which requires computer knowledge to conduct criminal proceedings in court against the person" and according to international legal perspective, a computer crime can be defined as "any illicit act which requires computer knowledge for carrying out illegal action".

Cybercrime is the result of globalization. Globalization do not refer to wellness of the people of the world bit it means that large number of offenses and crimes from around the world is considered in globalized information systems. Crimes related to computer network are one of the serious problems of the current world and could be the most dangerous threats of the future. This threat can be resolved by adopting two ways.one method is to classify information systems into segments which are outlined by state boundaries. The second method is to employ legal system in order to make it as a single entity by removing all the state boundaries.

The first method is not practical because separating information systems is not adapted in this world. Whereas the second method is also impractical because an entity without a boundary is not considered like a country.

CYBERCRIME: AN INDIAN PERSPECTIVE

India is placed at the fourth position in the world for its vast number of internet users. Based on the statistics, 45million people are using the internet. In this,57% of the Indian people who are using the internet are in the range of 18 to 35 years,35% if all the internet is used from cybercafés only. Based on the information technology(IT) Act, cybercrime has increased to the 50% in the period 2006-2007.People under 30 years are the offenders of the cybercrime. Most of the cases of cybercrime are based on cyber pornography and hacking. Basedon "crime in 2007" report given by National crime record Bureau (NCRB), 60% of the people are under 18 to 30 years.

The Indian Government is doing its best to control cybercrimes. For example, Delhi police have now trained 100 of its officers in handling cybercrime and placed them in its Economic offences wing. As at the time of writing this, the officers were trained for 6 weeks in computer hardware and software, computer networks comprising data communication networks protocols, wireless networks and network security.

The Government of India is trying to control the cybercrime at its level best.

GLOBAL PERSPECTIVE ON GLOBAL CRIME

The enhancement are made by a legislature globally and expressed in a formal document for cybercrimes. There are some laws which are described in Australia according to cybercrime Act 2001 which shows details about computer frauds and data.

Globally, cybercrime has been taken seriously. In Council of Europe's COE's cybercrime can be defined as an umbrella which includes cybercrime activities such as copyright offenses and computer-related offenses.

Cybercrime does not include general offenses of information and communication Technology (ICT) dependent crimes such as economic crime and white-collar crime. There are many countries who have enacted laws foe E-mail spam legislation. However, in case of India there are still no legislation but it has not shown any significant effect on the increased number of spammers who are sending spams to millions of users every day.

INDIAN INFORMATION TECHNOLOGY ACT 2000

The Indian Information Technology act was introduced in the year 2000 for providing legal recognition for all the business activities taking place in cyberspace electronically through electronic sources such as internet and networks. It also helps in the electronic filling of documents with government agencies. Indian information technology act also aimed at amending the provisions of Indian penal code (IPC), the Indian Evidence Act,1872 the banker's books Evidence Act,1891, the reserve bank of India Act 1934 and the related matters.

Information Technology Act 2000 in India has been passed after the resolution of united nation general assembly on January 30th in the year 1997.united nation had adopted the model law on electronic commerce for this purpose on international trade law. This is the first step at national level in order to regulate an alternative for commerce and also to offer an legal status in E-commerce field. It has been passed by considering the UNICITRAL model of law on E-commerce.

In India, cybercrimes are considered offense under two acts,

1) ITA 2000
2) IPC

There are various chapters containing sections that show the penalties for committing offence and other rules under Indian ITA 2000.The following are the description of sections 65,66,6,71,72,73 and 74 in pertaining to cybercrime in legal context.

1) Section 65: Tampering with computer source documents.
2) Section 66: computer related offences
3) Section 67: Punishment for publishing or transmitting obscene material in electronic form
4) Section 71: Penalty for misrepresentation
5) Section 72: Penalty for Breach of confidentiality and privacy
6) Section 73: Penalty for publishing digital signature certificate false in certain particulars
7) Section 74: Publication for fraudulent purpose.

CYBERCRIME ERA

The cybercrime era is an organized crime in which huge amount of personal data is stealed.The present cybercrime era is not dominated by the hackers who access any computer systems for notorious actions. The criminal landscape has been changed because of the rapid growth in digital

economy. The digital networks have become attractive for various cybercriminals due to the combination of high rewards with the low risks.

Cybercrime is becoming global in this era.In addition to this attackers are also becoming specialized and are concentrating the specific criminal exploits. But others are concentrating on offering the support capabilities which are designed as crime-as-a-service (CAAS).

The criminal groups at present can be benefited from the national jurisdictions which do have any legal frameworks or technical capabilities for fighting against cybercrime. It has become a global act and profit driven industry with fast expanding capability in order to perform illegal actions.

In order to fight against these, the organizations need to think globally and take actions locally. They need to gain knowledge about the scope and sophistication of attackers and how to minimize the attacks.