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**1: INTRODUCTION TO INFORMATION SYSTEMS**

The term “system” originates from the Greek term systema, which means to “place together.” Multiple business and engineering domains have definitions of a system. This text defines a system as: ***System An integrated set of interoperable elements, each with explicitly specified and bounded capabilities, working synergistically to perform value-added processing to enable a User to satisfy mission-oriented operational needs in a prescribed operating environment with a specified outcome and probability of success***.

**1.1 SYSTEM DEFINITION RATIONALE**

The definition above captures a number of key discussion points about systems.

* By *“an integrated set,”* means that a system, by definition, is composed of hierarchical levels of physical elements, entities, or components.
* By *“interoperable elements,”* we mean that elements within the system’s structure must be compatible with each other in form, fit, and function,
* By each element having *“explicitly specified and bounded capabilities,”* means that every element should work to accomplish some higher level goal or purposeful mission. System element contributions to the overall system performance must be explicitly specified. This requires that operational and functional performance capabilities for each system element be identified and explicitly bounded to a level of specificity that allows the element to be analyzed, designed, developed, tested, verified, and validated—either on a stand-alone basis or as part of the integrated system.
* By *“working in synergistically,”* means that the purpose of integrating the set of elements is to leverage the capabilities of individual element capabilities to accomplish a higher level capability that cannot be achieved as stand-alone elements.
* By *“value-added processing,”* means that factors such operational cost, utility, suitability, availability, and efficiency demand that each system operation and task add value to its inputs availability, and produce outputs that contribute to achievement of the overall system mission outcome and performance objectives.
* By *“enable a user to predictably satisfy mission-oriented operational needs,”* means that every system has a purpose (i.e., a reason for existence) and a value to the user(s). Its value may be a return on investment (ROI) relative to satisfying operational needs or to satisfy system missions and objectives.
* By *“in a prescribed operating environment,”* means that for economic, outcome, and survival reasons, every system must have a prescribed—that is, bounded—operating environment.
* By *“with a specified outcome,”* means that system stakeholders (Users, shareholders, owners, etc.) expect systems to produce results. The observed behavior, products, byproducts, or services, for example, must be outcome-oriented, quantifiable, measurable, and verifiable.
* By *“and probability of success,”* means that accomplishment of a specific outcome involves a degree of uncertainty or risk. Thus, the degree of success is determined by various performance factors such as reliability, dependability, availability, maintainability, sustainability, lethality, and survivability.

**1.2 SYSTEM REDEFINED**

A ***system*** is an ordered grouping of independent components linked together according to specifications so as to achieve defined objectives of a business organization.

A ***system*** in its broadest form is a group of components that interact to achieve a purpose. Comprises elements namely people, resources, concepts and procedures intended to perform a function towards a goal

***The study of systems concepts has the following implications:-***

* A system is designed to achieve a predetermined objective
* Interrelationships and interdependences exist among the components
* Objectives of an org. have higher priority than objectives of its sub-systems

***A system can assume one of the forms***

 ***Schematic system*** – a two dimensional representation

 ***Flow system*** – an abstraction of real world e.g. PERT chart

 ***Static system*** – exhibits one relationship e.g. GANNT charts

 ***Dynamic system*** – model that approximates the business organization

**1.3 SYSTEMS AND ORGARNIZATION**

* + Organizations are complex systems that consist of inter-related and interlocking subsystems such that changes in one subsystem has anticipated consequences in other parts of the systems.
	+ Systems analysis concerns the application of the system approach to the study and finding solution of problems using computer-based systems.
	+ System analysis provides a framework for visualizing the organizational and environment factors that operate on system.
	+ Computerizing operations of an org improves performance, efficiency, effectiveness, satisfaction, quality information processing and results.

***However automating operation has negative impact such as***

* Possible threat to employment due to redundancy
* Decreased morale of personnel who were not consulted about the installation
* Feeling of intimidation by users who have limited training in Computer skills

**1.3.1 SYSTEMS THEORY**

* The systems theory is concerned with tendency towards the fragmentation of knowledge and the increasing complexity of the organizations
* Systems concepts relate to the organizations by viewing an ongoing system / operations as a processor of information for making decisions, in which information and communication provide connecting links for unifying various components
* Generally, systems theory is concerned with developing a systematic, theoretical framework upon which to make decisions by considering all activities of the org. and its external environment

**1.3.2 COMPONENTS OF A SYSTEM**

A system has distinct components namely

* ***Inputs*** –elements that enter the system e.g. data entered into comp. raw materials to a plant,
* ***Processes*** – operations necessary to convert / transform inputs to outputs. Computer processing involves activating commands, execution, computations and storage
* ***Control***– elements that guide the system in decision making by monitoring pattern of activities that govern input, processing and output e.g. OS, management etc
* ***Outputs*** – Describes finished products / services as consequences of inputs being in the system
* ***Communication* -** Also feed-forward and feedback which are Connections / flow of info and materials among sub-systems. Reports on Operations & performance of systems for decision – making modification of inputs/process
* ***Boundary*** – Physical/non-physical confinement that separates a system from its environment
* ***Environment*** – Comprises elements outside a system that can impact on a system’s performance e.g. Business environ includes competitors, suppliers, customers, regulation agencies, demographic, social & economic conditions

**1.3.3 CHARACTERISTICS OF A SYSTEM**

* **Organization** – implies structure and order of arrangement of the components that help to achieve the objectives. A business system has a defined authority structure, specifies the formal flow of communication and formalizes the chain of command; whose info. Is processed by an IS
* **Interaction** – concerns the functions of systems’ components set to realize efficient and effective performance
* **Interdependence** – parts of org. or computer system depend on one another but are linked together and coordinated to a plan, whereby the output of one sub system may be an input of another, all aimed at proper functioning
* **Integration** – concerned with how parts of a system work together within the system even though each part performs a unique function
* **Common objective** – users to know the main objective of a computer application during analysis for a successful design and conversion

**1.4 SYSTEM FEATURES**

A big system may be seen as a set of interacting smaller systems known as subsystems or functional units each of which have its defined tasks. All these work in coordination to achieve the overall objective of the system. System engineering requires development of a strong foundation in understanding how to characterize a system, product, or service in terms of its attributes, properties, and performance. As discussed above, a system is a set of components working together to achieve some goal. Systems also exhibit certain features and characteristics, some of which are:

**1.4.1 OBJECTIVES**

Every system has a predefined goal or objective towards which it works. A system cannot exist without a defined objective. For example an organization would have an objective of earning maximum possible revenues, for which each department and each individual has to work in coordination.

**1.4.2 STANDARDS**

It is the acceptable level of performance for any system. Systems should be designed to meet standards. Standards can be business specific or organization specific. For example take a sorting problem. There are various sorting algorithms. But each has its own complexity so that such algorithm should be used that gives most optimum efficiency. So there should be a standard or rule to use a particular algorithm. It should be seen whether that algorithm is implemented in the system.

**1.4.3 ENVIRONMENT**

Every system whether it is natural or manmade co-exists with an environment. It is very important for a system to adapt itself to its environment. Also, for a system to exist it should change according to the changing environment.

**1.4.4 FEED BACK**

Feedback is an important element of systems. The output of a system needs to be observed and feedback from the output taken so as to improve the system and make it achieve the laid standards. A system takes input. It then transforms it into output. Also some feedback can come from customer (regarding quality) or it can be some intermediate data (the output of one process and input for the other) that is required to produce final output.

**1.4.5 BOUNDARIES AND INTERFACES**

Every system has defined boundaries within which it operates. Beyond these limits the system has to interact with the other systems. For instance, Personnel system in an organization has its work domain with defined procedures. If the financial details of an employee are required, the system has to interact with the Accounting system to get the required details. Interfaces are another important element through which the system interacts with the outside world. System interacts with other systems through its interfaces. Users of the systems also interact with it through interfaces. Therefore, these should be customized to the user needs. These should be as user friendly as possible.

## **2 INFORMATION SYSTEM CONCEPTS**

***2.1 DATA***

***Data***– Raw facts about an organization and its business transactions

***Data*** *is g*roups of non – random symbols which represent quantities, actions, objects etc

* + In IS data items are formed from characters that may be alphabetical, numeric or special symbols
	+ Data processing involves collecting and organizing the data items / symbols for the purpose of converting them into data structures and databases.
	+ Data relevant to the processing of Information and decision making may also be in the form of text, images or voice. For effective processing of data resources are necessary such as human personnel, facilities and equipment.

***2.1.2 INFORMATION***

***Information*** – data that has been processed into a form that is meaningful to the recipient and is of real / perceived value in the current / prospective actions and decisions.

***Information*** is organized ideas or facts obtained through processing data in a purposeful intelligence and can be used in decision making

The relation of data and Information is that of raw materials to finished products in the sense that an IS processes data into information, diagrammatically

Data / Input

Processing /

Conversion

Information

Data Storage

• ***Information***is data structured and organized to be useful in making a decision or performing some task. The information resources are reusable, don’t lose value and may indeed gain value through credibility added by its use. The value of information become meaningful in the context of decision, since if there were no current / future choices or decisions then information would be unnecessary.

***Quality of information***

The aspects of information in terms of the perceptions of the decision maker are:-

* ***Utility*** – evaluating info in terms of utilities / applications that may facilitate or retard info use and includes form, time, place and possession utility
* ***Satisfaction*** – degree to which a decision maker is satisfied with the output of the informal IS
* ***Errors and bias*** – errors causes variation of info, where improvement in quality is more important than an increase in the quantity of info. Bias is caused by individual’s ability to exercise discretion in info presentation

***2.1.3 KNOWLEDGE***

***Knowledge***implies “understanding” of information

Example from book: company analyzes its recruiting data and concludes that recruits from school *X* tend to have good outcomes only if their GPA’s are at least 3.0. In future, based on this “knowledge”, they screen applicants from school *X* by their GPA’s, only interviewing those with at least a 3.0 GPA. One common kind of knowledge representation in computers is called “artificial intelligence” (AI). It got a lot of hype in the 1980’s, and then went somewhat out of fashion, but it is still growing gradually. We will not discuss it much, and stick to “information” instead.

***2.1.4 INFORMATION SYSTEMS***

Definition of some basic terms - The ways that organizations Store, Move, Organize, Manipulate or process their information

 • Components that implement information systems – in other words, *Information Technology*

Hardware – physical tools: computer and network hardware, but also low-tech things like pens and paper

* Software – (changeable) instructions for the hardware
* People – the users of the systems having relevant knowledge
* Procedures – instructions for the people
* Data/databases – programs and storage facilities for data / information

Information systems existed before computers and networks – they just used relatively simple hardware that usually didn’t need software (at least as we know it today). Strictly speaking, this course is about “CBIS” (Computer Based Information Systems). Because of the present ubiquity of such systems, we usually leave the “CB” to be implicit.

 Impact of computer and network hardware and related software/services

* Can perform numerical computations and other data processing much more quickly, accurately, and cheaply than people
* Can communicate very quickly and accurately
* Can store large amounts of information quickly and cheaply; retrieval can often be very rapid
* Can automate tasks and processes that previously required human labor (various degrees possible, of course)
* Information doesn’t have to be “stuck” with particular things, locations, or people

***2.1.5 INFORMATION ARCHITECTURE***

***Information architecture***is the particular way an organization has arranged its information systems: for example, a particular network of computers running particular software supports the marketing organization, while another network of computers running different software supports the production facilities, etc.

***2.1.6 INFORMATION INFRASTRUCTURE***

***Information infrastructure*** consists of the hardware and software that support the information architecture, plus the personnel and services dedicated primarily to maintaining and developing that hardware and software.

***2.1.7 APPLICATION PROGRAMS***

***The Application and Application Programs*** *are* somewhat fuzzy terms, but typically denote computer software and databases supporting a particular task or group of tasks.

* Example from book: HR uses one application to screen job applicants and another to monitor employee turnover
* A classic business IT problem: applications that don’t communicate with one another (effectively)

**2.2 CLASSIFICATIONS OF SYSTEM**

Classification of systems can be done in many ways.

**2.2.1 PHYSICAL OR ABSTRACT SYSTEM**

Physical systems are tangible entities that we can feel and touch. These may be static or dynamic in nature. For example, take a computer center. Desks and chairs are the static parts, which assist in the working of the center. Static parts don't change. The dynamic systems are constantly changing. Computer systems are dynamic system. Programs, data, and applications can change according to the user's needs. Abstract systems are conceptual. These are not physical entities. They may be formulas, representation or model of a real system.

**2.2.2 OPEN AND CLOSED SYSTEM**

Systems interact with their environment to achieve their targets. Things that are not part of the system are environmental elements for the system. Depending upon the interaction with the environment, systems can be divided into two categories, open and closed.

* ***Open systems*:** Systems that interact with their environment. Practically most of the systems are open systems. An open system has many interfaces with its environment. It can also adapt to changing environmental conditions. It can receive inputs from, and delivers output to the outside of system. An information system is an example of this category.
* ***Closed systems*:** these are systems that do not interact with their environment. Closed systems exist in concept only.

**2.2.3 MAN MADE INFORMATION SYSTEM**

The main purpose of information systems is to manage data for a particular organization. Maintaining files, producing information and reports are a few functions. An information system produces customized information depending upon the needs of the organization. These are usually *formal, informal, and computer based.*

* ***Formal Information Systems:*** It deals with the flow of information from top management to lower management. Information flows in the form of memos, instructions, etc. But feedback can be given from lower authorities to top management.
* ***Informal Information systems:*** Informal systems are employee based. These are made to solve the day to day work related problems.
* ***Computer - Based Information Systems:*** This class of systems depends on the use of computer for managing business applications.

**2.3 ORGANIZATIONS AND INFORMATION SYSTEMS**

Information systems and organizations have a mutual influence on each other. Information systems must be aligned with the organization to provide information needed by important groups within the organization. Meanwhile, organization must be aware of and open itself to the influences of information systems in order to benefit from new technologies. The interaction between information technology and organizations is very complex and is influenced by a great many mediating factors, including the organization’s structure, standard operating procedures, politics, culture, surrounding environment and management decisions. The illustration below illustrates the two-way relationship between organization and information technology.

**Mediating Factors**

Environment

Culture

Structure

Standard Procedures

Business Processes

Politics

Management Decisions

Chance

**2.3.1 DEFINING AN ORGANIZATION**

Organization is a stable, formal social structure that takes resources from the environment and processes them to produce outputs (technical definition). This technical definition focuses on three elements of an organization:

* Capital and labor are primarily production factors provided by the environment.
* The organization (the firm) transforms these inputs into products and services in a production function.
* The products and services are consumed by environments in return for supply inputs.

The illustration below shows the relation between these three elements. In the technical microeconomic definition of the organization, capitol and labor (the primary production factor provided by the environment) are transformed by the firm through the production process into products and services (output to the environment). The products and services are consumed by

the environment, which supplies additional capital and labor as inputs in the feedback loop.

Production Process

Outputs to the environment

Organization

Inputs from the environment

* An organization is more stable than an informal group in terms of longevity and routine-ness. Organizations are formal legal entities, with internal rules and procedures, that must be abide by laws.
* Organizations are also social structure because they are a collection of rights, privileges, obligations and responsibilities that are delicately balanced over a period of time through conflict and conflict resolution (behavioral definition).Figure 4.3 below shows the behavioral view of an organization that emphasizes group relationships, values and structures.

Structure

 Hierarchy

 Division of Labor

 Rules, procedures

 Business processes

Process

 Rights/obligations

 Privileges/responsibilities

 Values

 Norms

 People

Environmental resources

Environmental outputs

From the technical view of organization, it encourages organization to focus upon the way inputs are combined into outputs when technology changes are introduced into the company. The firm is seen as infinitely malleable, with capital and labor substituting for each other quite easily. Meanwhile, from the behavioral view of organization, it suggests that building new information systems or rebuilding old ones involves much more than a technical rearrangement of machines or workers.

The technical and behavioral definitions of organizations are not contradictory but they complement each other. The technical definition tells us how many thousands of firms in competitive market combine capital, labor and information technology whereas the behavioral models takes us inside the individual firm to see how that technology affects the inner workings of the organization.

**2.3.2 SYSTEM APPLICATIONS IN THE ORGANIZATION**

Due to different interests, specialties and levels in an organization, there are different kinds of systems. No single system can provide all the information an organization needs. Organization and information systems can be divided into strategic, management, knowledge and operational level. All the above mentioned levels of an organization can be further divided into five functional areas: sales and marketing, manufacturing, accounting, finance and human resources. The diagram below shows the one way to depict the kinds of systems found in an organization.

Strategic Level

Management Level

Knowledge Level

Operational Level

**Kind of Information System**

**Group Served**

Operational Managers

Knowledge and Data Workers

Middle Managers

Senior Managers

Finance

Accounting

Human Resources

Manufacturing

Sales and Marketing

**2.4 DIFFERENT KINDS OF SYSTEMS**

***Strategic level systems help senior manager with long-term planning***. The principle concern at this level is matching changes in the external environment with existing organizational capabilities. It supports the long-range planning activities of senior management. It also helps the senior management to tackle and address strategic issues both in the firm and in the external environment.

***Management level systems help middle managers monitor and control.*** It typically provides periodic reports rather than instant information on operations. It supports the monitoring, controlling, decision-making and administrative activities of middle managers. Some of the management level systems support non-routine decision making where they tend to focus on less-structured decisions for which information requirements are not always clear.

***Knowledge level systems help knowledge and data workers design product, distribute information and cope with paperwork.*** The main purpose is to help integrate new knowledge into the business and to help the organization control the flow of paperwork. Knowledge level systems, especially in the form of workstations and office systems are the fastest-growing applications in business today.

***Operational level systems help operational manager keep track of the firm’s day-today activities.*** The principle purpose is of operational level system is to answer routine questions and to track the flow of transactions through the organization.

**2.5 ORGANIZATIONS AND INFORMATION SYSTEMS**

Some of the general benefits why organizations adopt information systems are as follow:

* More efficient operations
* Save money on costs of processes
* Reduce work force and increase benefits
* More innovative than others thus effective
* A source of competitive advantage over others
* Become vitally important simply to stay in business
* Satisfy the ambitious of various groups within an organization

**2.5.1 ORGANIZATIONS ADOPTION OF SYSTEMS**

The diagram below shows the system development process that includes many considerations other than economic. The model divides the explanation for why organization adopts systems into two groups:

Internal

**Environmental factors**

Uncertainties

Opportunities

**System development**

Adoption

Utilization

Management

**Institutional factors**

Values

Norms

Interests

External

***External environment factors*** – these are the constraints and opportunities that influence the adoption and design of information systems. Examples of external constraints would be the rising costs of labor or other resources, the competitive actions of other organizations and changes in government regulations. Examples of external opportunities include new technologies, new sources of capital, the demise of a competitors or a new government program.

***Institutional factors –*** these are factors internal to the organization that influence the adoption and design of information systems. They may include values, norms and vital interests that govern matters of strategic importance to the organization.

**3 INFORMATION SYSTEMS IN AN ORGANISATION**

**3.1 DEFINITION OF INFORMATION SYSTEM**

1. ***Information System*** –is a set of devices, procedures and Operating Systems designed around user-based criteria to produce info and communicate it to the user for planning, control and performance
2. ***Information System -*** an arrangement of people, data, processes and communication

technology that interact to support and improve operations in a business in a view of

problem-solving and decision making needs of management and users

1. ***Information System* -** it is a term that describes the combination of comp technology (HW / SW) with communication technology (data, images and voice networks). Thus an IS comprises computer technology and the operational structure in an organizational context,
* Consider a computer-based IS that relies on the computer for handling business applications, problem solving and decision making.
* The informal communication network of the employees in an organization is a useful source for examining systems, since computers cannot provide all the information and thus user staff support is important.
* Since IS can be classified as an open system that allows inputs and facilitates interactions of users; and is characterized of input from outside, processing output , operating in cycles through feedback and feed-forward and , differentiation and equifinality

***Finally, an Information System a system that uses resources to convert data into the information needed to accomplish the purposes of the business.***

**3.2 TYPES OF INFORMATION SYSTEMS**

Departmental information systems or functional area information systems are designed to be operated within a single traditional functional department of an organization such as sales, human resources, or accounting. In the early days of CBIS, these were often the only kind of systems that were practical.

1. ***Enterprise Resource Planning (ERP) systems***are a relatively extreme reaction to the problem of poorly integrated functional area systems, offered by vendors such as SAP, Oracle, and PeopleSoft. They aim to support the entire organization’s needs with essentially a single integrated system. They have enormous potential benefits, but are also notoriously tricky and expensive to configure and install.
2. ***Transaction Processing Systems (TPS)***gather data about everyday business events in “real time” as they occur. Examples: A shipment of coffee beans arrives at a local distribution center, A package is unloaded from a FedEx or UPS aircraft. All of these events are examples of transactions that may be immediately tracked by a TPS. Often, technology like barcodes and scanners makes tracking such transactions quicker, cheaper, and more detailed than it would otherwise be.
3. An ***Inter-organizational System* (IOS)** connects two organizations – for example, it may allow a company to automatically share inventory and backlog data with suppliers or customers.
4. ***Electronic Commerce* or *E-Commerce***refers to sales transactions in which at least one side of the transaction (buyer or seller), and perhaps both, is performed by a CBIS without direct human help.

**3.3 CATEGORIES OF INFORMATION SYSTEMS**

**1. Management Information System (MIS) -** an IS that provides for management oriented reporting in predetermined format that is the levels:-

* **Strategic -** relates to long range planning policies and upper management, especially in making unstructured decisions
* **Managerial -** info that helps middle management in policy implementation and control, resource allocation and coordination
* **Operational -** daily info needed to operate the business and is established by data processing systems-produces mgt reports required for planning, monitoring and control.

**2. Transaction Processing System (TPS) -** is applications that capture and process data about Business transactions especially the operational level.

**3. Decision Support System (DSS) -** is application that provides its users with decision oriented information whenever unstructured decision making situation arises.

**4. Expert Systems (ES) -** programmed IS that captures and reproduces the knowledge and expertise of an expert problem solver-decision maker by simulating thinking or actions of an expert.

**NB.**

* **Data warehouse -** a read only dbase that contains details of information that can be accessed by end users and managers
* **Repository -** is a location or store / database where system stakeholders keep all of the documentation associated with a project of a system.
* **A database -** is a non-redundant collection of interrelated data items that are processed through specific application programs

**3.4 SYSTEMS IN ORGANIZATIONAL LEVELS**

 Information is categorized in relation to the managerial levels for the respective decision making processes

* ***Strategic information* -** relates to the long range planning policies that are of direct interest to the top management
* ***Managerial information* –** mainly used for the implementation and control e.g. sales analysis, cash flows projections annual financial statements etc
* ***Knowledge information* –** mainly used for capturing and organizing data from the lower level of the organization
* ***Operational information* –** used to operate departments and enforces daily rules and regulations of the business

The lack of structure and incomplete information make it difficult to secure computer support. Thus an analyst has to determine the following

* Type of information required at different managerial levels
* Application of information at its respective level
* Structure and format of representing information

Generally, the decision making at operational level is highly structured, at managerial level is semi-structured and at the strategic level it is unstructured

***3.4.1 STRATEGIC LEVEL***

The characteristics of the information at the strategic level is as follows

* ***Unstructured* -** concerned with long term goals of an organization and that decisions will provide guidelines on which the firm will run
* ***Source* –** the information is obtained from both internal and external sources and help in the policy formulation
* ***Complex* -** high uncertainty requiring experience and good sense of judgement for the strategic planning and allocation of resources
* ***Summarized* –** info usually in the form of reports and records and less qualitative and quantitative

***3.4.2 MANAGERIAL LEVEL***

The characteristics of the information at the strategic level is as follows

* ***Semi-structured* -** concerned with medium range goals of an organization
* ***Source* –** usually of medium quality and obtained from restricted range of sources
* ***Largely quantitative* –** based on routine operations and non procedural decision making process
* ***Less summarized* –** information is obtained from both internally and less externally and helps in resource allocation

 ***3.4.3 OPERATIONAL LEVEL***

The characteristics of the information at the strategic level is as follows

* ***Structured* –** decisions associated with activities that are routine and cover short time ***Source* –** info derived internally and is relevant in short term
* ***Highly quantitative* –** information is obtained from quantitative data, highly detailed and help in the daily routines and procedures

**3.5 INFORMATION SYSTEM STAKEHOLDERS**

An IS architecture provides a unifying framework into which various people with different perspectives can organize and view the fundamental components of an information system i.e. system stakeholders.

* **System owners** - sponsors and advocates responsible for funding into develop, operate and maintain an IS i.e. pay for the system to be built and maintain.
* **System users -** use the system to perform or support the work to completion by capture, validate, enter, store and exchange data and info.
* **System Designers -** design a system to meet the user’s requirements
* **System Engineers** - translate users or business requirements and constraints into technical solutions.
* **System Builders -** construct, test and deliver the new system into the operation.
* **Vendors / Consultants –** sell system hardware, software and services to business for incorporation into their information systems.
* **System Analyst -** facilitator to the development of IS and computer applications by bridging the communication gap that exists between non technical system owners and users as well as the technical system designers and builders.

**3.6 RELATIONSHIP BETWEEN PEOPLE AND INFORMATION SYSTEMS**

* Top management usually make strategic decisions
* Managerial decisions are usually made by middle managers and line managers
* Operators make operational decisions
* The relationship between the people supported and the decision type is as follows:

 Strategic Top managers

 Systems

 Staff Support Knowledge workers professionals

 Managerial Systems Middle managers

 Operational Systems Line Managers

 Office Automation and Communication Systems Clerical staff

The staff support that is between the top and middle managers are professional people like financial and marketing analysts. They act as advisors to both top and middle management. Many of these professional people can be thought of as knowledge workers.

**3.6.1 KNOWLEDGE WORKERS**

* Knowledge workers are people who create information and knowledge as part of their work and integrate it into business e.g. engineers, financial and marketing analysts, production planners, lawyers and accountants, etc.
* They are responsible for finding or developing new knowledge for the organization and integrating it with existing knowledge. They are alert on all developments and events related to their profession
* They also act as advisors and consultants to the members of the organization
* They also act as change agents by introducing new procedures, technologies or process
* Knowledge workers can be supported by a variety of information systems: Search engines that help them find information; Expert systems that support information interpretation; Computer aided design and hyper text that help them increase their productivity and quality of work

They also need information systems that are built in a networked/distributed architecture environment so that they can be able to access the internet

**3.6.2 CLERICAL WORKERS**

* Clerical workers who use manipulate or disseminate information are referred to as *data workers* and support managers at all levels
* They include bookkeepers, secretaries who work with word processors, electronic file clerks, insurance claim processors
* Clerical employees are supported by office automation and communication systems including e-mail, co-ordination software document management, work flow

**4 MANAGEMENT INFORMATION SYSTEMS**

 MIS can be defined as a system that

* Provides information to support managerial functions like Planning, organizing, directing and controlling
* Collects information in a systematic and a routine manner which is in accordance with a well defined set of rules.
* Includes files, hardware, software and operations research models of Processing, storing, retrieving and transmitting information to the users.

**4.1 MANAGEMENT INFORMATION SYSTEMS (MIS)**

* Designed to ‘convert data from internal and external sources into information, communicated in an appropriate form to managers at different levels of an organization. The information enables effective decisions or appropriate planning to be carried out’ Usually based on one or more databases
* A sales manager will perhaps require a report showing the sales for a geographic area and or by salesman
* A production manager will require a report showing stock levels currently and anticipated sales.
* To be effective the reports should be in an appropriate form that is up to date and accurate with the correct level of detail for his job.

**4.1.1 OBJECTIVES OF MIS**

An effective MIS has the following objectives

* Facilitate the decision - making process by furnishing information in the proper time

Frame which helps the decision - maker to select the best course of action

* Provide requisite information at each level of management to carry out their functions.
* Help in highlighting the critical factors to the closely monitored for successful functioning of the organization.
* Support decision-making in both structured and unstructured problem environments.
* Provide a system of people, computers, procedures, and interactive query facilities, documents for collecting, sorting, retrieving and transmitting information to the users.

**4.1.2 CHARACTERISTICS OF MIS**

**Management Oriented *-*** The system is designed from the top to work downwards. It does not mean that the system is designed to provide information directly to the top management. Other levels of management are also provided with relevant information. For example, in the marketing information system, the activities such as sales order processing, shipment of goods to customers and billing for the goods are basically operational control activities. A salesman can also track this information, to know the sales territory, size of order, geography and product line, provide the system has been designed accordingly. However, if the system is designed keeping in mind the top management, then data on external competition, market and pricing can be created to know the market share of the company's product and to serve as a basis of a new product or market place introduction

**Management Directed -** Because of management orientation of MIS, it is necessary that management should actively direct the system development efforts. In order to ensure the effectiveness of system designed, management should continuously make reviews.

**Integrated -** The world "integration" means that the system has to cover all the functional areas of an organization so as to produce more meaningful management information, with a view to achieving the objectives of the organization. It has to consider various sub-system their objectives, information needs, and recognize the interdependence, that these subsystem have amongst themselves, so that common areas of information are identified and processed without repetition and overlapping

**4.1.3 LIMITATIONS OF MIS**

* Highly sensitive and requires constant monitoring
* Budgeting of Budgeting extremely difficult
* Lack of flexibility to update it
* Factors Contributing to Success

**4.1.4 SUCCESS OF MIS**

If MIS is to be success then it should have all the features listed as follows:

* The MIS is integrated into the managerial functions. It sets clear objectives to ensure that the MIS focuses on the major issues of the business.
* An appropriate information processing technology required to meet the data processing and analysis needs of the users of the MIS is selected.
* The MIS is oriented, defined and designed in terms of the user’s
* The MIS is kept under continuous surveillance, so that its open system design is modified according to the changing information needs.
* MIS focuses on the results and goals, and highlights the factors and reasons for non achievement
* MIS is not allowed to end up into an information generation mill avoiding the noise in the information and the communication system.
* The MIS recognizes that a manager is a human being and therefore, the systems must consider all the human behavioral factors in the process of the management.
* The MIS recognizes that the different information needs for different objectives must be met with. The globalization of information in isolation from the different objectives leads to too much information and information and its non-use.
* The MIS is easy to operate and, therefore, the design of the MIS has such features which make up a user-friendly design.
* MIS recognizes that the information needs become obsolete and new needs emerge.
* The MIS design, therefore, has a basic potential capability to quickly meet new needs of information.
* The MIS concentrates on developing the information support to manager critical success factors.
* It concentrates on the mission critical applications serving the needs of the top management Factors Contributing to Failures

**4.1.5 FAILURE OF MIS**

The common factors which are responsible for this are listed as follows:

* The MIS is conceived as a data processing and not as an information processing system.
* The MIS does not provide that information which is needed by the managers but it tends to provide the information generally the function calls for. The MIS then becomes an impersonal system.
* Under estimating the complexity in the business systems and not recognizing it in the MIS design leads to problems in the successful implementation.
* Adequate attention is not given to the quality control aspects of the inputs, the process and the outputs leading to insufficient checks and controls in the MIS.
* The MIS is developed without streamlining the transaction processing systems in the organization.
* Lack of training and appreciation that the users of the information and the generators of the data are different, and they have to play an important responsible role in the MIS.
* The MIS does not meet certain critical and key factors of its users such as a response to the query on the database, an inability to get the processing done in a particular manner, lack of user-friendly system and the dependence on the system personnel.
* A belief that the computerized MIS can solve all the management problems of planning and control of the business.
* Lack of administrative discipline in following the standardized systems and procedures, wrong coding and deviating from the system specifications result in incomplete and incorrect information.
* The MIS does not give perfect information to all the users in the organization.

**4.2 SOURCES OF INFORMATION**

Information may be internal or external.

* ***Internal information*** includes data from transaction processing of the data processing system.
* ***External information*** includes market research, details about the activities of competitors, information about social trends, economic factors, government legislation, and so on.
* ***Traditional information flow*** in an organization is through notice boards, newsletters and memos. Technological systems include Email, Intranets, collaboration software e.g. Lotus Notes and computer databases.

**4.3 ROLE OF MANAGEMENT**

The traditional roles of managers are:

* Planning
* Organizing
* Coordinating
* Controlling
* Forecasting
* Decision making

Bear in mind that an information system is not just for the use of ‘managers’. Anyone who shares the above roles can make use of an MIS.

**4.3.1 DECISION MAKING**

**Types of decision:**

* Structured are day to day decisions, are routine and have a procedure for handling them (i.e. staff discipline)
* Unstructured decisions require a manager to exercise judgment, insight and evaluation. Usually important, they have no procedure laid down (i.e. expanding the business).
* Levels of decision making:
* Strategic - where Senior managers need to make long-term planning decisions
* Tactical - where Middle managers often need to make tactical decisions.
* Operational - where decisions about the production of an organization need to be made.

**4.3.2 AIDS TO DECISION MAKING**

* ***Exception Reports*** are commonly used. These reports summarize the exceptions to the norm i.e. students obtaining low marks over a period of time.
* ***Decision Support Systems*** help decision-making but they do not themselves make decisions. For example, spreadsheets with "what if" capabilities can be used to model and test out different scenarios
* ***Expert Systems*** (also called Knowledge-based systems) are used to emulate human reasoning. They are usually limited to a specific area of expertise.
* ***Executive Information Systems (EIS)*** are used by executives who can view graphs and charts. They can click on "hotspots" and get much more detailed information. They can click through several layers to pin-point exactly

4.4 MANAGING OF INFORMATION SYSTEM

* Information system is a system, which collects, processes, stores, analysis and disseminates information for a specific purpose. It includes inputs i.e. data and instructions, outputs i.e. reports and calculations and it processes input and produces output that are sent to the user or other systems. It also contains a feedback mechanism that controls their operations and it operates within an environment.
* Managing of Information System is an approach that combines decision-making systems with information systems. It uses management models, mathematical models and scientific models in order to come up with optimum decision output.
* Management information systems are a system that combines management systems and information systems in order to support decision-making in an organization. It uses computer software that runs different decision-making models executed on hardware mainly computers and the results are used by people; those are the individuals who work with the system.
* Therefore management of information system is human, machine and software combination applied in order to achieve optimum results in an organization.
* Information system is a system that collects, process, stores, analysis and disseminates information for a specific purpose. It includes inputs, outputs, processes and a feedback mechanism that controls the operation and it functions within an environment.
* Modern information systems are computer bases as they use computer technology to perform some or all of its intended tasks as such a system can include a P.C. and software or it may include several thousand computers communication networks and databases.

Basic components of such a system can include hardware, software, database, network procedures and people. Some of the major capabilities of information system can include:

* High speed of performance
* Process high volume of data
* Provide fast, accurate and inexpensive communication with organizations
* Store huge amounts of information in an easily to access small space
* Allow quick and inexpensive access to vast amount of information world wide
* Increase the effectiveness and efficiency of people working in groups in one place or several occasions
* High speed typing and editing
* Clearly present information that challenges the human mind and automate business possessors that are done manually

Organizations have adopted modern information technology to implement the information system. This has been so in order to enable them to meet business pleasures and to improve their capability in responding to critical activity.

**4.5 BUSINESS PRESSURES**

These are caused by market pressures such as the globalization of world economies, competition of organizations on a global skill, emergence of strong consumers who not only know the price and value of goods but also where to get them cheaply.

The emergence of modern technology has caused an increase in business pressures particularly due to innovations. The emergence of e-commerce infrastructure and the information superhighway which has enabled organizations to access information which they could not access and even access it faster than they could do there before.

Another source is the society where organizations are supposed to participate their roles in major areas of social responsibilities such as environmental control.

* Providing equal opportunities to all
* Employment and housing
* Health, safety and social benefits to employees
* Employee education training and retraining
* External relationships
* Privacy and ethics

Also government regulations and irregularities have also constrained organizations, therefore causing them to seek for efficient alternatives to do business economically.

**4.6 CRITICAL RESPONSE**

Organizations have been forced to adopt modern information systems in order to improve their capability to respond to business challenges. This enables them to excel or even survive when they respond to critical activities.

Information system can also enable them to exploit rare opportunities i.e. they are proactive instead of being reactive. Information systems such as strategic enable organizations to reap strategic advantages that can enable them to increase their market than to better their negotiations to customers and suppliers or even prevent competitors from entering their territory.

The organization response can be improved by implementing information systems that support improvement utilities such as:

* Improving decision-making
* Innovating big methods of serving customers
* Providing total quality management
* Providing material or services just in the right time to support productive process

Information system also provides organizations with support in business process re-engineering. This is an approach that enables organizations to perform major innovations, which facilitates business restructuring and the empowerment of its employees besides reducing the process of creating goods or delivering services.

Information system also improves the organization’s ability to respond by supporting business alliances which enables creation of vital operations i.e. where companies are to limited by space, time or even service, customers can get support from any of the organization that is a business partner with any other organization even if the business are not doing exactly the same thing. Examples of information system that work at worldwide can include:

* Parcel tracking systems (used by U.P.S.) to provide her customers with the information about the movement of their parcels form the point of posting to the destination and details about the movement of the parcels can be tracked from their website
* An electronic commuting system used by Irrovine Company in the U.S. enables Russians, Koreans and the Indians to commute electronically to and from their offices located in California when physically they do not leave their countries. This system is used to reduce costs drastically while at the same time enables experts from distant countries to undertake projects as if they are working in the same offices.
* The Amazon Bookshop which in an electronic commerce information system used to improve the time to serve customers by reducing the time to do books shopping to reduce cost of shopping and to improve the access of information.

**4.7 MANAGERS AND DECISION-MAKING**

Decision-making can be classified by the organization level and decision-making is often a manager’s most challenging role. IS have helped managers communicate and distribute information. However, they have provided only limited assistance for management decision-making. Decisions are classified as follows:

***Structured* -** Structured decisions are repetitive and routine and they involve a definite procedure for handling them, so that they do not have to be treated each time as if they were new. Some decisions are semi-structured. In such cases, only part of the problem has a clear cut answer provided by an acceptable procedure.

***Unstructured* -** Unstructured decisions are those in which the decision maker must proved judgment, evaluation and insights into the problem definition. Unstructured decisions are novel, new, important and non-routine, and there’s no well understood or agreed on procedure for making them.

**4.8 STAGES IN DECISION-MAKING**

Making decisions consist of several different activities. The four stages in decision-making are:

***Intelligence*** – Consist of identifying and understanding the problems occurring in the organization by answering the questions; why the problem, where and what are the effects? MIS systems that achieve a wide variety of detailed information can help identify problems especially through the system’s report.

***Design Stage*** – Here the individual designs possible solutions to the problems

***Choice Stage*** – Consist of choosing among solution alternatives. A decision-maker may use a complex decisions system to develop more extensive data on a variety of alternatives and complex models or data analysis tools to account for all the cost, consequences and opportunities.

***Implementation Stage*** – Here the decision-maker choose an alternative and puts it into effect. Managers can use a reporting system that delivers routine reports on the progress of a specific solution.

Intelligence

Is there a problem?

Design

What are the alternatives?

Choice

Which should you choose?

Implementation

Is the choice working?

In general, the stages of decision-making do not necessarily follow a linear path. At any point in the decision-making process you may have to loop back to a previous stage. For instance, one can often come up with several designs but may not be certain about whether a design meets the requirements for the particular problem. In such a situation, the decision-maker requires additional intelligence work.

**4.8 MANAGING INFORMATION RESOURCES**

In modern organizations several information resources can exist. It is therefore essential to have a sound method of managing these resources. The challenges involved include identifying which resources are to be managed and by whom, establishing the role of the individual or department that has to be entrusted with the resources and establishing resource between individuals and departments that are in charge of managing the resources.

Information system resources can include:

* Hardware resources of all types such as computers, servers and all other devices
* Software resources including development tools, languages and applications
* Databases for the storage and retrieval of data and information
* Networks local or wide, internet and intranets and their supporting devices
* Procedures, security facilities, physical building and people
* These resources are widely scattered throughout the organizations and they might not be a standard procedure for dividing responsibility of how to manage them

Most organizations create an I.S. department. They assign the responsibility of managing these resources to its managers regardless of where these resources are located and how they are used. Other organizations assign the responsibility of managing the resources to individual users but set up a help desk or helpline through which support can be provided to the end users.

Other organizations outsource the I.T. resources by appointing vendors of the services performed by the I.T. facilities to outsiders of the organization. Where an organization creates an IS department following roles are assigned to the department and these include:

* Providing training services
* Managing computer operations
* Managing system development
* Staffing and training in information systems skills
* Designing specific strategic information systems
* Infrastructure plans
* Educating non-I.T. users about I.T
* Supporting end user computing
* Incorporating modern I.T. solutions into business e.g. E-Commerce
* Creating business alliances
* Actively participating in business process in engineering

Activities in this information system department can be categorized into three:

* ***Support of end user computing and can involve:***
	+ Training and education
	+ Support in application development
	+ Assisting in selecting I.T. solutions
	+ Identifying user requirements
	+ Supporting cooperation between different users of different categories
	+ Documentation of systems of an organization
	+ Providing formal means for users communication with management and with traditional data processing
* ***Technical assistance which involves:***
	+ Directing security and control issues
	+ Providing guidance in selection of hardware and software
	+ Assisting in software installation and upgrades
	+ Establishing database of file backs, recovery and archives guidelines
	+ Assisting in selection and evaluation of application pages and other development tools
* ***General Support services***

This includes providing clearing house functions for receiving and disseminating information on relevant personal computing issues, establishing a communication system for interrupt driver user requests for information on software, hardware or applications, chairing of user group meeting on a regular and adhoc basis.

The managing of information system department is similar to any other organizational unit. The Chief Information Officer who is always an important member of the organization’s top management leads it.

**4.9 ROLES OF CHIEF INFORMATION OFFICER**

* Align technology with business strategy
* Implement a state of act solutions
* Provide and improve information access
* Enhance customer service
* Train and empower employees
* Educate business units about I.T.
* Evaluate imaging I.T. technologies
* Enhance current systems
* Create links with the external customers of the organization

It is therefore important for the chief information officer to have skills such as to enable understanding the business that the organization is in:

* To maintain technology competency
* To facilitate change
* To provide education to other executives
* To understand and set industry standards
* To manage safety and security matters

Where I.T. resource users are left in-charge of the resources an organization has to create a mechanism that has to be used to assist users manage the resources. This mechanism can involve setting up a steering committee to represent all the users of the facilities and to be in-charge of setting I.T. policies, providing for priorities, coordinating I.S. projects, budgeting, running applications development and maintenance.

It also provides technical and administrative support for all end users. The other alternative is to outsource I.T. services form the vendors of such services. This is by entering into contracts or agreements with the vendors of the services by stating the nature of support to be provided, how it is to be provided, how often it is to be provided and what facilities the organization is to outsource.

## **5 STRATEGIC INFORMATION SYSTEMS**

Information systems can be implemented to support specific function or multiple functions performed in an organization. When changes are in process, ensure you improve your services to the greater services. A system that supports typical functions of a department can be referred to as a functional system. Such a function has the following features:

* It is made up of smaller information systems that support specific activities performed by each functional area
* Specific applications in each functional area can be integrated or can be completely independent
* These systems can interface with each other to form an organization wide information system
* These systems can interact with the environment to form a collaborative system that integrates direct input from the environment e.g. systems that support customers and render data requests in order to enhance the organization’s responses
* Functional information system applications support all the levels of an organizations’ activities i.e. the operational knowledge level, managerial level and the strategic level

An example of a functional information system can have the following at the strategic level, it can be composed of applications to perform tasks such as operation strategies capacity planning, facility planning and location, robotics and long term focusing. At the managerial level the system can be made up of applications such as inventory management, maternal requirement planning, manufacturing resource planning, total quality management, computer aided manufacturing and short term forecasting. At knowledge level, applications such as design and engineering, marketing and financial analysis, human resources management, manufacturing standards, quality control standards, time and motion standard, customer and vendor analysis can be implemented. At the operational level, applications such as materials management, cost analysis, quality control, short term scheduling can be implemented.

**5.1 TRANSACTION PROCESSING SYSTEM (TPS)**

They work at the operational level where tasks, resources and goals are predefined and are highly structured. They are the basic business systems and are often central to a business such that transaction processing system and are often central to a business such that TPS failure can lead to loss of data for other organizational levels.

A TPS can be defined as a computerized system that performs and records the daily routine transaction necessary to conduct business e.g. hotel reservation system, payroll, employee record keeping, sales order entry, airline booking system, etc. Managers use TPS to monitor the status of internal operations and the firm’s relations with external environment.

The objective of TPS is to provide all information so that the business can run efficiently

* TPS provide timely documents and reports
* They increase the competitive advantage of an organization
* TPS provide necessary data for tactical or strategic system e.g. MIS and DSS
* TPS are the backbone of any organization and they monitor, collect, store, process and
* disseminate information for all routine significant business applications

Functional information systems begin by the computerization of routine transaction processes. The objective of transaction processing systems is to provide all information by law or organization policies to keep the business running efficiently. Specifically the TPS provides timely documents and reports. They increase the competitive advantage of an organization and provide necessary data for tactical or strategic systems such as MIS and DSS. They also assure accuracy of data and information besides safeguarding assets and security of information. These systems are the backbones of any organization. They monitor, collect, store process and disseminate information for all routine significant business applications.

***The major characteristics include:***

* Process large amounts of data
* The sources of data that they process are internal and the output is mainly meant for internal audience
* They process information regularly can be on hourly basis, weekly basis
* Large storage capacity of data
* Process data at high speed
* Always process historical data
* The input and output data are always structured
* High level of details is always observed to ensure that input processing and output conforms to the existing structure
* They have a low computation complexity i.e. involve simple mathematical and statistical operation
* High level of accuracy data integrity and security is needed
* High reliability is needed
* They always support inquiry to the files and databases of the system online and ring time basis

**TPS DATA PROCESSING**

The Transaction processing systems processes data into two different ways:

## **BATCH PROCESSING**

Involves collecting transactions as they occur, placing them in groups or batches and then repairing and processing batches periodically i.e. at the end of every day or when so many transactions have been aborted

## **ONLINE PROCESSING**

It involves processing data as soon as a transaction occurs. The system updates the database as soon as a transaction is done and this update is done on real time. Transaction processing systems can be Internet based where they can involve an organization dealing with its customers and vendors through the support of telecommunications. This has leave to innovations such as Online Transaction Processing (OLTP). This system allow the user to capture data wherever it occurs at a faster rate and in a more economic order than if the user of the system was to feel physical forms or physical documents.

The system is also interactive and can allow the transfer of data in any form including multimedia, graphics and video. Can also support fast response time and storage of large databases in real-time and at low costs. However, it requires a client server system to implement. Additional benefits that an organization can have by using such an Internet based transaction system can include cost effectiveness, fast response time, effective storage of huge graphics and video databases, flexibility to accommodate unpredictable growth.

 - Timely search and analysis of large databases

- Interactive automatic billing that can enable a company to offer services to anyone not just subscribers

- High data through puts to support enquiries regarding massive file size

- Flexibility to accommodate unpredictable growth in processing demand and multimedia data such as pictures and sound are handled efficiently and effectively

* Decision making process fall along a continuum that range from highly structured referred to as programmed to highly unstructured (non programmed) decisions
* Structure process refer to routine and repetitive problems for which standard solutions exist in structured decisions all phases i.e. intelligence, design and choice are structured
* Unstructured processes are fuzzy complex problems for which there are not cut and dried solutions. None of the three phases; intelligence, design or choice is programmed. Usually human intuition is usually the basis for decision-making. Typical unstructured problems including planning new services to be offered, hiring an executive or choosing a set of research and development project for next year
* In a structured problem, all phases are structured and the procedures for obtaining the best solution are known. Whether the solution means finding an appropriate inventory level or deciding on an optimal investment strategy, the solutions’ criteria are clearly defined. They are frequently cost minimization or profit minimization. The manager can use computerized clerical assistance, data processing or management science models to support structured decisions.
* Semi structured problem, in which only some of the phases are structured require a combination of standard solution procedures and individual judgment. E.g. trading bonds, setting marketing budgets for consumer products and performing capital acquisition analysis. Here DSS is suitable. It can improve the quality of information on which decision is based by providing range of alternatives.
* Types of control are all managerial activities
	+ Strategic planning: the long range goals and policies for resource allocation
	+ Management control: the acquisition and efficient utilization of resources in the accomplishment of organization goals
	+ Operational control: the efficient and effective execution of specific tasks

**5.2 MANAGEMENT INFORMATION SYSTEMS**

Previously MIS is defined as the study of ISS in business and management. The term MIS also defines a specific category of ISS that serve the management level. These systems provide managers with reports and in some cases with online access to the organization’s current performance and historical records. MIS serve the functions of: Planning, Controlling and Decision-making at the management level

They depend upon the IPSS for their data. MIS summarize and report on the company’s basic operation, the basic transaction data from TPS, compressed are usually presented in long reports that are produced on a regular schedule. MIS usually serve managers interested in weekly, monthly and yearly reports/results; not day to day activities. MIS provide answers to routine questions that have been specified in advance and have a predefined procedure for answering them.

**5.3 DECISION SUPPORT SYSTEMS (DSS)**

Decision Support Systems are interactive computer based systems, which help decision makers to utilize data and models to solve unstructured models. A decision support system has the following features:

* Must have a data management component which must have a database and a database management system
* Must have a user interface subsystem that is used to communicate with the user
* Must have a model management component composed of financial statistical management science and other quantitative models that provide the systems analytical capabilities and an appropriate software management program to manage the models
* Must have a knowledge management component, this is a system that can support any of the other subsystems or act as an independent component providing knowledge for he solution of a specific problem. These features can be represented by a diagram

Other computer based systems

 (7)

Data Management System (1)

Model Management Base (2)

internal &

external

databases

Knowledge Manager (3)

 (6)

Dialogue Management

 (4)

 (8) DSS Application

 System

User

 (5)

**5.3.1 CHARATERISTICS OF DSS**

Decision Support Systems have the following characteristics:

* Provide support for decision makers at the management levels whether individuals or groups and mainly in semi-structured or structured situations by bringing together human and computerized judgment and Information
* They support several interdependent and sequential decisions
* They support all phases of decision-making process i.e. intelligence, design choice and implementation
* They are adaptable by the user overtime to deal with changing conditions
* Easy to construct and use
* Promote learning which leads to new demands and refinement of the application which leads to additional learning
* Usually utilize models, custom or standard made to allow efficient and effective solution of very complex problems
* Allow easy execution of sensitivity analysis i.e. the “what if” analysis, “goal seeking analysis”. What if analysis attempts to check the impact of a change in the assumption i.e. input data on the proposed solution e.g. what would happen to the total inventory cost if the originally assumed cost of carrying inventories is not 10% but 12%. GOAL SEEKING analysis attempts to find the value of input necessary to achieve a desired level of inputs. It represents a backward solution approach, example if in a DSS solution, if the profit yield is million shillings what sales volume would be necessary to generate the profit of 1.5 million

**5.4 EXECUTIVE INFORMATION SUPPORT SYSTEMS (EISS)**

The executive information support systems are computer based information system that serves the information need to the top executive. They provide rapid access to timely information and direct access to management report. They are user-friendly systems supported by graphic capabilities and provide exception reporting and drill down capabilities. They can also be easily connected online information services and electronic mail systems.

***The reason for usage of EISS includes:***

* The ability to face external pressures to the organization that include increased competition rapidly changing decision environment
* Need to access external databases
* Need to be more proactive
* Increasing government regulations

***Internal factors which can use the demand of EIS to increase can include:***

* Need for timely information
* Need for improved communication
* Need for access to operational data
* Need for rapid status updates on different activities
* Need for increased effectiveness
* Need to be able to identify historical trends
* Need for access to co-operative databases

***Some of the capabilities of EISS include***

* Drill down i.e. the systems have the ability to provide details of any given information by querying direct to the existing databases or even using intelligent agents to conduct a search in the internet or any available source of information that can support the drill down criteria
* The ability to identify critical success factors and determining the key performance indicators i.e. the EIS assist in identifying, monitoring, measuring a company’s standards of such factors that can be strategic, managerial or operational which will play a very important role in the organization’s success. Such factors are like comfort ability, financial, marketing, human resources, planning economic analysis and customer trends
* Status access - this is enabling the user of the system to access at any time latest data or reports on the status of key indicators or other factors
* Trend analysis - this is to enable the users of the set EIS to identify the movement of an important variable in an organization in order to be able to forecast the feature trends
* Exception reporting that enables the user of the system to pay attention to significant deviations from standards in order to enable decision maker to concentrate on areas that are extremely critical and might lead to very bad performance or very good performance

**5.5 EXECUTIVE SUPPORT SYSTEM (ESS)**

This is a comprehensive support system that goes beyond executive support to include analysis support communications, office automation and intelligence. However, much of its features resemble those of EIS but ESS includes the use of robotics in its support of the executives required to make decisions in an organization.

## **5.6 KNOWLEDGE MANAGEMENT SYSTEMS**

Businesses do not run on data but they run on information and their knowledge on how to put that information to use successfully. The transformation of data into knowledge is accomplished through a process that starts with data collection from various sources. This data is stored in a database where it can be preprocessed and stored in a data warehouse. To discover knowledge the processed data may go through a transformation that makes them ready for analysis. The analysis is done with data mining tools which look for patterns and intelligent systems which support data interpretation. The results of all these activities are generated knowledge. Such knowledge can be presented using different tools of presentation and can either be stored in a knowledge base or presented to the user. This process of converting data to knowledge is known as data life cycle.

In an organization data can be internal i.e. it can be stored in the transaction databases or personal data or external environment which can be commercial database or even satellite. This data in whichever source has to be collected through methods such as observations, surveys, time studies, contributions from experts and so on. Regardless of how they are collected, they must be validated in order to ensure that the information and knowledge that is obtained from them will be relevant and dependable. The validation will be aimed at removing problems in data such as errors, delays, improper data and improper organization or unavailability. If wrong data is collected then the information or knowledge to be created will be faulty hence data control must be put else the result will be GI GO (garbage in/garbage out) situation. To ensure data quality the following attributes must be present in data.

These are:

- Accuracy - Deliverability - Accessibility

- Objectivity - Reputation - Security

- Relevance - Value added - Timeliness

- Completeness - Interpretability - Ease of understanding

- Causes representation - Consistent representation

Data that has been preprocessed and stored in a data warehouse can be accessible for analysis and representation. A data warehouse is a single depository place for keeping all types of databases. It enables data to be accessed quickly as they are located in one place and the users of data can access such data easily and frequently. Data warehouses are organized to allow for the storage of metadata.

Metadata also known as a data mart is a replicated subset of the data warehouse and it is dedicated to a functional or regional area, for example, a company may keep data marts for different functions such as human resources, marketing, engineering and so on. Such data marts and data warehouses support analytical processing which is done in order to discover trends in data which is the basis of trusting and knowledge creation.

The process of extracting useful knowledge from volumes of data is known as knowledge discovery in databases or just knowledge discovery.

This process starts with identifying which data to consider in the data ware then processing this data to be ready for analysis. The objective is to identify valid, novel potentially useful and ultimately understandable patterns in data. In order to get the patterns, the knowledge discovery process can use any of the following three:

* Massive data collection
* Powerful multiprocessor computers
* The data mining algorithms

Data mining is searching for valuable business information in large databases. It can follow techniques such as case based reasoning where historic cases can be used to recognize patterns.

It can also follow neural computing. This is a machine learning approach by which historical data can be examined for pattern co-ordination or it can follow intelligent agents which in modern times uses internet to discover the right information in the internet or from the internet based databases or it can use association analysis which is in most cases expressions of statistical rules among items. In massive data collection knowledge discovery provides with huge volumes of data from where it can be believed that from those large volumes of data from where it can be believed that from those large volumes, knowledge can be discovered using any of the techniques that can be available to the user.

By use of powerful computers, knowledge based systems can be applied to look for trends in data which can be then applied to various uses that the user is interested. Once knowledge has been discovered, it has to be presented. If presentation has to be effective, then visualization technologies have to be used to communicate such knowledge to the users. Technologies such as digital images, geographical information systems, graphical user interfaces, multidimensional tables and graphs, virtual reality and animation make the knowledge presentation more attractive and understandable to users. When this presentation is done among the employees of an organization, it is said that an organization learns. This is critical because it enables an organization to survive and to sustain competitive advantage over its competitors.

## **5.7 EXPERT SYSTEMS**

Expert systems are computerized advisory programs that attempt to imitate the reasoning process of experts in solving difficult problems. These systems can be used by organizations to increase productivity and to argument work force in specialty areas where human experts are becoming increasingly difficult to find and retain or are too expensive to use.

An expert system attempts to mimic human experts. Experts have specific knowledge and experience in a specific problem area. This specific knowledge and experience can be programmed and stored in computer software. Technically an expert system is decision-making software that can reach a level of performance comparable to or even exceeding that of a human expert. Such a system stores the expertise and it can make inferences and a conclusion. Then like human experts, it advices non-experts and explains if necessary the logic behind advice.

Expertise in the extensive is the task specific knowledge acquired from reading and experience. It enables experts to make better and faster decisions than non-experts in solving complex problems. Expertise takes a long time usually several years to acquire and it is distributed in organizations in an uneven manner. The transfer of expertise from an expert to a computer and then to the user involves four steps:

* Knowledge acquisition from experts and other source
* Knowledge representation in the computer
* Knowledge referencing
* Knowledge transfer to the user

***Organizations can benefit from expert systems in the following ways:***

* Increased output and productivity which always support mass customization
* Increased quality as expert systems can increase the quality of providing consistent advise and reducing error rates
* Capture of scarce expertise and its dissemination
* Expert systems can operate in hazardous environment where a human being may not be able to work
* Expert systems can make knowledge to several people in many occasions e.g. can be implemented at a help desk where people acquire and receive advice
* Reliability as expert systems do not become tired or fall sick and always pay consistent attention to details and do not overlook relevant information and potential solutions
* Increased capabilities of other computerized systems i.e. expert systems can be made even more effective as they can easily be integrated in other systems in organization
* Provide training to novice users
* They have the ability to work with incomplete or uncertain information
* They enhance problem solving capabilities and also decrease decision-making time

## ***Limitations***

* Knowledge to be captured is not always readily available
* Expertise is hard to extract from humans
* The approach of each expert to a situation may be different nevertheless correct
* It is hard even for highly skilled experts to accurately access situations under time pressure
* Users of expert systems have natural cognitive limits so they may not use the benefits of the system to the fullest extent
* Lack of trust by end users may be barrier to expert system use
* Knowledge transfer is subject to perceptual and judgmental basis

## **5.7.1 COMPONENTS OF AN EXPERT SYSTEM**

An expert system is composed of five main components:

1. ***Knowledge based component*** which contains knowledge necessary for understanding, formulating and solving problems. It includes two basic elements. These are:
* Facts of the problem areas
* Rules that direct the use of knowledge to solve specific in a particular domain
1. ***Blackboard*** that an area of working memory set aside for the description of a current problem as specified by the input data and also used for recording intermediate results
2. ***Brain or inference engine*** that is a computer program that provides a methodology for researching formulating conclusions
3. ***The interface*** that allows a computer user to dialog in any language as natural as possible in order to enable the inference engine to match the problem symptoms in the knowledge base and generate advice
4. ***Explanation subsystems*** which is responsible for explaining the expert systems behaviour and also explain why certain questions are asked, how a conclusion was reached, why one rejected and the plan to reach the solution

A knowledge refining system can be included that enables to analyze their own performance and learn from it in order to improve their future consultations.

Knowledge base

 Facts: What is known about the

 domain area

 Rules: Logical reference (e.g. between

 symptoms and causes)

User

 Facts about the

 specific incident

User Interface

Explanation

facility

Knowledge Engineer

 Knowledge

 Inference engine draws

 conclusions

 acquisition

Recommended action

Expert & documented knowledge

Blackboard (workplace)

Knowledge refinement

## **6 INFORMATION TECHNOLOGY PLANNING**

1. It is the organized planning or I.T. infrastructure and applications portfolios done at various levels of the organization
2. IT planning is important for end users for the following reasons:
* End users do I.T. planning for their own units
* End users must participate in the corporate I.T. planning, hence must understand the process
* Corporate I.T. planning determines how the I.T. infrastructure will look. The future of every unit in an organization will be impacted by the infrastructure
1. A good I.S. plan has to keep in mind the internal customers as well as the external customers and vendors. The I.S. has to work closely with the business side to make sure I.S. is helping the company stay competitive.
2. A strategic information system plan identifies a set of computer based applications that will help the company reach its business goals
3. IT planning has similarities and differences as compared to any business planning e.g. forecasting which part of planning is predicts the future. Planning is preparing for the future.

## **6.1 ISSUES IN IT PLANNING**

* The basic information systems planning address the four general issues:
* Aligning the I.T. plan with the organizational business plan
* Designing I.T. architecture for the organization in such a way that users, applications and

Databases can be integrated and networked together.

* Efficiently allocating information systems development and operational resources among

Competing applications

* Planning information systems projects so that they are completed on time and within budget and include the specified functionalities

## **6.2 ALIGNMENT OF THE IT PLAN WITH THE ORGANIZATION PLAN**

* The first task of I.T. planning is to identify information systems applications that fit the priorities established by the organization
* Organizational strategies and plans are often not available in written form, or they may be formulated in terms that are not useful for information systems planning. It is often difficult to ascertain the strategies and goals to which the information systems plan should be aligned.
* Without this alignment the information systems plan cannot get and keep long term organizational support
* The figure below represents the relationship between business, I.S. and I.T. strategies

 BUSINESS STRAGEY

I.T. impact & potential

* + - * Business decisions Where is the business
			* Objectives and direction going and why
			* Change

 Supports business Direction for business

 I.S. STRAGEGY

* Business based
* Demand orientation What is required
* Application focused

Infrastructure & services Needs and priorities

 I.T. STRATEGY

* Activity based
* Supply orientation How can it be delivered
* Technology focused

## **6.3 DESIGN OF INFORMATION TECHNOLOGY ARCHITECTURE**

Information technology architecture refers to the overall high-level structure of all information systems in an organization. This structure consists of applications for various managerial levels (operational control, management planning and control and strategic planning) and applications oriented to various functional-operational activities such as marketing, production and distribution. Information technology architecture also includes infrastructure e.g. databases, supporting software and networks needed to connect applications together. Information architecture for an organization should guide long-range development as well as allow for responsiveness to diverse, short range information systems demands.

## **6.3.1 ALLOCATION OF RESOURCES**

Rational, optimal allocation of information system resources among competing organizational units is difficult. This is true if the functional or organizational unit requirements have not been integrated into a planning framework and establishes completeness and priority. Sometimes organizational dynamics, such as relative power and aggressiveness are used in place of rational allocation.

## **6.3.2 COMPLETION OF PROJECTS ON TIME AND WITHIN BUDGETS**

Few IS projects or applications are completed on time or within budget. Often, under the pressure to finish a project on time and/or within budget certain promised features are omitted.

This reduction in functionality and/or quality frequently leads to user dissatisfaction with the resultant system. Missing or inadequate features must be added later in what is usually called “system maintenance”. Better project planning could avoid or reduce the impact of such mishaps.

## **6.4 PROBLEMS WITH IT PLANNING**

* I.T. planning can be expensive and time-consuming process
* Research findings suggest that, although IT planning is desirable, organizations should be careful not to devote an excessive amount of resources to these efforts e.g. time, human resources, as it will derail other productive functions in an organization.
* Organizations should beware of pitfall of allowing IT planning to become an end in itself.
* To achieve the potential benefits of IT planning, organizations need to focus greater effort on actually implementing the plans they develop.

**6.5 A FOUR-STAGE MODEL OF IT PLANNING**

Below is a basic four-stage model of I.S. planning

Generic Strategic Information Resource Project

activity IT requirements allocation planning

 planning analysis

Most organizations engage in each of the four stages, but their involvement tends to be sporadic and influenced by problems as they occur, instead of reflecting a systematic, stage-by-stage process.

Major IT planning activity Description

Strategic IT planning Establishing the relationship between the overall

 organizational plan and the IT plan

Information requirements analysis Identifying broad, organizational information requirements to establish a strategic information architecture that

 can be used to direct specific application

Resource allocation Allocating both I.T. application development resources and operational resources

Project planning Developing a plan that expresses schedules and resource

 Requirements for specific information systems projects

**7 CONCEPT OF DATABASE**

Databaseis a data structure used to store organized information. A database is typically made up of many linked tables of rows and columns. For example, a company might use a database to store information about their products, their employees, and financial information. Databases are now also used in nearly all ecommerce sites to store product inventory and customer information. Database software, such as Microsoft Access, FileMaker Pro, and MySQL is designed to help companies and individuals organize large amounts of information in a way where the data can be easily searched, sorted, and updated.

**7.1 DEFINITIONS OF A DATABASE**

1. A Database (DB) is structure that can store information about: multiple types of entities, the attributes that describe those entities; and the relationships among the entities
2. A Database (DB) is collection of related data - with the following properties:
* A Database is logically coherent and has some relevant meaning
* A Database is designed, built and populated with data for a specific purpose
* A Database represents some aspect of the real world.
1. A database is an *integrated*, *self-describing* collection of *related* data
* ***Integrated:*** Data is stored in a uniform way, typically all in one place (a single physical computer for example)
* ***Self-Describing:*** A database maintains a description of the data it contains (Catalog)
* ***Related:*** Data has some relationship to other data. In a University we have *students* who take *courses* taught by *professors*

By taking advantage of relationships and integration, we can provide *information* to users as opposed to simply *data*. We can also say that the database is a *model* of what the users perceive.

**7.1.1 DATA MINING**

Data mining is primarily used as a part of information system today, by companies with strong consumer focus retail, financial, communication, and marketing organizations. It enables these companies to determine relationships among "internal" factors such as price, product positioning, or staff skills, and "external" factors such as economic indicators, competition, and customer demographics. And, it enables them to determine the impact on sales, customer satisfaction, and corporate profits. Finally, it enables them to "drill down" into summary information to view detail transactional data. With data mining, a retailer could use point of sale records of customer purchases to send targeted promotions based on an individual's purchase history. By mining demographic data from comment or warranty cards, the retailer could develop products and promotions to appeal to specific customer segments.

**7.1.2 DATA WAREHOUSING**

A data warehouse is a copy of transaction data specifically structured for querying and reporting. The main output from data warehouse systems is either tabular listings (queries) with minimal formatting or highly formatted "formal" reports on business activities. This becomes a convenient way to handle the information being generated by various processes. Data warehouse is an archive of information collected from wide multiple sources, stored under a unified scheme, at a single site. This data is stored for a long time permitting the user an access to archived data for years. The data stored and the subsequent report generated out of a querying Process enables decision making quickly. This concept is useful for big companies having plenty of data on their business processes. Big companies have bigger problems and complex problems. Decision makers require access to information from all sources. Setting up queries on individual processes may be tedious and inefficient. Data warehouse may be considered under such situations.

**7.2 FILE SYSTEMS**

A File System is a collection of individual files accessed by applications programs. Usually the files are stored separately in cabinets and the control of the data is not centralized. It is also called traditional file processing approach that focuses on informational needs of individual departments/applications. For example, accounting department has its own application, similarly Sales, Production, Purchases department and others each have its own application.

**7.2.1 LIMITATIONS OF A FILE SYSTEM:**

* ***Data redundancy -*** These files are likely to have some data in common, i.e. duplication of data (data redundancy). This makes it expensive to store and update such files. It wastes space and can lead to data integrity (inconsistency) problems
* ***Lack of data integrity*** - Since the files are maintained separately data about one record may bear inconsistent values, thus leading to inaccurate reporting.
* ***Incapable of ad hoc reporting -*** Since the files are not related easily it would take much time to get an unplanned-for report involving data analysis from all the functional files.
* ***Security risks*** - The data is owned by the departments that use it and therefore it is not easily to control the data as an organization resource making data possible to be subject to fraud.
* ***Isolated Data*** - Makes coordinating, assimilating and representing data difficult
* ***Application Program Dependencies*** - Changes to a single file can require changes to numerous application programs thus incompatible Files
* ***Lack of Data Sharing*** - Difficult to control access to files, especially some portions of files

**7.3 DATABASE MANAGEMENT SYSTEMS**

Redefine the term database as a single organized collection of structured data, stored with a minimum duplicated data so as to provide a consistent and controlled pool of data. This data is common to all users of the system, but is independent of programs that use the data. The following are the features that characterize a database approach

* ***Share ability of data*** - Data is stored in a centralized database to which all potential users are permitted access.
* ***Centralized control -***  The database is managed and controlled by a Database Administrator. Centralization enables DBA to be impartial toward individual departments needs and to make decisions that are to the best of the interest of the organization.
* ***Adaptability -*** Database approach is adaptable to change. It allows users to easily relate existing data items quickly to others that emerge. New requests are easily assimilated into the existing database as the database grows.
* ***Application specific approach -*** This means there is a set of electronic files dedicated to each business function with each set being accessed by a different program.

**7.3.1 ADVANTAGES OF DATABASE APPROACH**

* ***Redundancy control -***  Data items are stored ideally once therefore there is reduced replication or duplication on data.
* ***Improved data integrity -*** Due to the fact that data about a record is stored ideally once when it is updated everyone using that data gets up to date data. There are therefore no inconsistencies in data stored. This is an aspect of data integrity.
* ***Improved data security*** - Since data is centrally managed by the Database Administrator it is easy to monitor and control access and use of the database. This done using user names and passwords, and assignment of user rights and their subsequent revoking when necessary
* ***Data independence -*** The data in the database is independent of the programs that access it and the storage media in which it is stored. Therefore programs that access the data can change without need to change the database or even the storages.
* ***Multiple schemas /user views -*** Since the database is designed around the organization rather than specific applications it is possible to have many user views or sub schemas according to users’ needs. User views are only selected record types, fields or relationships in the conceptual database.
* ***Reduced overall cost -*** Due to reduced redundancy, data independence and consequently database adaptability, there are substantial cost reductions by use of database approach.
* ***Data Shareability -*** Data in a database is widely available for all users
* **O*rganization resource -*** Installation of a database encourages management of data as an organization resource thus fostering the achievement of organizations objectives.
* ***Ease in auditing*** - Data is centrally managed and controlled so it makes it easy to audit the system for it efficiency and effectiveness.

**7.3.2 DISADVANTAGES OF DATABASE APPROACH**

* ***Complex conceptual -*** Developing a conceptual database for an entire organization is usually too complex. Finally some organizations end designing several functional database e.g. financial databases, marketing databases, etc.
* ***High acquisition costs –*** Need to hire database related employees, An organization must hire a DBA and other related staff, system development time, acquisition of DBMS software, file conversion, database operations: such as back-ups
* **C*omplex programmer environment -*** Testing a DBMS during its development is very complex.
* ***Potentially catastrophic*** - If DBMS fails the loss to the organization can be great since its operations may get totally impaired.
* ***Longer running time for applications -*** As programs complexity increases, so does the amount of time required to run the program. Therefore applications using DBMS may take longer to run unless installed on very fast CPUs or disk drives and remain memory resident.
* ***High costs of operations -*** The costs of converting applications to a new DBMS are quite high and also DBMS requires, Definition of database, DBMS, DBA, file management systems, Advantages and Disadvantages of Database approach, Components of DBMS, Types of DBMS structures, Duties of DBA

**7.4 CONTENTS OF A DATABASE**

1. ***User Data* -** Data users work with directly by entering, updating and viewing. For our purposes, data will be generally stored in *tables* with some *relationships* between tables. Each table has one or more *columns*. A set of columns forms a database *record*. Recall the fact that a database is *self- describing*
2. ***Metadata:*** Data about data i.e. Data that describe how user data are stored in terms of table name, column name, data type, length, primary keys, etc. Metadata are typically stored in *System tables* or *System Catalog* and are typically only directly accessible by the DBMS or by the system administrator.

***NB:*** *Applications Metadata* - is accessed via the database development programs and where many DBMS have storage facilities for forms, reports, queries and other application components.

1. ***Indexes* -** In keeping with our desire to provide users with several different views of data, indexes provide an alternate means of accessing user data. Sorting and Searching: An index for our new banking example might include the account numbers in a sorted order. Indexes allow the database to access a record without having to search through the entire table. Updating data requires an extra step: The index must also be updated. Example: Index in a book consists of two things: A Keyword stored in order and a *pointer* to the rest of the information. In the case of the book, the pointer is a page number.

**7.4.1 DATABASE SYSTEM COMPONENTS**

* The term database system refers to the organization of the components that define and regulate the collection, storage, management and the use of the data within a database environment. The database eliminates most of the file systems that have data inconsistencies, anomalies and structural dependency problems.
* The current generations of the DBMS software stores not only the data structures in a central location but also stores the relationships between the database components. The DBMS also takes care of defining all the required access paths on the required component. Consider the following database system components
1. **Hardware –** this identifies all the system’s physical devices e.g. the composition peripherals, storage devices etc
2. **Software –** this comprises of the collection of the programs used by the computer within the database system and includes:-
	* ***Operating system*** – manages the hardware components and makes it possible for all other and software to run or use the computer
	* ***DBMS*** – manages database within the database system e.g. Oracle, DB2, Ms Access etc
	* ***Application programs and utilities*** to access and manipulate data in the database system
3. **Data –** the collection of the facts that are stored in the database and serves as the raw material from which the information is generated – thus the determination of what is to be stored in the database and how the data is to be organized; which is a vital part of the database design task
4. **Procedures –** these are instructions that govern the design and the use of the database system. They enforce the standards by which the business is conducted within the organization and with the customers. They also ensure that there is an organized way to monitor and audit both the data that enters the database and the information that is generated through the use or processing of such data
5. **People –** these are basically the database users and include:-
* ***Systems Administrator*** – oversees the database system’s general operations
* ***Database Designer*** – the database architects who design the database structure
* ***Systems Analyst*** – analyses and implements the application programs and creates the procedures through which the users access and manipulate the data in the database
* ***End Users*** – these are the people who use the application programs to run the organization’s daily operations
* ***Database Administrator*** – manages the DBMS use and ensures that the database is operating properly

**7.4.2 DATABASE ADMINISTRATOR**

The DBA is a person who controls activities in a Database Management System environment. The person must have good knowledge of the databases and the DBMS. The person should also have a thorough knowledge of the organization and its information system needs.

**7.5 FUNCTIONS OF DBA**

The DBA must perform the following roles:

* ***Scheme definition*** *–* original database scheme is created by writing a set of definitions which are translated to tables that are permanently stored in the data dictionary
* ***Storage structure*** *–* ensure that facilities to access data and produce outputs are appropriate for the organization.
* ***Access methods definition*** *–* these are translated by the data storage and definition language compiler
* ***Physical modifications*** *–* allows for the modifications to the appropriate internal systems tables
* ***Granting authorization*** *–* grant data accessso as to regulate which the parts of the database users can access
* ***Maintaining integrity constraints*** *–* these are special system features that are retained whenever an update takes place in the system and that data can be added in the required formats and constraints
* ***Integrity constraint specification*** - ensures that data in the database is complete, accurate, and not duplicated.
* ***Maintaining flexible structure*** - provides for a form which can be modified without endangering then instances in the database.
* ***System controls*** - provide for system recovery, backup procedures, control on passwords, privileges, granting of permissions etc
* ***Document controls*** - so as to ensure that the applications and equipment are safe from piracy and vandalism

**7.6 DATABASE SECURITY**

 As database practitioners, we must provide a means of preventing unauthorized use of data in a database. Three areas are considered

1. ***Access Control***: Who should be allowed access to which databases? This is typically enforced using system level accounts with passwords.
2. ***Authorization***: for the purposes of:
	* *Reading Data* - Such as reading another employee's salary (using a SELECT statement)
	* *Writing Data* - Such as changing a value in a database (using UPDATE or DELETE)
3. ***Statistical Information:*** Enforcing who should be allowed access to information derived from underlying databases (Census example).

**7.6.1 DB SECURITY ISSUES**

* Legal – maintain licenses and contract terms
* Ethical considerations - Who has the right to read what information
* Policy issues - Who should enforce security (government, corporations etc)
* System-Level issues - Where should security be enforced in the system and how

**7.7 DBMS SECURITY FEATURES**

***7.7.1 AUTHENTICATION***

Accounts have user-ids and password; Passwords are stored in an encrypted format in the data dictionary. Passwords include user passwords whether across the network or local connections, server to server passwords, and database administrator passwords. Host-based authentication which is based on the operating system’s user accounts which are then passed on to DBMS

***7.7.2 PRIVILEGES***

New users must be given privileges before they can logon or execute any database operation. There are an impressive number of privileges that can be given, around 100 in all. There are two types of privileges available to be granted to users. They are system and object privileges.

* *System privileges* allow a user to create or manipulate objects, but do not give access to actual

Database objects. System privileges allow a user to execute commands such as ALTER

TABLE, CREATE TABLE, EXECUTE ANY PROCEDURE, and DELETE TABLE.

* *Object privileges* are used to allow access to a specific database object, such as a particular

Table or view and are given at the view level. This allows for an administrator to give users access to a chosen sub-set of columns or rows in a table, rather than the entire table. Oracle also allows for the user of the GRANT privilege which allows a user to GRANT their privileges to another user or role for objects that they own.

***7.7.3 ROLES***

Roles are used to ease the management task of assigning a multitude of privileges to users. Roles are first created and then given sets of privileges that can be assigned to users and other roles. Users can be given multiple roles. It is much easier to create sub-sets of privileges that are organized into roles and then assign the role to one or more users. Roles can be protected with passwords. Roles that are protected with passwords require that a password be provided before activating a role unless it is the user’s default role. The password feature can be useful in situations where a user needs access to data through an application but it is not desirable to give the user direct access to the data through the use of a report writing tool, etc. The password can be supplied by the application, thus preventing the user to even need to know the password.

***7.7.4 PROFILES***

Profiles allow the administrator to place specific restrictions and controls on a number of system resources, password use etc. These profiles can be defined, named, and then assigned to specific users or groups of users. Two types of profiles:

* *System resource profiles* can be used to put user limits on certain system resources such as CPU time, the number of data blocks that can be read per session or program call, the number of concurrent active sessions, idle time, and the maximum connection time for a user. Define and enforce password rules such as password life, grace logins, and account lockout after a defined number of failed login attempts.
* *Product profiles* can be used to prevent users from accessing specific commands or all commands in Oracle SQL, SQL\*Plus, SQL\*Report Writer, and PL\*SQL. Use of this option allows the administrator to do such things as prevent user access to the operating system (SQL\*PLUS HOST command), and to prevent unauthorized copying of data from one table to another (SQL\*PLUS COPY command).

**7.7.5 DATABASE SECURITY THREATS**

A threat is any situation or event, whether intentional or unintentional, that will adversely affect a system and consequently an organization

* ***Human Error*** -The risks with the highest incidence. Examples include entering incorrect transactions, failing to correct errors, using wrong data files during processing, and failing to carry out instructions in respect of security procedures
* ***Technical Error***- This is probably the second most common risk after error. They involve malfunctioning of hardware, system software, application software or communications software
* ***Natural Disasters***- Fire, flooding, bombs, impact and lightening etc.
* ***Deliberate Actions*** - Fraud. There is a wide variety of different methods by which such fraud can be committed.
* ***Commercial Espionage*** - When considering the value of data to competitors the organization should consider how a particular item of data might complement other data, which a competitor has obtained from publicly available sources.
* ***Malicious Damage*** - Disaffected employees destroying data also includes sabotage also falls under this heading.

**7.7.6 SECURITY POLICY**

* A security policy will include the following:
* Identification of and qualification of risks
* Identification of counter-measures
* Costing of counter-measures
* Selection of counter-measures
* Implementation of counter-measures and drawing up of a contingency plan.

***NB: Risk Analysis -*** A contingency can be defined as 'an unscheduled interruption of computing services that requires measures outside the day to day routine operating procedures. A contingency plan must therefore provide for standby procedures to those operations can be performed while normal services are disrupted, recovery procedures, and personnel management policies.

**7.7.7 ADMINISTRATIVE CONTROLS**

* Building controls
* Contingency plans
* Secure positioning of equipment
* Physical access controls
* Personnel controls e.g. selection and division of responsibility.

**7.7.8 DEVELOPMENT CONTROLS**

When a database system is developed, there should be controls over the design, development and testing

* Program testing, system testing and user department's acceptance testing
* Formal Technical Review - Controls over changes by use configuration management
* Controls over file conversion - Standards are required for the documentation such as:
* Requirement Specification; Program Specification; Operations Manual, User Manual
* Legal Issues - legal contracts concerning software, Maintenance Agreements, Copyrights, Licenses, Privacy (Data Protection Act)

**7.8 DATABASE AVAILABILITY**

* ***Backups*** - "Cold" backups allow backups when the database is down. "Hot" backups allow backups to be done while the database is up. Logical backups or "exports" take a snapshot of the database at a given point in time by user or specific table(s) and allow recovery of the full database or of single tables if needed. There is also a sophisticated Recovery Manager facility which catalogs backup sets to aid in successful recovery
* ***Database Encryption* -** Oracle 8i provides a special PL/SQL package which can be used to encrypt and decrypt data. However, encryption has a high cost in over-head due to the processing power needed to execute the complex encryption/decryption algorithms. For these reasons, Oracle 8i does not provide full database encryption.
* ***Auditing*** - There are three standard types of auditing available in Oracle, including SQL statement-level, privilege-level, and object-level auditing. Audit records can be written to the standard Oracle audit table, to an operating system audit trail (dependent on operating system used), or to an external file. The three basic types of auditing can be done by user, successful or non-successful attempts, and by session or access time intervals. The standard auditing is useful but is at the table level. It cannot be used to audit at the record or column level.

## **8 COMPUTER SYSTEMS VULNERABILITY**

Information Systems are made up of many components that may be in several locations. Each information system is vulnerable to many potential hazards. Vulnerability is increasing as many information systems become networked thus increasing the threats. Threats to information system can be categorized into:

## **8.1 UNINTENTIONAL THREATS**

Unintentional threats can be caused by human errors, environmental hazards or can be accidental computer failures. Human errors can be caused by the design of the hardware in programming, testing, during data collection, data entry, authorization and instructions. Environmental hazards include earthquakes, hurricanes, storms, power failures, fire, defective air conditioning explosions, radioactive fail outs, smoke, heat, flood, etc. Computer failures can be a result of poor manufacturing or defective materials.

## **8.2 INTENTIONAL THREATS**

Intentional threats occur as a result of intentional actions. Examples include: theft of data, inappropriate use of data e.g. manipulating inputs, theft of computer time, theft of equipment or programs, deliberate manipulation in handling, entering, processing or transferring or programming data, labour strikes, riots or sabotage, malicious damage to computer resources, destruction from viruses, computer abuses and crimes.

**8.3 COMPUTER CRIMES**

Computer crimes in many ways resemble conventional crimes. They can occur in four ways:

* Can target a computer e.g. a computer may be stolen, destroyed or a virus may destroy data in a computer
* The computer can be the media of the attack by creating an environment in which a crime or fraud can occur.
* False data are entered into a computer system to mislead individuals examining a system support
* Computer can be the tool by which the crime is perpetrating a computer is used to plan the crime but the crime does not involve a computer.

The computer can be used to intimidate or deceive e.g. computer statistics or show forecasts that are deceiving in order to confuse or convince people who have to depend on the statistics or forecasts to make decisions. Computer crimes can be performed by outsiders to an organization to penetrate a computer system or by an insider who is authorized to use the computer system but misuses the authorization. Such a person is known as a hacker. If the intention of the hacker is to cause malicious damage he is known as a cracker. Computer criminals are various and frequently innovative in their attack method. The two basic approaches that they use are data tampering where false data, fabricated data or fraudulent data is entered into the system or the existing data is changed or deleted.

* Data tampering can also be done through programming techniques where skilled criminals can modify a computer program with the intention of committing fraud.
* Through viruses which is the introduction of undesired program in a system that can cause files, databases, other programs or even parts of the computer hardware to malfunction. When a virus is attached to a legitimate program, that program becomes infected without the owner becoming aware and the infection may spread causing damage to the program and other programs of files in the system.

Information systems must be secured from all types of attacks by providing security and controls that aim to protect the system and its components. To protect information system is not a simple or inexpensive task due to the fact that there are very many threats. Information systems components are always widely distributed, many users, technological changes are very fast thus requiring frequent upgrades to the control and security measures as well. Also many crimes are undetected or may even go for a long period of time. People tend to violate security procedures because procedures and inconvenient, it may require a lot of knowledge for someone to commit a computer crime and the cost of preventing hazards can be very high and many organizations may not afford.

However, information systems can be protected by inserting controls i.e. defense mechanisms which can be intended to prevent accident hazards, to deter intended acts, to detect problems as early as possible, to enhance damage and recovery and correct problems. The selection of specific strategy depends on the objective of the defense and the perceived cost benefit. The following defense strategies can be implemented:

* ***Controls for prevention and difference*** – This is aimed at preventing errors from occurring, to deter criminals from attacking and to deny access to unauthorized people. This is important where potential damage to the information system is very high.
* ***Detection*** – It may not be possible to prevent all hazards therefore deterring measures may not work therefore unprotected systems are vulnerable to attach hence if the attack can be detected as early as possible it will be possible to combat it before it causes damage e.g. one may not protect or prevent fire from occurring or a virus from attacking but if either of this is detected early enough the damage can be minimal
* ***Imitation*** – This means minimizing losses once a malfunction has occurred. It can be accomplished by including a fault tolerant system that permits operation in a degraded mode until full recovery is made
* ***Recovery*** – This defense strategy explains how to fix a damaged information system as quickly as possible. It involves replacing of components that have been affected in order to recover as fast as possible.
* ***Correction*** – This strategy focuses on the repairing of the damaged components and also preventing the problem for occurring again.

## **8.4 GENERAL COMPUTER CONTROLS**

***The Defense Strategies*** can be implemented either as application controls or general controls. Some are intended to protect against human errors or others protect against natural causes. General controls are established to protect the system regardless of the specific application e.g. protecting hardware and controlling access to a computer centre. Application controls as safeguards that are intended to protect specific applications, major categories of general controls include physical controls, access controls, data security controls, network controls and administrative controls.

***The Physical Controls*** refer to protection of computer facilities and resources which include computers, data centers, software manuals and networks. Physical controls protect against most natural hazards and subhuman hazards and are commonly referred to as the first line in defense.

They include the following:

* Appropriate design of a computer centre so that it is fireproof and waterproof
* Shielding against electromagnetic fields
* Good fire prevention, detection and extinguishing system
* Emergency power shut off and backup batteries
* Properly designed maintained and operated air conditioning system
* Motion detector alarms that detect physical intrusion

## **8.4.1 ACCESS CONTROL**

This refers to the restriction of unauthorized access to a portion of computer system or the entire system. To gain access the user must be authenticated and this can be done in three steps:

* To allow physical access to the terminal
* To access the system
* To access specific commands transactions privileges programs and data within the system.

Access control can be accomplished by the user using something the user has e.g. token or smartcard or using the user e.g. signature, voice, fingerprint or retinal scan which are all implemented through biometric controls.

A biometric control is defined as an automated method of verifying the identity of a person based on psychological or behavioral characteristics. Common biometrics includes a photographs, fingerprint, voice, signature, hand geometry, keystroke dynamics and blood vessel patterns in the retina of a person’s eye.

## **8.5 DATA SECURITY CONTROLS**

This is concerned with protecting data from accidental or intentional disclosure to unauthorized persons or from unauthorized modification or destruction. These controls are implemented through operating systems, security access control programs, data communication products, and backup and recovery procedure and application programs. There controls address the following issues:

* Confidentiality of data
* Access control
* Critical nature of data
* Integrity of data

***They must reflect the following two basic principles:***

* Minimal privilege i.e. only the information the user needs to carry out an assigned task should be made available to him or her
* Minimal exposure i.e. once a user gains access to sensitive information he or she has the responsibility of protecting it by making sure only people whose duty require it obtain knowledge of this information while it is processed, stored or in transit.

***Data integrity*** is the condition that exists as long as accidental or intentional destruction, alteration or loss of data does not occur. It is the preservation of data or for its intended use.

## **8.5.1 COMMUNICATION CONTROLS**

These controls are essential in protected data that is in transit through the Internet or intranets. The most common measures of protecting information in a network include: access control that includes authentication and passwords, encryption, cable testing and firewalls. Access controls safeguards against dial-in attempt. It authenticates the personal identification number assigned to every user and also user passwords. It can also include biometrics. Encryption encodes regular digitized text into unreadable scrabbled text or numbers to be decoded upon receipt. It accomplishes three purposes:

* Identifying legitimate senders and receivers
* Preventing changing any transaction or message
* Accomplishes privacy

Cable testing is popular in LANS and is used to find faults that can occur with LAN cabling. It can also include protocol analysis which allows users to inspect the contents of information packets as they travel through networks. Firewalls are groups of systems that enforce an access control policy between two networks. They are commonly used as a barrier between secure cooperate network or any other internal network and the Internet which is always assumed to be insecure. The firewall follows state guidelines that either permit or block traffic. It is designed with clear and specific rules about what can pass through.

## **8.5.2 ADMINISTRATION CONTROLS**

These controls deal with issuing guidelines and monitoring with the guidelines. They can include:

* Appropriately selecting training and supervising employees especially in accounting and information systems.
* Fostering company loyalty
* Immediately relocking access privileges of dismissed, transferred or resigned employees
* Periodically modifying access control with such passwords
* Developing programming documentation standards to make auditing easier
* Holding periodic random audits of the system
* Insisting on security bonds for key employees
* Instituting separation of duties by dividing sensitive computer duties among as many employees as economically feasible in order to decrease chances of intentional or unintentional damage

## **8.5.3 APPLICATION CONTROLS**

They are intended to protect the content of each specific application. They are therefore built into the application and usually written as validation rules. They can also be classified into three:

* Input controls
* Processing controls
* Output controls

Input controls are designed to prevent data alteration or loss. Data are checked for accuracy completeness and consistency. Also the range and format of data are validated to prevent GIGO situation. Processing controls ensure that data are complete, valid and accurate when being processed and that program have been properly executed. Output controls ensure that the results of computer processing are accurate, valid complete and consistent and they are also used to evaluate common output errors and their possible courses in order to determine what can be done. These controls ensure that output have set only the authorized personnel.

**8.5.4 NATURAL AND ENVIRONMENTAL THREATS**

Computers are also threatened by natural or environmental disaster. Be it at home, stores, offices and also automobiles. Examples of natural and environmental disasters: flood, fire, earthquakes, storms and tornados, excessive heat, and inadequate power supply

**8.6 SECURITY MEASURES**

* Today, people rely on computer to create, store and manage critical information. It is important that the computer and the data they store are accessible and available when needed. It is also important that user take measures to protect their computers and data from lost, damage and misuse. How do we protect our computer from breaches of security and our security risk?
* Security measures mean the precautionary measures taken to ward off possible danger or damage. There are 6 types of security measures which are data backup, cryptography, Antivirus, Anti-Spyware, Firewall and human aspects.

**8.6.1 DATA BACKUP**

* Data backup is a program of file duplication.
* Backups of data applications are necessary so that they can be recovered in case of an emergency.
* Depending on the importance of the information, daily, weekly or biweekly backups from a hard disk can be performed.

**8.6.2 CRYPTOGRAPHY**

* Cryptography is a process of hiding information by altering the actual information into different representation, for example APA can be written as I?X.
* Almost all cryptosystem depend on a key such as a password like the numbers or a phase that can be used to encrypt or decrypt a message.
* The traditional type of cryptosystem used on a computer network is called a symmetric secret key system.
* With this approach, the sender and the recipient use the same key, and they have to keep the share key a secret from anyone else.

**8.6.3 ANTIVIRUS**

* User should install an Antivirus program and update it frequently.
* An Antivirus program protects a computer against viruses by identifying and removing any computer viruses found in the computer memory, on storage media or incoming e-mail files

***Identifying virus: Two techniques are use to identify the virus:***

* ***Virus signature*** – also called a virus definition. It is a specific pattern of the virus code.
* ***Inoculating a program file*** – the Antivirus program records information such as the file size and file creation date in a separate inculcation file. The Antivirus program then uses this information to detect if a virus tampers with the data describing the inoculated program file.
* If an Antivirus program identifies an infected file, it attempts to remove its virus, worm or Trojan horse.
* If the Antivirus program cannot remove the infection, it often quarantines the infected file. Quarantine is a separate area of a hard disk that holds the infected file until the infection can be removed. This step ensures other files will not become infected.
* An Antivirus program scans for programs that attempt to modify the boot program, the operating system and other programs that normally are read from but not modified.
* Many Antivirus program automatically scan files downloaded from the web, e-mail attachments and all types of removable media inserted into the computer.

**8.6.4 ANTI - SPYWARE**

* Spyware is a program placed on a computer without the user’s knowledge. It secretly collects information about the user.
* The Spyware program communicates information to the outside source.
* An Anti-Spyware application program sometimes called tracking for threat or a Spybot is used to remove Spyware.

***Among the popular Anti-Spyware programs are:*** Spybot Search and destroy Ad-aware and Spyware Blaster

**8.6.5 FIREWALL**

* Firewall is a piece of hardware or software which functions in a networked environment to prevent some communications forbidden by the security policy.
* The purpose of a firewall is to keep bad thing outside a protected firewall implement a security policy. It might permit limited access from in or outside the network perimeters or from certain users or for certain activity.

***There are three types of firewall***

* *Screening routers* - Simplest and sees only addresses and service protocol type and uses screen based on connection rules
* *Proxy gateway* - Complex and sees full text of communication and is screen based on behaviour proxies
* *Guard* - Most complex and sees full text of communication and uses screens based on interpretation of message content.

**8.7 NATURAL DISASTER VS DATA BACKUP**

* The natural and environmental disaster may include flood, fire, earthquakes, storms and tornados.
* Natural disaster may threaten a computer’s hardware and software easily. Computers are also sensitive to their operating environment such as excessive heat or the inadequacy of power supply.
* The backup system is needed to backup all data and applications in the computer. With the backup system, data can be recovered in case of an emergency.

**8.8 HUMAN ASPECTS**

* Human aspects refer to the user and also the intruder of a computer system.
* It is one of the hardest aspects to give protection to.
* The most common problem is the lack of achieving a good information security procedure.

***There are three ways to protect computer from human aspect threat:***

* ***Organization Self Awareness*** - Organizations need to be aware of the people they work with. Some threat also comes from within the organization and not just from the outside.
* ***Organizational User Self Awareness*** *-* Provide employee with adequate training and the importance of security and control. Even a very high-tech protection system could not protect the system against incompetent users.
* ***Individual User Self Awareness*** *-* Threat often comes in beautiful offers and packages. Do not download or install software from unreliable sources. Do not expose important information to strangers.

**8.8.1 THEFT VERSUS HUMAN ASPECTS**

***Computer theft can be of 2 kinds:***

* Can be used to steal money, goods, and information and computer resources.
* The actual stealing of computers, especially notebooks and PDAs
* These threats can be handled based on the human aspects.

***Approaches that can be taken by individuals or organizations to prevent theft which are***

* Prevent access by using locks, smart card or password
* Prevent portability by restricting the hardware from being moved
* Detect and guard all exits and record any hardware transported.

***Be suspicious of all results***

* There are many instances where non-programmers develop applications which are not built with proper understanding of software engineering practices.
* Data produced by such applications may not be correct and may risk corrupting data received from other sources that are not compatible with the application.

**9 DEVELOPMENTS OF MANAGEMENT INFORMATION SYSTEMS**

Information is a corporate resource, as important as the capital, labour, know-how etc. and is being used for decision-making. Its quality, therefore, is required to be very high. Low quality information would adversely affect the organizational performance as it affects decision-making. The quality of information is the result of the quality of the input data, processing design, system design, system and procedures which generate such a data, and the management of the data processing function. Quality, unlike any other product, is not an absolute concept. Its level is determined with reference to the context and its use, and the user. Perfect quality just as perfect information is non-achievable and has cost-benefit implications.

However, it is possible to measure the quality of information on certain parameters. All these parameters need not have a very high value. Some parameters may have lesser importance in the total value on account of their relevance in the information and its use. The quality of these important parameters is ensured by conducting a proper systems analysis, designing a suitable information system and ensuring its maintenance from time to time, and also subjecting it to audit checks to ensure the system integrity. The quality of the parameters is assured if the following steps are taken.

* All the input is processed and controlled, as input and process design.
* All updating and corrections are completed before the data processing begins.
* Inputs (transactions, documents, fields and records) are subject to validity checks.
* The access to the data files is protected and secured through an authorization scheme.
* Intermediate processing checks are introduced to ensure that the complete data is processed right through, i.e. run to run controls.
* Due attention is given to the proper file selection in terms of data, periods and so on.
* Backup of the data and files are taken to safeguard corruption or loss of data.
* The system audit is conducted from time to time to ensure that the information system specifications are not violated.
* The system modifications are approved by following a set procedure which begins with authorization of a change to its implementation followed by an audit.
* Systems are developed with a standard specification of design and development.
* Information system processing is controlled through program control, process control and access control.
* Ensure MIS model confirms consistency to business plan satisfying information needs to achieve business goals.

The assurance of quality is a continuing function and needs to be evolved over a period and requires to be monitored properly. It cannot be assessed in physical units of measure. The user of the information is the best judge of the quality.

**9.1 COMPONENTS FOR DESIGN IN MIS**

The business application system demands designing of systems suitable to the application in project. The major steps involved in the design are the following:

***9.1.1 INPUT DESIGN***

Input design is defined as the input requirement specification as per a format required. Input design begins long before the data arrives at the device. The analyst will have to design source documents, input screens and methods and procedures for getting the data into the computer

***9.1.2 OUTPUT DESIGN***

The design of the output is based on the requirement of the user – manager, customer etc. The output formats have to very friendly to the user. Therefore the designer has to ensure the appropriateness of the output format.

***9.1.3 DEVELOPMENT***

When the design and its methodology is approved, the system is developed using appropriate business models. The development has to be in accordance to a given standard. The norms have to be strictly adhered to

***9.1.4 TESTING***

Exhaustive and thorough testing must be conducted to ascertain whether the system produces the right results. Testing is time consuming: Test data must be carefully prepared, results reviewed and corrections made in the system. In some instances, parts of the system may have to be redesigned. Testing an information system can be broken down into three types of activities: unit testing, system testing and acceptance testing

1. ***Unit testing*** – also the program testing consists of testing each program separately in the system. The purpose of such testing is to guarantee that programs are error free, but this goal is realistically impossible. Instead, testing should be viewed as a means of locating errors in programs, focusing on finding all ways to make a program fail. Once pinpointed, problems can be corrected
2. ***System testing*** - tests the functioning of the information system as a whole. It tries to determine if discrete modules will function together as planned and whether discrepancies exist between the way the system actually works and the way it was conceived. Among the areas examined are performance time, capacity for file storage and handling peak loads, recovery and restart capabilities and manual procedures
3. ***Acceptance testing*** provides the final certification that the system is ready to be used in a production setting. Systems tests are evaluated by users and reviewed by management. When all parties are satisfied that the new system meets their standards, the system is formally accepted for installation.

**9.2 IMPLEMENTATION AND MAINTENANCE**

Define systems conversionasthe process of changing from the old system to the new system. Four main conversion strategies can be employed. They are the parallel strategy, the direct cutover strategy, the pilot strategy and the phased strategy.

* + 1. ***PARALLEL STRATEGY***

Both the old system and its potential replacement are run together for a time until everyone is assuring that the new one functions correctly. This is the safest conversion approach because, in the event of errors or processing disruptions, the old system can still be used as a backup. But, this approach is very expensive, and additional staff or resources may be required to run the extra system.

* + 1. ***DIRECT CUTOVER STRATEGY***

It replaces the old system entirely with the new system on an appointed day. At first glance, this strategy seems less costly than the parallel conversion strategy. But, it is a very risky approach that can potentially be more costly than parallel activities if serious problems with the new system are found. There is no other system to fall back on. Dislocations, disruptions and the cost of corrections are enormous.

* + 1. ***PILOT STUDY STRATEGY***

It introduces the new system to only a limited area of the organization, such as a single department or operating unit. When this version is complete and working smoothly, it is installed throughout the rest of the organization, either simultaneously or in stages.

* + 1. ***PHASED APPROACH STRATEGY***

It introduces the new system in stages, either by functions or by organizational units. If, for example, the system is introduced by functions, a new payroll system might begin with hourly workers who are paid weekly, followed six months later by adding salaried employees( who are paid monthly) to the system. If the system is introduced by organizational units, corporate headquarters might be converted first, followed by outlying operating units four months later.

Moving from an old system to a new system requires that end users be trained to use the new system. Detailed documentation showing how the system works from both a technical and end-user standpoint is finalized during conversion time for use in training and everyday operations. Lack of proper training and documentation contributes to system failure, so this portion of the systems development process is very important.

**9.3 PRODUCTION AND MAINTENANCE**

After the new system is installed and conversion is complete, the system is said to be in production. During this stage the system will be reviewed by both users and technical specialists to determine how well it has met its original objectives and to decide whether any revisions or modifications are in order. In some instances, a formal post implementation audit document will be prepared. After the system has been fine-tuned, it will need to be maintained while it is in production to correct errors, meet requirements or improve processing efficiency. Once a system is fully implemented and is being used in business operations, the maintenance function begins.

* Systems maintenance is the monitoring, or necessary improvements. For example, the implementation of a new system usually results in the phenomenon known as the learning curve. Personnel who operate and use the system will make mistake simply because they are familiar with it. Though such errors usually diminish as experience is gained with a new system, they do point out areas where a system may be improved.
* Maintenance is also necessary for other failures and problems that arise during the operation of a system. End-users and information systems personnel then perform a troubleshooting function to determine the causes of and solutions to such problems.
* Maintenance also includes making modifications to an established system due to changes in the business organizations, and new e-business and ecommerce initiatives may require major changes to current business systems.

**9.4 MANAGING AN E-BUSINESS**

Due to Internet capabilities and web technology, traditional business organization definition has undergone a change where scope of the enterprise now includes other company locations, business partners, customers and vendors.

* It has no geographic boundaries as it can extend its operations where Internet works. All this is possible due to Internet and web moving traditional paper driven organization to information driven Internet enabled E-business enterprise.
* E-business enterprise is open twenty-four hours, and being independent, managers, vendors; customers transact business anytime from anywhere. Internet capabilities have given E-business enterprise a cutting edge capability advantage to increase the business value.
* It has opened new channels of business as buying and selling can be done on Internet.
* It enables to reach new markets across the world anywhere due to communication capabilities.
* It has empowered customers and vendors / suppliers through secured access to information to act, wherever necessary.
* The cost of business operations has come down significantly due to the elimination of paper-driven processes, faster communication and effective collaborative working. The effect of these radical changes is the reduction in administrative and management overheads, reduction in inventory, faster delivery of goods and services to the customers.
* In E-business enterprise traditional people organization based on 'Command Control' principle is absent.
* It is replaced by people organization that is empowered by information and knowledge to perform their role.
* They are supported by information systems, application packages, and decision-support systems.
* It is no longer functional, product, and project or matrix organization of people but E-organization where people work in network environment as a team or work group in virtual mode.
* E-business enterprise is more process-driven, Technology-enabled and uses its own information and knowledge to perform. It is lean in number, flat in structure, broad in scope and a learning organization.
* In E-business enterprise, most of the things are electronic, use digital technologies and work on databases, knowledge bases, directories and document repositories.

The business processes are conducted through enterprise software like ERP, SCM, and CRM supported by data warehouse, decision support, and knowledge management systems. Today most of the business organizations are using Internet technology, network, and wireless technology for improving the business performance measured in terms of cost, efficiency, competitiveness and profitability. They are using E-business, Ecommerce solutions to reach faraway locations to deliver product and services. The enterprise solutions like ERP, SCM, and

CRM run on Internet (Internet / Extranet) & Wide Area Network (WAN).

The business processes across the organization and outside run on E-technology platform using digital technology. Hence today's business firm is also called E-enterprise or Digital firm. The paradigm shift to E-enterprise has brought four transformations, namely:

* Domestic business to global business
* Industrial manufacturing economy to knowledge-based service economy
* Enterprise Resource Management to Enterprise Network Management
* Manual document driven business process to paperless, automated, electronically transacted business process.

These transformations have made conventional organization design obsolete. In E-enterprise, business is conducted electronically. Buyers and sellers through Internet drive the market and Internet-based web systems. Buying and selling is possible on Internet. Books, CDs, computer, white goods and many such goods are bought and sold on Internet.

The new channel of business is well-known as Ecommerce. On the same lines, banking, insurance, healthcare are being managed through Internet E-banking, E-billing, E-audit, & use of Credit cards, Smart card, ATM, E-money is the examples of the Ecommerce application. The digital firm, which uses Internet and web technology and uses E-business and Ecommerce solutions, is a reality and is going to increase in number.

MIS for E-business is different compared to conventional MIS design of an organization. The role of MIS in E-business organization is to deal with changes in global market and enterprises. MIS produces more knowledge-based products. Knowledge management system is formally recognized as a part of MIS. It is effectively used for strategic planning for survival and growth, increase in profit and productivity and so on. To achieve the said benefits of E-business organization, it is necessary to redesign the organization to realize the benefits of digital firm.

* The organization structure should be lean and flat.
* Get rid of rigid established infrastructure such as branch office or zonal office.
* Allow people to work from anywhere
* Automate processes after reengineering the process to cut down process cycle time.
* Make use of groupware technology on
* Internet platform for faster response processing

Another challenge is to convert domestic process design to work for international process, where integration of multinational information systems using different communication standards, country-specific accounting practices, and laws of security are to be adhered strictly.

Internet and networking technology has thrown another challenge to enlarge the scope of organization where customers and vendors become part of the organization. This technology offers a solution to communicate, coordinate, and collaborate with customers, vendors and business partners. This is just not a technical change in business operations but a cultural change in the mindset of managers and workers to look beyond the conventional organization. It means changing the organization behaviour to take competitive advantage of the E-business technology.

The last but not the least important is the challenge to organize and implement information architecture and information technology platforms, considering multiple locations and multiple information needs arising due to global operations of the business into a comprehensive MIS.

**9.5 E-COMMERCE**

E-commerce is a second big application next to Enterprise Resource Planning (ERP). It is essential deals with buying and selling of goods. With the advent of intent and web technology, E-Commerce today covers an entire commercial scope online including design and developing, marketing, selling, delivering, servicing, and paying for goods. Some E-Commerce application adds order tracking as a feature for customer to know the delivery status of the order.

The entire model successfully works on web platform and uses internet technology.

Ecommerce process has two participants, namely Buyer and Seller, like in traditional business model. Unique and typical to E-commerce there is one more participant to seller by authorization and authentication of commercial transaction. E-Commerce process model can be viewed in four ways and categories:

* B2C: Business Organization to Customer
* B2B: Business Organization to Business
* C2B: Customer to Business Organization
* C2C: Customer to Customer

**B2C model -** Business organization uses websites or portals to offer information about product, through multimedia clippings, catalogues, product configuration guidelines, customer histories and so on. A new customer interacts with the site and uses interactive order processing system for order placements. On placements of order, secured payment systems comes into operation to authorize and authenticate payment to seller. The delivery system then takes over to execute the delivery to customer.

**B2B model -** Buyer and seller are business organizations. They exchange technical and commercial through websites and portals. Then model works on similar line like B2C. More advanced B2B model uses Extranet and Conducts business transaction based on the information status displayed on the buyer’s application server.

**C2B model -** Customer initiates actions after logging on to seller’s website or to server. On the server of the selling organization, E-Commerce applications are present for the use of the customer. The entire Internet banking process work on C2B model where account holders of the bank transact a number of requirements such as seeking account balance, payment and so on

**C2C model -** Customer Participates in the process of selling and buying through the auction website. In this model, website is used for personal advertising of products or services. E-Newspaper website is an Example of advertising and selling of goods to customer.

**B2B model -** The participants in E-business are two organizations with relations as buyer-seller, distributor-dealer and so on.

**9.6 E-COLLABORATION**

Every business has a number of work scenarios where group of people work together to complete the tasks and to achieve a common objective. The group could be teams or virtual teams with different member strength. They come together to platform a task to achieve some results. The process is called Collaboration. The Biggest Advantage of E-Collaboration

* It taps the collective wisdom, knowledge and experience of the members.
* The collaboration team or group could be within the organization and between the organizations as well
* Since, E-Collaboration works on an internet platform and uses web technology, work group/team need not be at one physical location.
* E-collaboration uses E-Communication capabilities to perform collaborative tasks or project assignment.
* Its effectiveness is increased by software ‘GroupWare’ that enables the members of the group to share information, invoke an application and work together to create documents and share them and so on.
* E-Collaboration helps work effectively on applications like calendaring and scheduling tasks, event, project management, workflow application, work group application.
* E-collaboration system components are internet, Intranet, Extranet and LAN, WAN networks for communication through GroupWare tools, browser.

Let us illustrate the model using an event in the business such as receipt of material for a job to

be processed on the shop floor. In this event there is a transaction receipt of material, which needs to be processed, and then a workgroup will use this information of material receipt. Each member of this workgroup has a different goal.

**9.7 INTRANET**

An Intranet is an internal use, private network inside an organization that uses the same kind of software which would also be found on the Internet. It is an inter-connected network within one organization that uses Web technologies for the sharing of information internally, not worldwide. Such information might include organization policies and procedures, announcements, or information about new products.

An intranet is a restricted-access network that works like the Web, but isn't on it. Usually owned and managed by a company, an intranet enables a company to share its resources with its employees without confidential information being made available to everyone with Internet access. A network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access. Like the Internet itself, intranets are used to share information.

An intranet is an information portal designed specifically for the internal communications of small, medium or large businesses, enterprises, governments, industries or financial institutions of any size or complexity. Intranets can be custom-designed to fit the exact needs of businesses no matter where they are situated. A user of intranets consists mainly of:

* Members of the executive team
* Accounting and order billing
* Managers and directors
* Sales people and support staff
* Customer service, help desk, etc.

**9.8 EXTRANET**

An extranet is a private network that uses the Internet protocols and the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers, or other businesses. An extranet can be viewed as part of a company's intranet that is extended to users outside the company. An extranet requires security and privacy.

A new buzzword that refers to an intranet that is partially accessible to authorized outsiders. Whereas an intranet resides behind a firewall and is accessible only to people who are members of the same company or organization, an extranet provides various levels of accessibility to outsiders. You can access an extranet only if you have a valid username and password, and your identity determines which parts of the extranet you can view. An extranet is somewhat very similar to an intranet. Extranets are designed specifically to give external, limited access to certain files of your computer systems to:

* Certain large or privileged customers
* Selected industry partners.
* Suppliers and subcontractors etc

Therefore, a carefully designed extranet can bring additional business to your company. Intranets and extranets all have three things in common:

* They both use secured Internet access to the outside world.
* Both can drastically save your company or organization a lot of money.
* Both need a user ID & password to control access to the whole system.

The professional development team at My Web Services has the expertise and the right tools to design the right intranet or extranet that will meet your exact needs, both for today and the Future.

**9.9 THE INTERNET**

Internet is a global network of interconnected computers, enabling users to share information along multiple channels. Typically, a computer that connects to the Internet can access information from a vast array of available servers and other computers by moving information from them to the computer's local memory. The same connection allows that computer to send information to servers on the network; that information is in turn accessed and potentially modified by a variety of other interconnected computers. A majority of widely accessible information on the Internet consists of inter-linked hypertext documents and other resources of the World Wide Web (WWW). Computer users typically manage sent and received information with web browsers; other software for users' interface with computer networks includes specialized programs for electronic mail, online chat, file transfer and file sharing.

The movement of information in the Internet is achieved via a system of interconnected computer networks that share data by packet switching using the standardized Internet Protocol Suite (TCP/IP). It is a "network of networks" that consists of millions of private and public, academic, business, and government networks of local to global scope that are linked by copper wires, fiber- optic cables, wireless connections, and other technologies. Difference between internet, intranet and extranet as follow:

Internet is an electronic network of computers that includes nearly every university, government, and research facility in the world. Also included are many commercial sites. It started with four interconnected computers in 1969 and was known as ARPAnet. A network of computer networks which operates world-wide using a common set of communications protocols. The vast collection of inter-connected networks across the world that all use the TCP/IP protocols

Internet is a global network connecting millions of computers. It is a worldwide network of computer networks. It is an interconnection of large and small networks around the globe. The Internet began in 1962 as a resilient computer network for the US military and over time has grown into a global communication tool of more than 12,000 computer networks that share a common addressing scheme.