

CHAPTER 1 – INFORMATION SYSTEM CONCEPTS

SYSTEM

System may be defined as an orderly arrangement of a set of interrelated and interdependent elements that operate collectively to accomplish some common purpose or goal.

INFORMATION SYSTEM

System that provides Information is called Information system.

(i.e. Common purpose or goal is providing Information to users)

Information system need not be computerised. Even manual stock register is an information system.

BENEFITS OF COMPUTERISED INFORMATION SYSTEM

1. Handling Huge Volume of data (Not manageable by human efforts)
2. Storing enormous volume of data for indefinite period without any decay
3. Quick and accurate processing of data
4. Quick retrieval of information on query
5. Quick and efficient transportation of data / information

TYPES OF SYSTEM

Systems can be classified in different ways based on different parameter (as shown below)

I. Elements

- **Abstract**
 - System of conceptual models and ideas (No Physical material)
(Ex: Design)
- **Physical**
 - Set of tangible elements (Ex: Computer)

II. Interactive behaviour

- **Open**
 - Systems that interacts freely with environment (No restricted input or output)
 - They have unknown inputs and outputs
- **Closed**
 - Doesn't Interacts with the environment or changes with the change in the environment.
 - Fully Closed system is very rare
- **Relatively closed system**
 - Here they continuously interact with environment but insulated from outside disturbances
 - They have known inputs and outputs

III. Degree of Human intervention

- **Manual**
 - Absolutely carried out by human efforts
- **Automated**
 - Carried out by help of microprocessors or computers
 - No system is 100 % Automated

IV. Working / Output

- **Deterministic**
 - Works in a predictable manner
 - Output is known. Interactions between various parts were known with certainty
- **Probabilistic**
 - Works in a probable behaviour
 - A certain degree of error is always attached to the prediction of what the system will do

SYSTEM ENTROPY

It is the quantitative measure of disorder in a system.

Offsetting the increase in entropy requires inputs of matter and energy to repair, replenish and maintain the system. This maintenance input is termed as **Negative Entropy**.

SYSTEM ENVIRONMENT

The external world outside the system boundary is known as SYSTEM ENVIRONMENT.

SUB SYSTEM

Subsystem is a part of a larger system.

Each system is composed of subsystems , which in turn are made up of other subsystems.

The Interconnections and Interactions between the subsystem are termed as **Interfaces**.

SUPRA SYSTEM

A Supra system is the larger unit comprises smaller subsystems

INFORMATION**Information**

- It is data that has been processed into a form that is meaningful to the recipient.
- It's nothing but processed data.

ATTRIBUTUES OF INFORMATION**1. Availability**

- Information not available at the time of need is useless

2. Purpose

- Should have some purpose to the receiver; otherwise it is simple data.
- Should help the receiver in decision making, creating new concepts, identifying problems, solving problems, planning, initiating , and controlling

3. Mode and format

- Medium of communication has to be decided keeping in view the receiver's requirement
- Format of information has to be designed in such a way that it assists the receiver in his work

4. Decay

- Value of information decays time to time. And so it should be refreshed from time to time

5. Rate

- Useful information is the one which is transmitted at a rate which matches with the rate at which the recipient wants to receive.

6. Frequency

- Frequency affects the value of information.
- Balance sheet prepared every week serves no purpose as compared to monthly balance sheet.

7. Completeness

- Information should be complete as possible
- It gives better position to the receiver to do his work

8. Reliability

- It is a measure of failure or success of using information for decision making.

9. Validity

- It measures the closeness of the information to the purpose which it purports to serve

10. Quality

- Refers to the correctness of the information. Information is likely to be spoiled by the personal bias.

11. Transparency

- If information does not directly reveal what we want to know, it is not transparent.

12. Value of Information

- Defined as difference between the value of change in decision behaviour caused by the information and cost of the information

13. Adequacy

- Information must be adequate. Too much information will kill the entire purpose.

FACTORS ON WHICH INFORMATION REQUIREMENTS OF USERS DEPENDS

1. OPERATIONAL FUNCTION:

Information requirement of various operational functions vary not only in content but also in characteristics.

Information requirement of Marketing department and Finance department would completely differ based on the activities performed by them.

2. TYPE OF DECISION MAKING:

- Programmed Decisions

These are well structured in advance and are time-tested for their validity

- Non Programmed Decisions

Unstructured Decisions; Decisions are made on those situations which are new and non-repetitive and about which no much knowledge and information are available.

3. LEVEL OF MANAGEMENT ACTIVITY:

Management will be classified to three levels based on hierarchy

a. Strategic or Top Level (Think of board, directors, CEO)

At this level, they were concerned about organizational Mission, objectives and strategies (Strategic decisions).

These decisions have vital impact on direction and functioning of organisation

The Information required for this level of management will be very complex information but the accuracy of data need not be 100%

b. Tactical or Middle Level (Think of Finance managers, Marketing managers)

Decisions made at this level are called Tactical Decisions. Tactical Level converts the directions (Mission, objectives and strategies) of Top Level management in to the operational plan of targets, schedule, etc.,

Here, the managers plan, organize, lead and control the activities of Next level (Operational level) of management

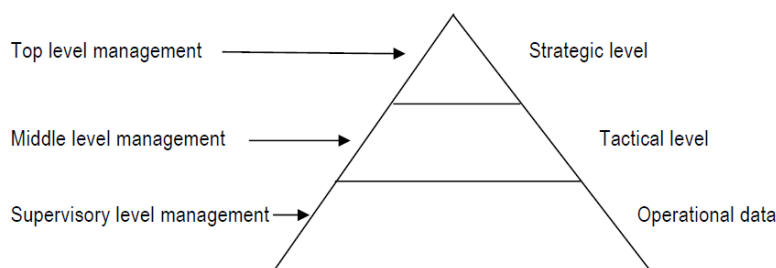
Here the information required need not be much complex but should have some certainty

c. Operational or Supervisory Level (Think of Factory manager , operation manager)

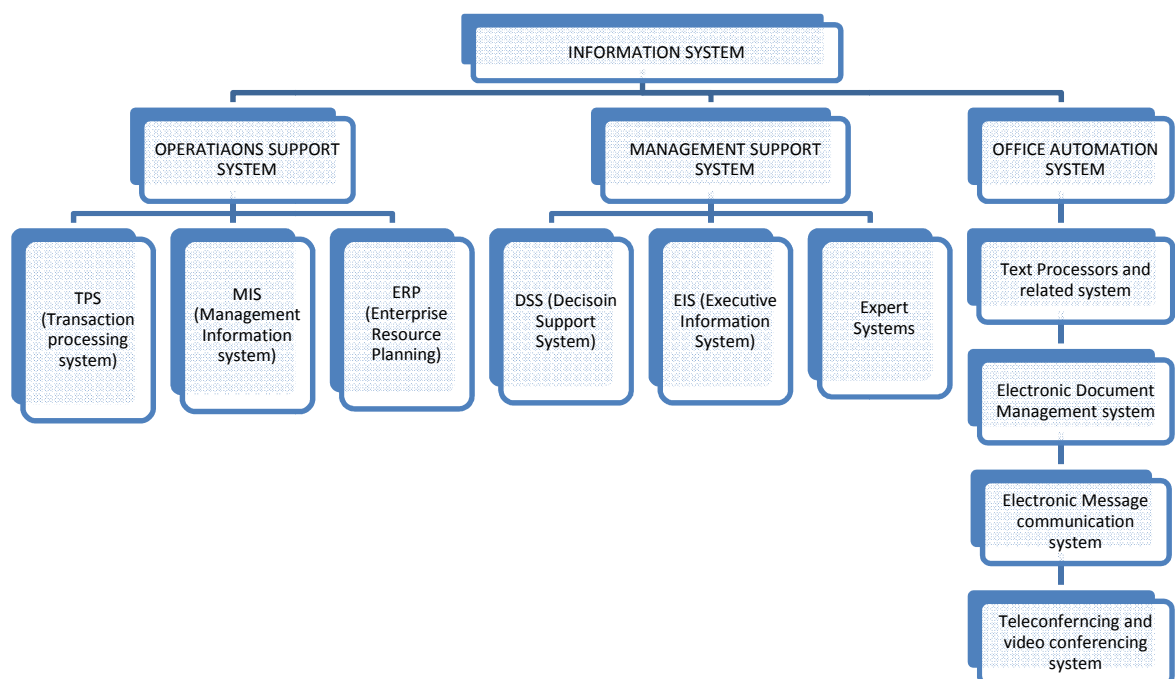
These are lowest level of management hierarchy wherein managers coordinate the work of others who are themselves managers. They ensure that the directions given by Middle level was carried out effectively and efficiently.

Information required by these level managers need 100% accuracy because it affects the output. For ex: Design, height and weight of the goods manufactured.

As information required by the managers at the different level differs based on the requirement (as explained above), they need different information system.



Information systems can be broadly classified into three categories based upon their focus on the kind of activities in business enterprises.



OPERATIONAL SUPPORT SYSTEMS

The objective of the system is to improve the operational efficiency of the enterprise. They use primarily Internal data as they are concerned with the Operations.

1. TRANSACTION PROCESSING SYSTEM (TPS)

This systems process the business transactions into information.

TPS involves the following activities

- Capturing data to organize in files or database
- Processing of files / database using application software
- Generating information in the form of reports
- Processing of queries from various users

TPS may follow periodic data preparation and batch processing. But Now-a-days online approach is preferred in many systems.

PRINCIPAL COMPONENTS OF TPS WERE

- Inputs (Ex Voucher entry)
- Processing (Ledger Posting)
- Storage (Data saved)
- Outputs (Balance sheet, TB)

FEATURES OF TPS:

- Large Volume of data were processed and requires more storage space
- Automation of basic operations
- Benefits are easily Measurable
- Output of TPS are input for other systems like MIS, ERP

2. MANAGEMENT INFORMATION SYSTEM (MIS)

Assist manager in decision making and problem solving in contrast to TPS.

MIS is a system designed for providing information to support operational control, management control, and decision making functions in an organization.

MIS is an information system that developed to give regular reports to the manager to help them in regular decision making

EIGHT CHARACTERISTICS OF MIS

1. **Management oriented**

Information provided by the MIS should be helpful to the managers; otherwise serves no purpose

2. **Management Directed**

Management should actively direct and involve in system development process. Otherwise, we won't get support of lower level managers.

3. **Integrated**

All functional and operational subsystem has to be integrated together; it gives more comprehensive information system

4. **Common Dataflows**

Meant to use common inputs, data processing, and output procedures. Data is captured by system only once ; Eliminates data duplication

5. **Heavy planning Element**

Usually involves 3 to 5 years and so system developer should keep in view future objectives and developments.

6. **Sub system concept**

Must be broken down in to many smaller subsystem; so system can be developed in various phases; And also maintenance (updatation) of system is convenient

7. **Common data base**

Same database has to be accessed by all subsystems and thus eliminates the necessity of duplication in data storage, updating, deletion and protection.

8. Computerized

Need not be computerized; But if computerized, it increases efficiency and effectiveness

MISCONCEPTIONS ABOUT MIS (Following statement are not true)

- MIS is computerised (MIS May or may not be computerised)
- More data more information (Unorganised mass data is of no information)
- Information need to be 100% accurate (Accuracy level depends on the level of management. Executive level does not need 100% accuracy as they decide on broad terms. But Lower level need 100% accuracy as it would affects the output (service & goods). Higher Accuracy involve higher cost)

PREREQUISITES OF AN EFFECTIVE MIS**- DATABASE**

Efficient database improves access to the data and reduces redundancy.

Data base should be

- User oriented
- Capable of being used as common data source
- Available only to authorised persons
- Controlled by separate authority (DBMS)

- QUALIFIED SYSTEM AND MANAGEMENT STAFF

System and computer experts – should be capable of understanding management concepts to facilitate the understanding of problems faced by the Managers. This would help in developing effective system

Management Experts – should also understand clearly the concepts and the operations of the computer. This would help them to be part of designing phase of the system.

- **SUPPORT OF TOP MANAGEMENT**

Need full support of the top management.

Subordinate managers are usually lethargic and the system would not be effectively implemented without the support of top management.

- **CONTROL AND MAINTENANCE OF MIS**

Control - Devise checks to monitor that the system is being operated as it was designed

Maintenance – there are times when the need for improvements to the system will be discovered. The system should be adapted and modified accordingly

- **EVALUATION OF MIS**

Effective MIS should be capable of meeting the information requirement of the managers both at the present and in future as well. This will be maintained by Evaluating and taking appropriate timely action

- Examining Flexibility of the system
- Checking views of users and designers
- Guiding in maintenance of MIS

CONSTRAINTS IN OPERATING A MIS

1. Non availability of experts (Both system and management staff) – otherwise needs more training.
2. Selection of first sub subsystem to be installed and operated upon. Because if the first phase of installation doesn't impress the top level , then the complete support of the top management would be lost
3. System development approach for MIS is not standardised one due to varied objectives of the business concerns.
4. Non availability of cooperation from staff; without the support of the staff, you could not ascertain the information requirements.

EFFECTS OF USING COMPUTER BASED MIS

- 1. Speed of processing and retrieval of data increases**
 - Manual system cannot be matched with computer system in term of speed
- 2. Scope of analysis widened**
 - Provide multiple type of information accurately and in no time. Extend the analysis of managers as the information received has huge scope for analysis
- 3. Complexity of system design and operation increased**
 - The Information requirement and operational flow become very complex and so the design of the system was also very complex which is very difficult to develop without computers.
- 4. Integrated the working of different information sub system**
 - Computers help us in integrating many subsystems efficiently with help of common databases and proper interfaces.
- 5. Increases the effectiveness of information system**
 - Information received in time has more value and that makes the information system more effective
- 6. More comprehensive information**
 - Use of computers enables system experts to provide comprehensive information to the managers.

LIMITATION OF MIS

1. Quality of MIS depends of the quality of input. So the deficiency of transaction processing system carries to MIS as well.
2. MIS is not a substitute for effective management. It is merely an management tool
3. May not have requisite flexibility to quickly update to fast changing and complex environment.
4. MIS cannot provide tailor made information packages
5. It ignores non quantitative figures like morale and attitude of members
6. MIS is less useful for non programmed decisions.
7. MIS effectiveness reduces if there are frequent changes in top management, organisational structure and operational team.

3. ERP

– DISCUUSED IN SEPARATE CHAPTER

MANAGEMENT SUPPORT SYSTEM (MSS)

1. DECISION SUPORT SYSTEM (DSS)

It is specific class of computerised information system that supports business and organizational decision making.

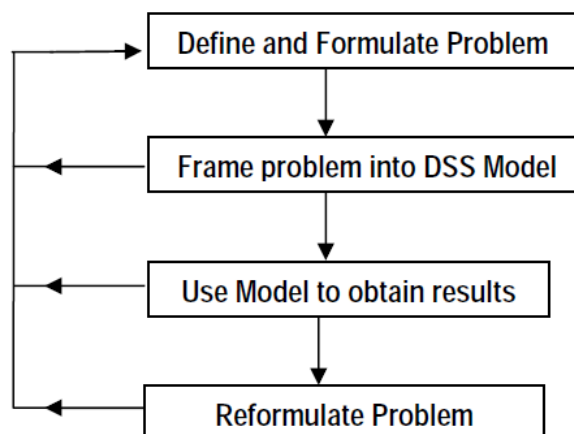
DSS is not intended to make decisions for managers; rather to provide managers with a set of capabilities that enable them to generate the information required by them in making decisions. DSS supports the human decision making process rather than replacing it.

CHARACTERISTICS OF DSS:

- **Supports semi structured and or unstructured decision making**

A Manager can browse through data at will (perhaps at display terminal). When enough information is gathered from this system to supplement other information (perhaps not from system) a decision can be reached.

Steps in solving a problem in DSS



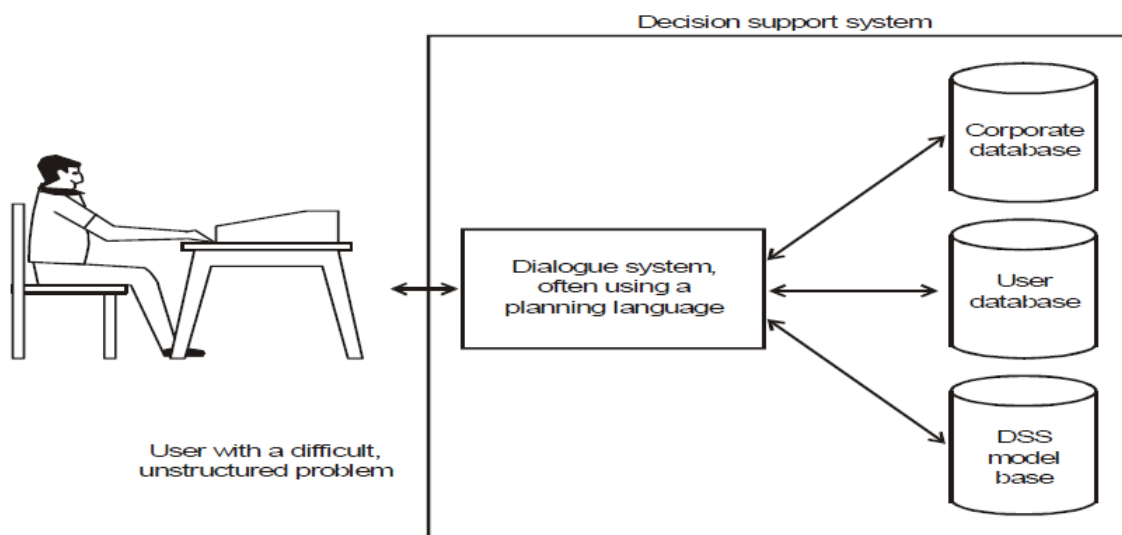
- **Flexible enough to respond to changing needs of decision makers**

Semi structured and unstructured decisions do not conform to a predefined set of decision making rules. DSS must provide for enough flexibility to enable users to model their own information needs and should also be capable of adapting to changing information needs

- **Easy to use** (Because managers are not system experts)

Since the DSS are built and operated by the managers rather than by computer professionals, the tools that accompany them should be relatively easy to learn and use. (User oriented interfaces)

COMPONENTS OF DSS:



A. USERS

User is usually a manager with unstructured or semi-structured problems to solve.

There are two broad classes of users

- **Manager** – are the users who have basic computer knowledge and want the DSS to be very user friendly.
- **Staff Specialist (Analysts)** – helps in building the system with user friendly interface

B. DATABASES

DSS include one or more databases that contain both routine and non routine data from both internal and external sources. DSS users can construct additional database themselves.

Databases are implemented at three levels as listed below:

a. PHYSICAL LEVEL

It involves implementation of the database on the hard disk. The management of storage and access is controlled by Operating system

b. LOGICAL LEVEL

It is designed by professional programmers who have complete knowledge of DBMS.

c. EXTERNAL LEVEL

The logical level defines schema which is divided into smaller units known as sub-schema and given to managers containing all the relevant data needed by the manager.

C. PLANNING LANGUAGE

Two type of languages are used in DSS

General Purpose Planning language

- Allows users to perform many routine tasks (think of a Excel)

Special purpose planning language

- Some special purpose language like SAS and SPSS (Statistical languages) are more limited in what they can do, but usually do certain jobs better than the general purpose planning languages.

D. MODEL BASE

- Planning languages allows the users to maintain the dialogue with the model base which is the brain of the DSS because it performs data manipulations and computations with the data provided to it by the user and the database. (for Ex: Cross tabulation , regression analysis, time series analysis , Linear programming and financial computations).

2. EXECUTIVE INFORMATION SYSTEMS (EIS)

Sometimes referred to as Executive support system (ESS) – is a DSS that is designed to meet the special needs of top-level managers.

Executive – Managers at the Top level of organizational Hierarchy.

CHARACTERISTICS OF EIS:

- EIS is computer based Information system that serves the need of top executives
- EIS enables users to extract summary data and model complex problem without need to learn query languages, statistical formulae.
- EIS provides rapid access to timely information and direct access to management reports
- Capable of accessing both internal and external data
- Provide extensive online analysis tool – trend analysis , market conditions etc.,
- EIS can be easily given a DSS Support for decision making

Often, Executives make decisions based on a vision they have regarding what it will take their companies successful. To a larger extent, executives rely much more on their own intuition than on the sophisticated analytical skills

Five Characteristics of type of information used in Executive Decision making:

- **LACK OF STRUCTURE**
Most of the decisions are unstructured. It is not obvious which data is required or how to weigh available data
- **HIGH DEGREE OF UNCERTAINTY**
Results of decisions and future events are highly unpredictable
- **FUTURE ORIENTATION**
Strategic decisions are made in order to shape future

- **INFORMAL SOURCE**
Different from managers, Executives rely heavily on informal source for key information.
- **LOW LEVEL OF DETAIL**
Most Executive decisions are made by observing broad trends.

CONTENT OF EIS:

- EIS measures must be easy to understand and collect. Wherever possible, the data should be collected naturally as part of the process of work.
- EIS measures must be based on the balanced view of the organisation's objective.
- Performance indicators should be as independent as possible from the variables outside the control of managers.
- EIS measures must encourage management and staff to share the ownership of the organisation's objective.
- EIS information must be available to everyone in the organisation
- EIS measures must evolve to meet the changing needs of the organisation

3. EXPERT SYSTEMS

Expert system is a highly developed DSS that utilizes knowledge generally possessed by an expert to solve the problem.

It imitates the reasoning process of human experts and help decision makers to take decision with the expert knowledge.

NEED FOR EXPERT SYSTEMS

- Expert labor is expensive and scarce.
- No matter how bright or knowledgeable certain people are, they can often handle only a few factors at a time

Both these limitations imposed by human processing capability and rushed pace at which the business conducted today put a practical limit on the quality of human decision making this putting a need for expert systems.

BENEFITS OF EXPERT SYSTEMS:

- Expert system preserves knowledge that might be lost through retirement, resignation or death of an acknowledged company expert.
- Expert system assist novices (Inexperienced person) in thinking the way experienced professional do.
- ES are not subject to human fallings like fatigue, being too busy, or being emotional.
- ES can be used as a strategic tool in the areas of marketing products, cutting costs, and improving products

COMPONENETS OF EXPERT SYSTEM:

Expert systems typically composed of

- **Knowledge Base**

It stores the rules data and relationships that are used to solve problems and contains specific facts about the expert data

- **Inference Engine**

Inference Engine is the main processing element consisting of system of programs that request data from the user, manipulates the knowledge base and provides the decision to the user.

- **Knowledge Acquisition Subsystem**

It is the software component of Expert system that enables the knowledge Engineer (system analyst) to build and refine an expert systems knowledge base. It helps in updating the knowledge base.

- **User Interface**

It is the method through which expert system interacts with the users. It will be highly interactive.

OFFICE AUTOMATION SYSTEMS

Office automation systems are among the newest and most rapidly expanding computer based information systems.

Different office activities have been made very simple and effective by the use of computers.

Office activities

- Document Capture
- Document Creation
- Receipts and Distribution
- Filing, search, retrieval and follow up
- Calculations
- Recording utilization of resources

BENEFITS OF OFFICE AUTOMATION SYSTEM:

- Improves communication within a organization and between organization
- Reduces the cycle time between preparation of messages and receipt of messages at the recipient's end
- Reduces the cost of office communications both in terms of time and infrastructure
- Ensure accuracy of communication flows

CATEGORIES OF OFFICE AUTOMATION SYSTEMS

1. TEXT PROCESSING SYSTEM

- Reduces Keying effort
- Reduces chance of errors
- Helps in quick production of multiple copies of document with quality printing

2. ELECTRONIC DOCUMENT MANAGEMENT SYSTEMS

- Can be stored for future reference
- Useful for remote access

3. ELECTRONIC MESSAGE COMMUNICATION SYSTEMS

Computer based communication systems offer a lot of economy not only in terms of time and cost.

Three (3) Basic Components of Message communication systems

- Electronic Mail
- Fax / Facsimile
- Voice mail

4. TELECONFERENCING AND VIDEO CONFERENCING SYSTEMS

It helps in reducing time and the cost of meeting as the participants do not have to travel to attend the meeting

*****_*****