



SYLLABUS

Class - B.B.A. II Sem.

Subject - Management Information System

UNIT - I	The meaning and use MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS.
UNIT - II	Planning, Implementation and Controlling of Management Information System.
UNIT - III	Fundamentals of Data Processing, Computer Operation of Manual Information System, Components of Computer Systems, Flow Chart, Conversion of Manual to Computer Based Systems, Computer Systems Software, Application Software, Telecommunication Modem.
UNIT - IV	Managerial Decision Making, characteristics and components of Decision Support System.
UNIT - V	System Design: System design consideration, input/output design, forms design, file organization and database, data management, file design, program design, control and security.



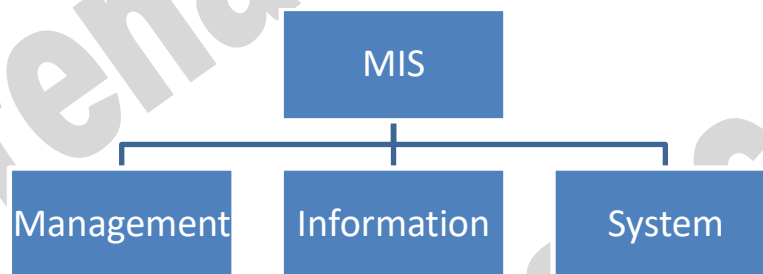
INTRODUCTION TO MIS

Definition of MIS

A system that collects, process, stores the data and distributes information to help in decision making for managerial function. It is also defined as the integrated user machine system for providing information to supports the decision making operations & achieving organizational goal. According to **Jerome** "A system that aids management in making, carrying out and controlling decisions".

According to **Kelley**, "A combination of human and computer based resources which results in collection, storage, retrieval, communication and use of efficient management of operations and for business planning".

Right Information → To the right person → At the right place → At the right time → In the right form → At the right cost



Management:- Management covers the planning, control and administration of the operations of a concern.

Information:- Information, in MIS, means the processed data that helps the management in planning, controlling and operations.

System:- data is processed into information with the help of a system.

Need of MIS

MIS helps the management at various levels and it is mean of communication where data are collected, processed, stored and retrieved for making decisions regarding planning, operation and control of an organization.

Characteristics of MIS

- Management Oriented
- Management Directed
- Integrated System
- Avoid Redundancy
- Common Data Flow
- Heavy Planning Element
- Subsystem Concept
- Common Database
- Flexibility
- Computerization



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Components of MIS

Management information system refers to the data, hardware and the computer programs that are used to develop information for managerial use.

- **People** – it is the only living component of MIS which operates, controls the other components of MIS.
- **Procedure** – procedure explain people how to operate the computer hardware.
- **Data** – Data provide interface between the user and computer.
- **Hardware** – It is the machine part of the system which executes the instruction in programs.
- **Programs** – The program is the set of instruction written in logical order for performing specific task related to information production.

Function of MIS

It is used to collect the data and present the information to the managers. MIS is the combination of computer and procedures for providing information that manager's use in making decision.

- **Collect Data** – Data can be obtained from sources within organization and outside world.
- **Store & Process Data** – After creation of the data, a database must be stored and process in the form useful to manager's data is generally stored to CD ROM or hard disk.
- **Present Information to Managers** – After collection, storing and processing of data, the next step is to present information to the managers.

Role of MIS

- 1 MIS ensure that appropriate and relevant data is collected from various sources, processed and is sent further to the needy destination.
- 2 It fulfills the need of individual, workgroup and management.
3. MIS satisfies the diverse need of various systems like query, Analysis, Modeling, DSS.
- 4 MIS helps in strategic planning, management control, operational control and transaction processing level.
- 5 MIS play important role in information generation, communication, problem identification and decision making administration.
- 6 With good MIS support marketing, finance, production, and personal functions increases efficiently.
- 7 MIS helps in streamlining of the operations.
- 8 MIS creates structured database and therefore saves the time.
- 9 MIS bring clarity in communication and understanding this help in bringing high degree of professionalism.
- 10 MIS helps in systemization of business operation through tools and techniques of the computer, which makes task simpler, accurate and faster.

Process of MIS

The process of MIS starts by knowing MIS objectives. The objectives of MIS should be compatible with the company's objectives.

Management comprises process or activities they are as follows:-

1. Recognition of a problem and an opportunity
2. Define problem or opportunity
3. Develop alternative course of action
4. Decision
5. Implementation of plan



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6. Control performance against plan

For its smooth functioning and achieving of its predetermined goals through optimal utilization of its resources like men, money, material and machines.

System View of Business

The systems approach provides an overall view of an organization's activities whereby an organization is separated into identifiable subsystems or departments. All such departments are interdependent and perform specific tasks of work which contribute to the organization's goals. The simplest model of a business system consist of basic elements, they are input, processes, output and feedback.

A systems view regards business operations as systems embedded within a larger environmental setting. It's an abstract way of thinking, but it has potential value to the manager. The systems view:

1. reduces complexity
2. requires good objectives
3. emphasizes working together
4. acknowledges interconnections
5. values feedback

Eg. Computer

Elements of computer are: - Monitor, CPU, Printer etc

Basic goals: Data Processing

Development of MIS within the Organization

If MIS is to assist managerial decision making at all level of company then low organization level information systems must be integrated in MIS. Next stage is planning & control. Next stage of MIS development is integration of subsystems. Management plans to integrate existing sub system to unified system. The management focuses attention to database administration. Next stage is MIS maturity. This is to state when MIS department is agreed up to plan future needs for organization.

Management Process

Management comprises process or activities via planning, organizing, controlling, directing and initiating operation of an organization. For its smooth functioning and achieving of its predetermined goals through optimal utilization of its resources like men, money, material and machines.

Concept of Data & Information

Data - Data is a set of characters or symbols like numeric, alphabetic or alphanumeric, audio, video, images or any combination of these. Raw facts & figure are known as data.

Information -Processed data is known as information.

System - System is set of components which interact with each other to accomplish a specific goal.

1 Human body and its subsystem could be nervous system, digestive system and cardiac system etc

2 Computer system and it has various subsystem like ALU, CU, Memory, Input unit and Output unit etc.



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Characteristics of system

- Every system has a purpose.
- Every system is made up of components like input process output, feedback and control etc.
- System is made up of subsystem, whose goals are referred to as sub goals.
- Goal of a system is more important than subsystem goal.
- Systems whether open or closed have an element of control associated with them.

Types of System

There is several way of classifying systems that emphasizes the differences. Classification of system is as follows-

Open & Closed Systems -An open system interfaces and interacts with other system. An open system needs to receive feedback to change and continue to exist in its environment. Example - A marketing system is an open system.

A closed system does not exchange the information with its environment. It does not have any connection to the other system. Example - Research & development of organization, ICU dept. of hospital, etc.

Physical & Abstract System - Physical system are tangible entities that may be static or dynamic in operations. For example the physical parts of the computer center are the computers, desk, chair, etc. that facilitate operation of the computer.

Abstract systems are conceptual and non physical entities. They may be formulas of relationship among set of variables or models, software / program.

Deterministic & Probabilistic System - A deterministic system works with certainty in predictable manner. The interaction among its subsystem is known in advance. One state of the system determines the next state of the system.

Example - A computer system which works on the principal GIGO.

A **probabilistic system** operates with uncertainty as certain degree of error is always attached with prediction of what the system will do.

Example - A student admission system in a college is probable in nature.

Systems approach is an organized way of dealing with a problem.

Information system

Information system are a set of people, procedure and resources that collects , transforms and disseminates information in an organization

There are six building block of information system, is the input, output, technology, models, database and control.

Types of Information System- there are two types of information system.

1 Operation Information system - it process the data generated by and used in business operation.

It is of two types:-

- Transaction processing system
- Office Automation system

2 Management information System - MIS provide information to support management decision making.

- Decision Support System
- Executive information System



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Business organization as a system

An organization is an open, adaptive system in a business environment. A business consists of the following system components –

1 Input	2 Processing	3 Outputs
4 Feedback	5 Control	6 Environment

Information Needs

There are different levels of the organization and the information requirement is different for the different layers.

- At the organizational level, information requirements define an overall structure for the information system and specific applications and database.
- Application level requirements include social or behavioral- covering work organization objectives, individual roles and responsibility assumptions, and organizational policies and technical, which are based on the information needed for the job to be performed.
- At the user level, database requirement can be classified as perceived by the user or as required for physical design of the database.

System approach in planning, organizing & Controlling MIS

System Approach in Planning – The important function of management is planning. Planning means deciding in advance, what has to be done, who has to do it, when is to be done and how it is to be done. The planning process consists of two steps –

- 1) Developing the strategic
- 2) Formulating the steps, timing and cost, required to achieve the strategy.

System Approach in Organizing – Organizing is important to manager because it helps in effective group action. It also helps in maintaining the people to work together. It consists of the following points –

- 1 The formal organization system as described in chart policies and procedure.
- 2 The informal organizing.
- 3 The individual as a system
- 4 The organizational communication system.
- 5 The power system.
- 6 The functional system.
- 7 The management process system.
- 8 The material logistic system.

The different phases of organizing are:

- Develop a technical organization
- Start with total company objectives and develop a hierarchy of systems required.
- Involve specialists in developing a team, matrix or a system.

System Approach in Controlling – Controlling is important because it is needed to achieve the desired result. The most common process consists of three steps –



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- 1 *Setting standard for performance* – It involves what level of performance we need. These criteria can be quantitative or qualitative.
- 2 *Measuring performance against this standard* – once standard have been established it is necessary to measure performance against standards.
- 3 *Deviation Control* – we know that for measuring the deviation, first comparison of standard with actual performance is made.

Why MIS Fails?

MIS failures can be expensive and bring bad publicity to all parties. They can arise due to:

- Inadequate analysis- problems, needs and constraints aren't understood in the early stages.
- Lack of management involved in the design – wrong expectations of a new system / no-one understands the system.
- Emphasis on the computer system – Need procedures for handling input and output / select the right hardware and software
- Concentration on low-level data processing – Information must be easily accessible and understood
- Lack of management knowledge of ICT systems and capabilities – managers know what they want from the system but don't understand the technology
- Lack of teamwork – An ICT manager must co-ordinate the accounts, marketing, sales etc. departments and help everyone understand the benefits of the system
- Lack of professional standards – All systems need clear documentation that all users can understand (not just the ICT literate)



Unit II
General Business Planning

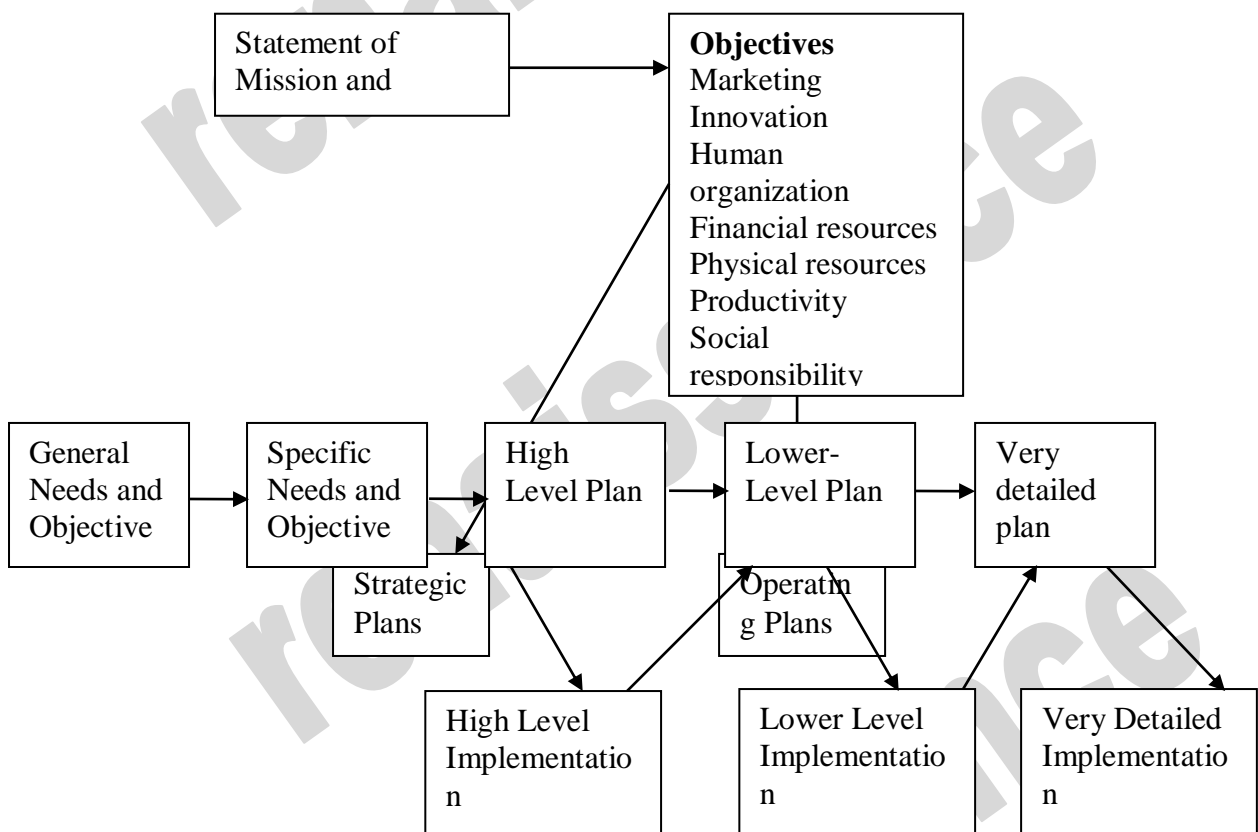
Starting point for MIS planning is general business planning. No MIS department can decide what they should do or how they should do it without the groundwork provided by objectives and plans for the company they are supporting.

General Business Item

- Statement of mission or purpose
Objectives
Strategic plans
Operating plans

Importance

Clearly defines the business of the firms.
set goals for the company in all key performance areas
Provide general guidance on how to get to the long-Range objective
provide detailed guidance on how to get to the short-term objectives



The following items should certainly be included to understand what planning constitute-

- 1. Summary statement of the problem being solved by this project is required.
2. A breakdown of the work to be done (as detailed as practical) is required. Also estimates of how long each piece will take are needed. Documentation, testing, and maintenance efforts should be included.
3. A list of dependencies on outside groups with target dates for "delivery" of services or equipment is required.
4. A list of outside group that depend on this project with target dates for delivery is required.
5. A list of interdependencies of various pieces within this project with dates of need/delivery is required.



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6. The skills needed to complete the project should be listed. Eventually, the people who work on the project must match this list exactly.
7. Other resources needed to complete the project must be identified (e.g., space, computer hardware, and telephones). Dates these items are needed must be specified.
8. A budget covering salaries, rent, capital expenditure, and so on must be part of the plan.
9. A statement of the reporting and tracking system to be used must be included.
10. A schedule of activities reflecting all the above work and interdependencies is required.
11. A backup plan if any piece of the plan fails must be supplied.

Planning Techniques

Most of the techniques and tools have been borrowed from engineering project management theory and practice, where they originated.

Work Breakdown structure

A fundamental concept in project management is the work breakdown structure, which starts with the total end result desired and terminates with the individual detailed tasks. The project breakdown structure is a natural decomposition of the project end result. It is created in a level-by-level breakdown from –

1. System to subsystem
2. Subsystem to task
3. Task to subtask
4. Subtask to work package

Sequence Planning

The relationships among tasks must be set forth by a chronological ordering, starting with the terminal task of the project and working backward. As each task is set down, it is necessary to determine what immediately preceding tasks must first be completed. When a network of events has been established, estimates of the time required to complete each event, based upon the work package information, may be entered. There are a number of time paths through a network that run from the starting event to the terminal event. The longest is called the critical path.

Master Program Schedule

The master program schedule (MPS) is a management document giving the calendar dates for milestones (major tasks and critical path minors tasks), thus providing the control points for management review. The MPS may be in the form of a Gantt chart for small MIS projects or in machine (computer) printout for large projects whose networks have been programmed for computer analysis and reporting.

Budgeting

The establishment of cost and resource targets for a planned series of periods in advance is project budgeting. Although cost constraints may be applied in a top-down fashion during planning, such constraints must be reconciled with a bottom-up approach through the work breakdown structure.

Reporting and controlling

Control of the project means control of performance/cost/time (P/C/T). These elements, P/C/T, must be reported in a way that ties them all together, otherwise the report is meaningless.

Reporting Techniques

The reporting system for a project is its own MIS. Some methods of project reporting are

1. Integrated P/C/T charts as shown in Figure 6-4
2. Financial schedules and variance reports.
3. Time-scaled network plans and computerized based on them.



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4. Problem analysis and trend charts
5. Project control room and computerized room and computerized graphic systems.

Implementation of MIS

There are four basic methods for implementing the MIS once the design has been completed. These are–

1. Cut off the old system and install the new. This produces a time gap during which no system. Small is n operation. It is practical only for small companies or small systems where installation required one or two dates. An exception to this would be the installation of a larger system during a plant's vacation shut down or some other period of inactivity.
2. Cut over by segments. This method is also referred to as "phasing in" the new system. Small parts or subsystems are substituted for the old. If this method is possible, some careful questions should be asked about the design of the new system. Is it really just an automation of isolated groups of clerical activities? Generally, new systems are not substitutable piece by piece for previous non systems. However, in the case of upgrading old system, this may be a very desirable method.
3. Operate in parallel and cut over. The new system is installed and operated in parallel with the current system until it has been checked out; then the current system is cut out. This method is expensive because of personnel and related costs. However, it is required in certain essential systems, such as payroll or customer billing. Its big advantage is that the system is fairly well debugged when it becomes the essential information system of the company.

Identity the Implementation Tasks

The major implementation tasks, or milestones, usually consist of

1. Planning the implementation activities.
2. Acquiring and laying out facilities and offices
3. Organizing the personnel for implementation
4. Developing procedures for installation and testing
5. Developing the training program for operating personnel
6. Completing the system's software
7. Acquiring required hardware
8. Generating files
9. Designing forms
10. Testing of the entire system
11. Completing cutover to the new system
12. Documenting the system
13. Evaluating the MIS
14. Providing system maintenance (debugging and improving)

Planning the implementation activities

- Establish Relationships among Tasks
- Establish a schedule
- Prepare a Cost schedule Tied to tasks and time
- Establish a reporting and control system

Acquire Floor space and Plan space layout

To replace a current one may require a major revision of facilities as well as completely new office, computer room, and production layouts. The MIS project manager must prepare rough layouts and costumes of particular floor areas he or she feels will be needed. The manager should then prepare cost estimates and submit a proposal for management's approval. Facilities and space planning should be as soon as approval of gross space allocations has been obtained.



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Organize for implementation

Once the implementation tasks have been defined in the planning phase, management usually assign a project manager to guide the implementation. A manager of management information systems may assume this responsibility by virtue of a permanent assignment. In smaller companies, someone from the finance.

Development Procedures for implementation

The project leader has available the network plan for proceeding with the implementation. The leader must now call upon key people in the project to prepare more detailed procedures for system installation.

Train the operating personnel

Should be developed to impress upon management and support personnel the nature and goals of the MIS and to train operating personnel in their new duties.

Computer-related Acquisitions

The management of automation of logic, communication, and display is important as a basis for systems design and as a factor in system implementation. One complicating factor in system installation is that a new computer is often required along with the new MIS.

Acquisition consists of bringing on site

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

Development forms for data collection and information dissemination

A vast amount of detailed data, both external and internal to the company, must be collected for input to the MIS. If control marketing is to be exercised or sales forecasting is carried out, then somewhere, every day, a salesperson must sit in a room and fill out a form summarizing the day's activities.

Develop the Files

The specification for the files has been developed in the detailed design stage. In the implementation stage, the actual data must be obtained and recorded for the initial testing and operation of the system. This collection of data used in routine operations is often called the master file.

Test the System

Each part of the total system is installed, test should be performed in accordance with the test specifications and procedures describes earlier. Tests during the installation stage consist of component tests, subsystem tests, and total system acceptance test. Components may consist of -

1. Equipment, old or new
2. New forms'
3. New software programs
4. New data collection methods
5. New work procedure
6. New reporting formats

Cutover

Cutover is the point at which the new component replaces the old component or the new system replaces the old system. This usually involves a good deal of last-minute physical transfer of files, rearrangement of office furniture, and movement of work stations and people. Old forms, old files and old equipment are suddenly retires.



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Document the system

“Documentation” of the MIS means preparation of written description of the scope, purpose, information flow components and operating procedures of the system. Documentation is not a frill; it is a necessity – for troubleshooting, for replacement of subsystems, for interfacing with other systems, for training new operating personnel, and also for evaluating and upgrading systems.

Evaluate the MIS

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

Control and Maintain the System

Control and maintenance of the system are the responsibilities of the line managers. Control of the system means the operation of the system as it was designed to operate. Maintenance is closely related to control. Maintenance is that ongoing activity that keeps the MIS at the highest levels of effectiveness and efficiency within cost constraints.



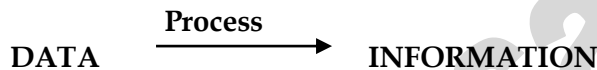
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Unit III
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Management information system

Data: - Raw facts and figures are known as data.

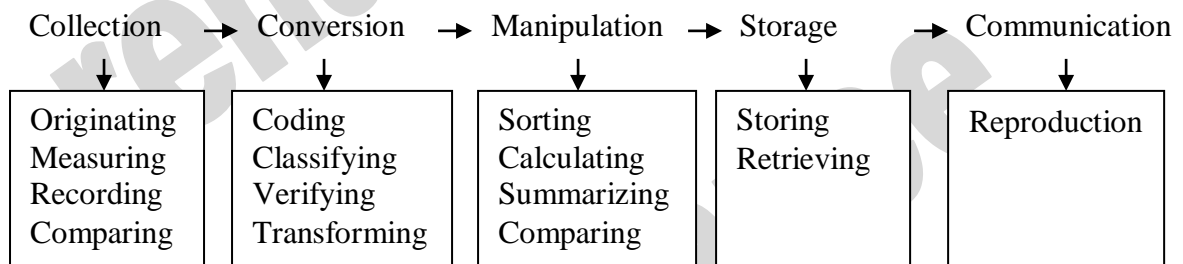
Information: - Processed data is known as information.



Data Processing - it is basically concern with converting raw data in to well order information.

Need for data processing - it reduce the paper work for increasing volume of data.

Data processing Activities:-



- Collection** - Data originates in the form of events transactions or some observations. This data is then recorded in some usable form.
- Conversion** - once the data is collected, it is converted from its source document to a form that is more suitable for processing.
- Manipulation** - Once data is collected and converted it is ready for manipulation functions which convert data into information. Manipulation consists of following activities -
 - Sorting
 - Calculating]
 - Summarizing
 - Comparing
- Managing the output result** - Once data has been captured and manipulated following activities may be carried out
 - Storing
 - Retrieving
- Communication** - It is a process of sharing information.

Data processing cycle & Function -

- Originating
- Input
- Manipulation- it consist of sorting, classification, calculating, scanning etc.
- Output - output is concern with reporting, retrieval, storage etc.

Component of data processing

- Data Input
- Data Processing



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- c. Maintaining Files & Record
- d. Data Procedure & Instruction
- e. Output

Data Processing System

The activity of data processing can be viewed as a "system". According to James O'brien a system can be defined as "a group of interrelated components that seeks the attainment of a common goal by accepting inputs and producing outputs in an organized process".

For example, a production system accepts raw material as input and produces finished goods as output.

Similarly, a data processing system can be viewed as a system that uses data as input and processes this data to produce information as output.

Types of data processing:-

Data processing applications very considerable and although different data processing applications are not quite the same yet it is still possible to identify a number of distinct, types of data processing systems. Data processing system may be categorized under three main types:

1. Systems where processing is done periodically
2. Real-time systems
3. Database systems

These three types of systems are further divided into sub-categories.

Systems where processing is done periodically/ Batch Processing:-

The main feature of such system is that they handle large amount of data. The data, which these systems handle, is of the same type. As the volume of data is of an identical type. The data may be processes in batches in one time. It should be noted that the stored in the form of files. This helps to standardize the data. This is the reason these systems are also referred to as 'file processing systems. e.g. payroll system.

Real-time systems

In real time processing the computer keeps pace with some external process. Small quantities of data are processed in one operation. The delay in processing the data, which vary from a fraction of a second to a couple of minutes, is acceptable to the user of the system. Three types of real time system may be identified, through the distinction between them is not very apparent.

The three types are

- Process control
- Information storage and retrieval
- Transaction processing

Database systems

Database systems use one store of information to support all data processing. The database is independent of any individual

Manual data processing system - Data processor is Human being, input received through hearing & seeing sense and output record in files.

There are many kinds of data processing systems. A manual data processing system is one that utilizes tools like pens, and filing cabinets.

A system which does not use any computer devices, all data would be kept in other ways, mainly paper. As a few examples: Before accounts, payroll and spreadsheet applications, people would



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have worked out this kind of information on paper. People would have handwritten letters or used typewriters.

Instead of word processors, Graphs and diagrams would have been drawn by hand instead of using computer software to do them.

Advantages of manual data processing system:-

- No training cost
- No set up cost
- Less indirect cost (electricity bill)

Disadvantages of manual data processing system:-

- Inconsistency in data entry, room for errors, miskeying information.
- Large ongoing staff training cost.
- System is dependent on good individuals.
- Reduction in sharing information and customer services.
- Time consuming and costly to produce reports.
- Lack of security.
- Duplication of data entry.

Electronic data processing system – It is computerized system which process data automatically. A mechanical data processing system uses devices such as typewriters, calculating machines and book-keeping machines. Finally, electronic data processing uses computers to automatically process data.

Advantages of computer data processing system:-

- Faster and efficient
- Automatic generation of documents
- Timely
- Provides Reports

Disadvantages of computer data processing system:-

- Power failure, computer viruses and hacking are inherent problem.
- security

Steps required for converting manual information system into Computerized System – The following steps are involved:-

a. System Description:-

After preliminary investigation and definition of the problem, the system description is generally prepared. It is essentially a statement of the major inputs, outputs, processing operations and files needed. Its purpose is to show the logical flow of information and the logical operations necessary to carry out the particular design alternative chosen.

It is in two forms:-

Narrative:-

It is general English depiction of the operation of the system. It should describe inputs, outputs, files and operations

Pictorial:-

It provides a visual overview of the entire operation



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b. Input document:-

After the completion of the system description, it is very necessary to specify how the information should be put into a form that is acceptable to the computer.

c. Output Document:-

It is the output document with which management is almost exclusively concerned and because of its critical nature, care should be taken in its design. Output format represents the purpose or objective of the entire operation

d. File Design

The logic required to control the flow of data through the system is a part of systems design, and the flow is in turn depended upon the design of data files. These two steps are also associated.

e. Program Logic

The program flowchart is the programmer's logic of the detailed, step by step representation of how the computer program will accomplish the job. It is the 'blueprint' of a program.

f. System verification

After the program has been written and run through the compilation process, it is placed in memory in 'machine readable' form and is ready to process the terminal input, update the master file on the disk and print the required report. The computer will execute the instructions of the program in sequence until a program comes to a halt.

g. Documentation

System failure is due to lack of adequate documentation generally, three types of documentation are needed:-

- For those providing input, a clear description of what input is expected and what input is not acceptable.
- For those running and maintaining the system, all the technical documentation generated during the development process.
- For those the output, a clear description of what the output means and about its limitations.

Conversion Method - There are four ways to convert from manual to computerized system -

- a. Parallel Conversion - running both old & new computerized systems
- b. Phased Conversion - install new system only into a department or branch office.
- c. Pilot Conversion - implement only in one department then implemented in whole organization.
- d. Direct Conversion - stop working on old system & completely adopt new system.

To know more about data processing you may visit
http://en.wikipedia.org/wiki/Data_processing_system.



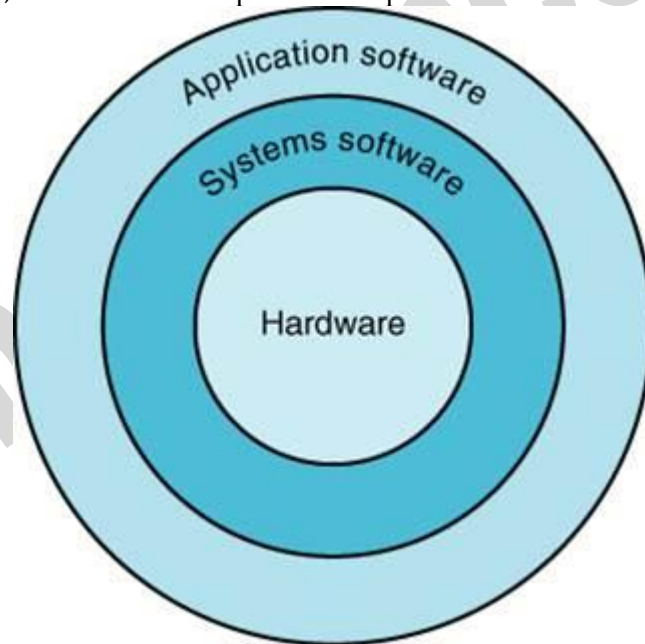
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Software

Computer software is also known as computer programs. Software is the non-tangible component of computers. Computer software communicates with hardware and get the work done.

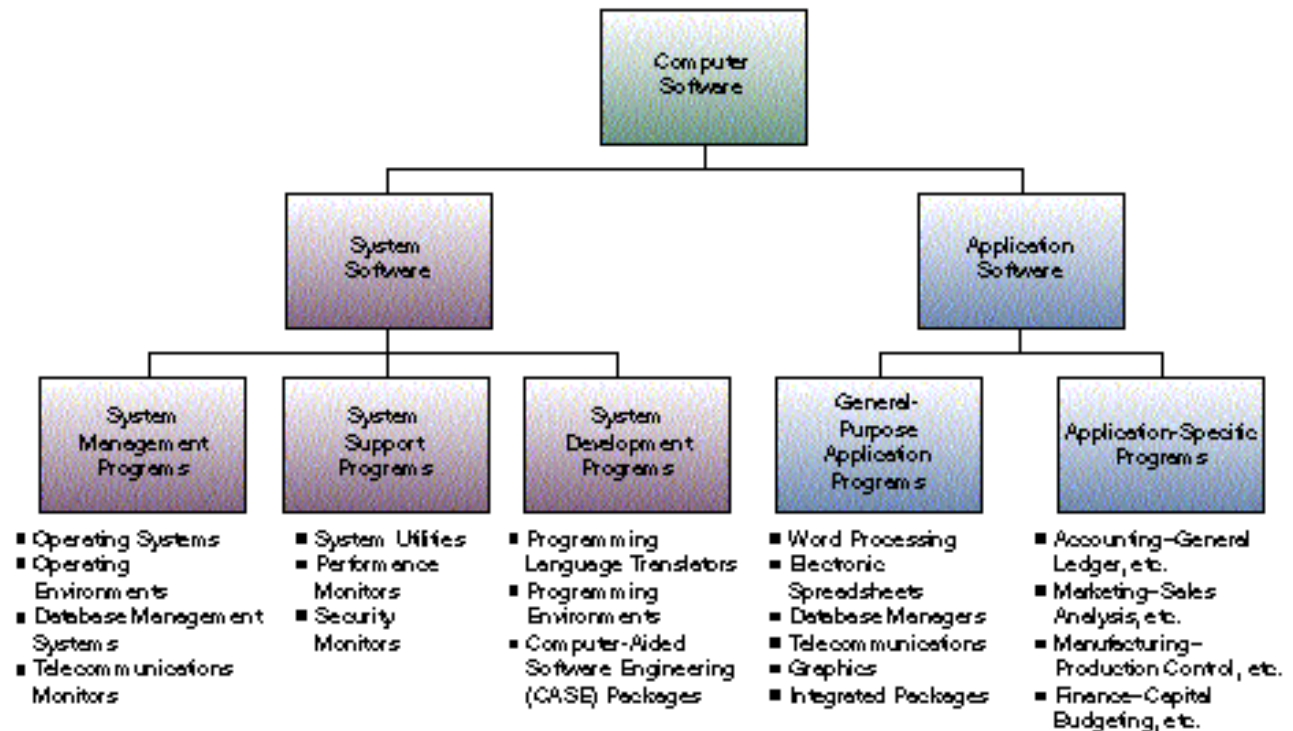
Computer software includes all computer programs regardless of their architecture; for example, executable files, libraries and scripts are computer software.



Types of Software

The computer software can broadly divide into two types. They are as follows:-

- System software
- Application software



System software is a program that manages and supports the computer resources and operations of a **computer system** while it executes various tasks such as processing data and information, controlling hardware components, and allowing users to use application software.

Systems software works as a bridge between computer system hardware and the **application software**.

Systems software is of three types. They are as follows:-

- **System management programs:-**

These are programs that manage the application software, computer hardware, and data resources of the computer system.

- **System support programs :-**

These are the programs that help the operations and management of a computer system. They provide a variety of support services to let the computer hardware and other system programs run efficiently. The major system support programs are system utility programs, system performance monitor programs, and system security monitor programs

- **System development programs**

These are programs that help users develop information system programs and prepare user programs for computer processing. These programs may analyze and design systems and program itself. The main system development programs are programming language translators, programming environment programs, computer-aided software engineering packages.

Application software



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Application software consists of programs that direct computers to perform specific information processing activities for end users. Application software is further divided into two types they are as follows:-

- General purpose software
- Application specific software

To study in detail visit:-

<http://en.wikipedia.org/wiki/Software>

Flowchart:-

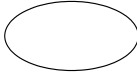




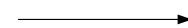
A **flowchart** is a type of diagram that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution to a given problem. Process operations are represented in these boxes, and arrows; rather, they are implied by the sequencing of operations. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields.

- A schematic representation of a sequence of operations, as in a manufacturing process or computer program.
- A graphical representation of the sequence of operations in an information system or program. Information system flowcharts show how data flows from source documents through the computer to final distribution to users. Program flowcharts show the sequence of instructions in a single program or subroutine.



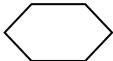
Symbols:-

Different symbols are used to draw each type of flowchart.

Name	Symbol	Use in Flowchart
Oval		Denotes the beginning or end of the program
Parallelogram		Denotes an input operation
Rectangle		Denotes a process to be carried out e.g. addition, subtraction, division etc.
Diamond		Denotes a decision (or branch) to be made. The program should continue along one of two routes. (e.g. IF/THEN/ELSE)
Hybrid		Denotes an output operation
Flow line		Denotes the direction of logic flow in the program

2. Additional Symbols

Related to more advanced programming



Preparation (may be used with "do loops" explained later)



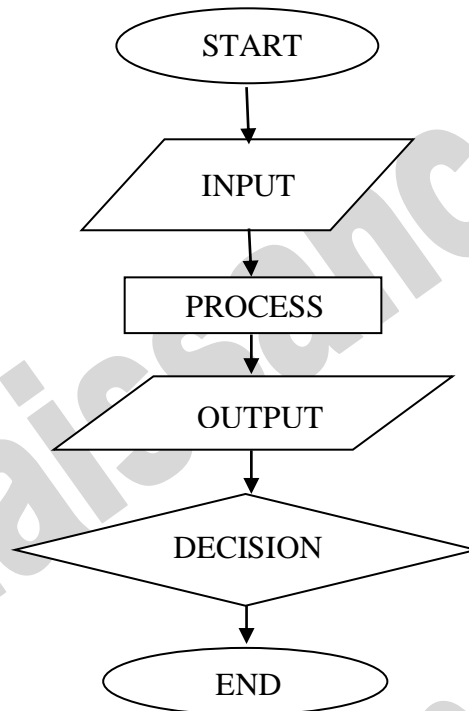
Refers to separate flowchart ("Subprograms"(explained later) are shown in separate flowcharts).

Types of flowchart:-

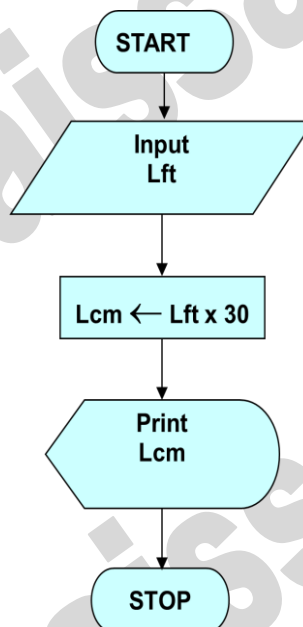
Sterneckert (2003) suggested that flowcharts can be modeled from the perspective of different user groups (such as managers, system analysts and clerks) and that there are four general types:

- *Document flowcharts*, showing controls over a document-flow through a system
- *Data flowcharts*, showing controls over a data-flow in a system
- *System flowcharts* showing controls at a physical or resource level
- *Program flowchart*, showing the controls in a program within a system

Program Flowchart - shows the sequence of instructions in a program or subroutine. These instructions are followed to procedure the needed output.



Write an algorithm and draw a flowchart to convert the length in feet to centimeter



Advantages and limitation of flowchart:-

1. Better communication
2. Proper program documentation
3. Efficient coding
4. Systematic debugging
5. Systematic testing

Disadvantages Of Using flowcharts: -



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1. **Complex logic:** - Sometimes, the program logic is quite complicated. In that case, flowchart becomes complex and clumsy.
2. **Alterations and Modifications:** - If alterations are required the flowchart may require re-drawing completely.
3. **Reproduction:** - As the flowchart symbols cannot be typed, reproduction of flowchart becomes a problem.
4. The essentials of what is done can easily be lost in the technical details of how it is done.

Limitation of flowchart:-

1. Flowchart are very time consuming and laborious to draw.
2. There are no standards determining the amount of detail that should be included in flowchart.
3. Owing to the symbol-string nature of flowcharting, any change or modification in the program logic will usually require a completely new flowchart.

To study in detail with example visit:-

<http://www.edrawsoft.com/flowchart-examples.php>

Data communication - Exchange of data between two devices through any physical medium.

Characteristics -

- a. Delivery
- b. Accuracy
- c. Timeliness

Attributes of data communication

- a. Message - information to be communicated
- b. Sender - device that sends data
- c. Receiver - Device that receive message
- d. Medium - physical medium by which messages travel. Ex. Coaxial cable, twisted pair cable
- e. Protocol - Set of rule that governs data communication

Network & its types - multiple computer are connected in a manner to enable meaningful transmission. It is of 3 types -

- a. LAN - Computers are connected in building or in a small organization is local area network.
- b. WAN - Computers are connected in large geographical area like internet is wide area network.
- c. MAN - The network that shares some characteristics of both LAN & WAN network.

Topology:-

The topology of a network is the geographical representation of the relationship of all the links and linking devices to each other.

The five basic topologies are as follows:-

- Bus
- Ring
- Tree
- Star
- Mesh



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Telecommunication is of two types -

- a. **Wired** - Communication is done with the help of physical wired.
- b. **Wireless** - Communication is done without any physical medium. Ex. Internet.

Transmission mode:

The term transmission mode is used to define the direction of signal flow between two linked devices.

There are three types of transmission modes:

- **Simplex**
- **Half duplex**
- **Full duplex**

Modem:-

Anyone who has surfed the internet, logged on to an office computer from home, or field a news story from a word processor over the phone line has used a modem

The external or internal signal generated by the computer into an analog signal to be carried by a public access phone line.

It is also the device that converts the analog signals received over a phone line into digital signal usable by your computer.

The modem is a composite word that refers to the two functional entities that make up the device:-

A signal modulator

A signal demodulator

“Modem stands for Modulation/ Demodulation.”

A modulator converts digital signal into analog signal.

A demodulator converts analog to digital signal

Modem standards:-

Bell modem:-

The first commercial modem were produced by the bell telephone company in the early 1970s

- 103/113 Series
- 202 Series
- 212 Series
- 201 Series
- 208 Series
- 209 Series

ITU modem:-

- v.21
- v.22 bis
- v.32
- v.32 bis
- v.32 terbo
- v.33
- v.34
- v.42
- v.42 bis



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Unit: IV -Decision Support System

Types of Decision:

1. **Structured or programmable Decision-** A decision can be programmed, if it follows decision rule, decision procedure or specified sequence of activity is performed [Algorithm]. This can be expressed as a flowchart, a decision table or a formula. The decision procedure will also specify the information to be acquired before the decision can be pre-specified; many of these decisions can be handled by lower-level personnel with little specialized knowledge. For example, inventory recording decision or the decision rule for granting credit.

The important characteristics of programmed decision are-

- These decisions can be delegated.
 - The cost of taking such decision is not as high as that of non-programmed once.
 - These decisions can be made with the help of computer systems.
2. **Non-programmed or unstructured decision-** This type of decision is occasional and unique in nature. There are no predefined procedures available to solve these problems and a new analysis is required for each occurrence. Production scheduling, advertising budget, taking of capital projects i.e., capital executives have to make use of problem-solving methodology, which itself depends on subjective human judgments. The risk involved in taking decision to solve the problems in this manner is usually high. The important feature of non programmed decision are:
These decisions cannot be delegated.
The best of taking decision in comparison with programmed decision is quite high.
 3. **Semi-structured-** Semi structured decisions are such type of decision procedures that can be pre-specified, but not enough to lead to a definite recommended decision.

Decision Making

Decision making is a cognitive process that results in the selection of a course of action among several alternative scenarios.

Decision making is a daily activity for any human being. There is no exception about that. When it comes to business organizations, decision making is a habit and a process as well.

Effective and successful decisions make profit to the company and unsuccessful ones make losses. Therefore, corporate decision making process is the most critical process in any organization.

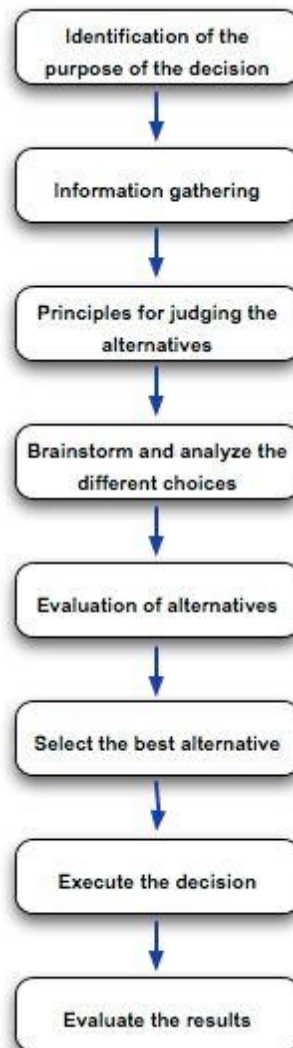
In the decision making process, we choose one course of action from a few possible alternatives. In the process of decision making, we may use many tools, techniques and perceptions.

In addition, we may make our own private decisions or may prefer a collective decision.

Usually, decision making is hard. Majority of corporate decisions involve some level of dissatisfaction or conflict with another party.

Decision Making Process:

Following are the important steps of the decision making process. Each step may be supported by different tools and techniques.



Process and Modeling in Decision Making

There are two basic models in decision making:

- Rational models
- Normative model

Dimensions and characteristics of managerial decision making:

- it is sequential in nature
- it is exceedingly complex due to risks and trade offs
- managerial decisions are influenced by personal values

Decision Support system (DSS)

The decision support system is an interactive computer based system, which helps decision-makers to utilize data and models to solve unstructured problems. The DSS is designed to facilitate the solutions of problem of structured than those of MIS and TPS which are less structured. The nature of decision taken by DSS is of non-routine and less structured. The DSS is a collection of data and data processing tools used to creatively manipulate data to answer unknown



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and often unexpected questions. DSS is a coordinated collection of data, system, tools and techniques with the necessary, S/W and computer H/w through which an organization gathers and interprets relevant information from the business and environment and turns into information that acted upon. In the end, we can say that- DSS aims at supporting the decision maker by providing the information with the aid of quantitative techniques.

Attributes of a DSS

- Adaptability and flexibility
- High level of Interactivity
- Ease of use
- Efficiency and effectiveness
- Complete control by decision-makers.
- Ease of development
- Extendibility
- Support for modeling and analysis
- Support for data access
- Standalone, integrated and Web-based

Characteristics of a DSS

- Support for decision makers in semi structured and unstructured problems.
- Support for managers at various managerial levels, ranging from top executive to line managers.
- Support for individuals and groups. Less structured problems often requires the involvement of several individuals from different departments and organization level.
- Support for interdependent or sequential decisions.
- Support for intelligence, design, choice, and implementation.
- Support for variety of decision processes and styles
- DSSs are adaptive over time.

Application of D.S.S.

The applications of DSS are as follows-

1. An airline DSS -developed by American Airlines but is used by other airlines, aircraft manufacturers and airlines financial analysis consultants and associations.
2. A Marketing DSS - BRAND AID is used for marketing planning, especially in the packaged goods industries. It helps brand managers to make pricing, sales effort, promotion, advertising and budgeting decision for products, product line and brand of products.
3. Government DSS- GADS (Geodata-Analysis and Display System) was developed by IBM. It constructs and displays maps and other graphics display that support decisions affecting the geographic distribution of people and other resources.
4. Banking DSS-MAPP (Managerial analysis for profit planning) is a DSS developed by citi-bank. It was designed to support decisions involved in the financial planning, budgeting costing and pricing of bank products, It helps bank executives define banking products and services, It also

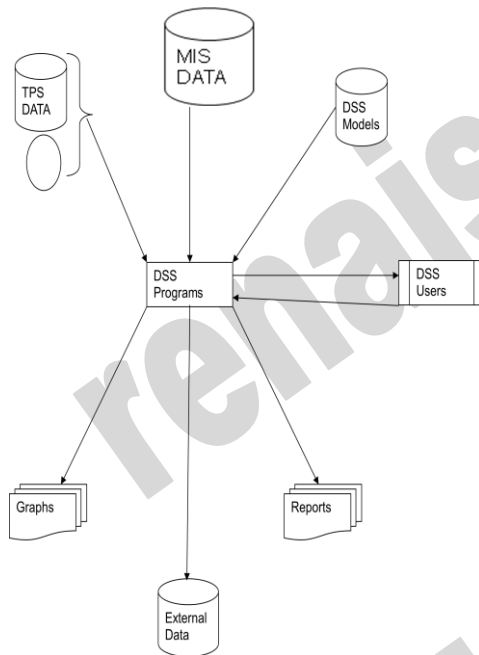


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helps to determine, how resources should be shifted among bank products and services and it prepares budgets for the bank department producing each banking product.

Architecture of DSS



Data from the organizations, TPS and MIS applications are input to the DSS programs, along with data from external sources and DSS model data. As stated, the DSS may store and later reprocess its own model data as well. The user interacts with the DSS online, requests are made, models are created or adjusted and data is manipulated etc. The outputs of the DSS program can be either text, structured reports or graphics. A variety of programs supported by the DSS include spreadsheet programs, personal data base management systems, model base management systems, word processing packages and other special purpose programs.

Benefits of DSS

- Improves efficiency and speed of decision making activities
- Increases the control, competitiveness and capability of futuristic decision making of the organization
- Facilitates interpersonal communication
- Encourages learning or training
- Since it is mostly used in non-programmed decisions, it reveals new approaches and sets up new evidences for an unusual decision
- Helps automate managerial processes

Components of a DSS

Following are the components of the Decision Support System:

Database Management System (DBMS) : To solve a problem the necessary data may come from internal or external database. In an organization, internal data are generated by a system such as TPS and MIS. External data come from a variety of sources such as newspapers, online data services, databases (financial, marketing, human resources).

Model Management system: It stores and accesses models that managers use to make decisions. Such models are used for designing manufacturing facility, analyzing the financial health of an organization. Forecasting demand of a product or service etc.



Support Tools: Support tools like online help; pull down menus, user interfaces, graphical analysis, error correction mechanism, facilitates the user interactions with the system.

Classification of DSS

There are several ways to classify DSS. Hoi Apple and Whinstone classify DSS in following:

- Text Oriented DSS
- Database Oriented DSS
- Spreadsheet Oriented DSS
- Solver Oriented DSS
- Rules Oriented DSS
- Rules Oriented DSS
- Compound DSS

The tools of decision support systems

Decision support system's tools are programs or codes which are the foundation used to create the generations and in turn specific DSS.

Decision support tools may involve the following:-

- (a) Material requirement planning (MRP)** – MRP is a method for ordering and maintaining materials in stock. It is a systematic approach to identify cost-beneficial ways of storing materials.
- (b) Linear programming** – Linear programming assists in solving problems which involves allocation off limited resources and evaluation of alternatives to achieve objectives.
- (c) Queuing theory** – Queuing theory is used in planning the activities of the organization to determine economically beneficial queues e.g. production of goods.
- (d) Descriptive statistics-** Descriptive statistics are used to estimate parameter and the dispersion of values associated with that parameter. These estimates are made for the various critical environmental factors to plan the day-to-day operations of the organizations.
- (e) Correlation analysis-** Correlation analysis is made to calculate relationship between values for particular parameters, such parameters value describing current conditions.
- (f) Variance analysis-** Variance analysis is used to describe variance between two or more variables.
- (g) Network analysis-** Network analysis is a pictorial tool for identifying and sequencing tasks. Those analysis help manager in controlling tasks necessary for successful operation of organization.
- (h) Transportation problems-** Transportation problems are used for planning and distribution of various facilities and resources.
- (i) Maximum flow or distance** – Program flow or distance is a tools for identifying the most economically beneficial flow through, or distances between, particular objects, this facilitates in determining the most preferred flow of goods or services through an object for which the organization must conduct business.



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- (j) **Dynamic programming** - Dynamic programming is a tool to enable that appropriate course of action and top level management are being followed by managers at operational level.
- (k) **Regression analysis**- The regression analysis can be used to estimate particular values on the basis of known values for variables. It may be used to estimate the value of known variables which may influence plans for implementing the decision of top level managers.
- (l) **Markov processes** - Markov processes are tools used to determine global associated with the occurrences of the related to changing probabilities of particular object. These global probabilities can then be used to determine more appropriate courses of action for the organization.

For more details visit:

http://en.wikipedia.org/wiki/Decision_support_system



Unit V System Design

System – System is set of components which interact with each other to accomplish a specific goal.

1 Human body and its subsystem could be nervous system, digestive system and cardiac system etc

2 Computer system and it has various subsystem like ALU, CU, Memory, Input unit and Output unit etc.

Characteristics of system

- Every system has a purpose.
- Every system is made up of components like input process output, feedback and control etc.
- System is made up of subsystem, whose goals are referred to as sub goals.
- Goal of a system is more important than subsystem goal.
- Systems whether open or closed have an element of control associated with them.

Types of System

There is several way of classifying systems that emphasizes the differences. Classification of system is as follows-

Open & Closed Systems –An open system interfaces and interacts with other system. An open system needs to receive feedback to change and continue to exist in its environment. Example – A marketing system is an open system.

A closed system does not exchange the information with its environment. It does not have any connection to the other system. Example – Research & development of organization, ICU dept. of hospital, etc.

Physical & Abstract System – Physical system are tangible entities that may be static or dynamic in operations. For example the physical parts of the computer center are the computers, desk, chair, etc. that facilitate operation of the computer.

Abstract systems are conceptual and non physical entities. They may be formulas of relationship among set of variables or models, software / program.

Deterministic & Probabilistic System – A deterministic system works with certainty in predictable manner. The interaction among its subsystem is known in advance. One state of the system determines the next state of the system.

Example – A computer system which works on the principal GIGO.

A **probabilistic system** operates with uncertainty as certain degree of error is always attached with prediction of what the system will do.

Example – A student admission system in a college is probable in nature.

Systems approach is an organized way of dealing with a problem.

System development life cycle (SDLC)

System development life cycle has 6 phases. They are

1. Recognition of need
2. Feasibility study
3. Analysis
4. Design
5. Implementation
6. Post-implementation and maintenance



System Design is a solution. It tells the approach to the creation of a new system. It provides the methods to implement the system given in the feasibility study. Emphasis is placed on transforming the performance requirements to design specifications. Design is done both logically and physically.

PROCESS AND STAGE OF SYSTEM DESIGN

The design phase focuses on the detailed implementation of the system recommended in the feasibility study. The design phase is a transition from a user-oriented document to a document oriented to the programmers or data base personnel.

System design goes through two phases of development

- Logical design
- Physical design

Design concept

The fundamental concepts are as measured:-

- Abstraction
- Refinement
- Modularity
- Software architecture
- Control hierarchy
- Structural partitioning
- Data structure
- Information hiding

Design considerations:-

There are many aspects to consider in the design of a piece of software. They are as follows:

- Compatibility
- Extensibility
- Fault tolerance
- Maintainability
- Modularity
- Packaging
- Reliability
- Reusability
- Robustness
- Security
- Usability

Design methodologies aim at the following

- Improve productivity of the analysts and programmers.
- Improve documentation.
- Cut down costs.
- Improve communication among users, analysts, designers and the programmers.
- Simplify the design by segmentation.

The main objective of general system design:

- Specify the logical design
- Support business activities
- Ensure that system meets user requirements
- Easy to use
- Provide detailed software development specification
- Conform to design standards



Input/output design:-

OUTPUT DESIGN

The term output necessarily implies to information printed or displayed by an information system. Following are the activities that are carried out in the output design stage:

- Identification of the specific outputs required to meet the information requirements.
- Selection of methods required for presenting information.
- Designing of reports, formats or other documents that acts as carrier of information.

The most important source of information is the output, efficient, intelligible output design should improve the system's relationship with the user and help in decision making.

Objectives of output design:-

- Carry information about past activities, current affairs or projection of the future
- Mark important events
- Take an action
- Confirm an action

Principles of output design:-

- Too many details should be avoided
- Design should be used from top to bottom approach
- All pages must have heading and page number
- All column must be labeled
- Abbreviations should be avoided

Types of output

- Report
- Document
- Message

PRESENTATION OF OUTPUT

The presentation of an output represented either in tabular or graphical form or in both forms. A tabular format is preferred in the following conditions:

- When the details dominate the content of the output
- When the contents of the output are classified in groups
- When the output design are to be compared.
- A tabular format is also preferred for the detailed reports .

Graphical representation are used to improve the effectiveness of the output because some users prefer to view information in graphic form rather than in rows and columns of the tables.

The tabular and graphical formats may be combined together to enhance the presentation of the output.

OUTPUT DESIGN SPECIFICATIONS

The specifications for the output design should be considered first while designing any output. The main points in the output design specifications are:



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Paper size:

Data and details

Special forms:

Summaries and totals

Multiple copies of output

Page title, number and date

Turnaround documents:

Notes and comments

Headings and date

Column headings and data type

A system designer may design multiple screens or special windowing capabilities such as pop-up windows for designing screens. Such design will enhance readability for the visual displays.

INPUT DESIGN

The data base is the data that must be obtained and stored for later retrieval for managerial decision making. The most common cause of error during the data processing is inaccurate input. The inaccurate input is entered by data entry operators but it can be controlled by input design.

Objectives of input design:

- Avoiding errors in data
- Avoiding delay
- Avoiding duplication of data
- Avoiding extra steps
- Controlling the amount of input required
- Keeping the process simple

Activities involved in input design:

- Collection of data
- Conversion of the input data to computer acceptable form
- Checking the conversion
- Transmitting the data to computer
- Checking the input data
- Correct the error if error occur

Similar to the output design, input design is equally important for a system designer. This is because output from a system is regarded as the foremost determinant for defining the performance of a system. The output of the system greatly affects the input design of the system.

Input layout

The layout of the input design must contain the following items.

- Headings and date of data entry.
- Data heading and value
- Data type and width of the column
- Initials of data entry operator

Form design

Form design is a specific component of user interface design and involves the creation of a system used by people to interact with an object such as a microwave, cell phone, or computer. Form design ergonomic factors, ease of use, and understandability are all combined to create the science of user interface design.



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Poor form designs can cause frustration, mistakes, fatigue, and actual physical damage such as eye strain and carpal tunnel syndrome.

Form design recommendations:-

- Form Colors
- Form Fonts
- Form Layout
- Form Buttons
- Form Navigation

Requirements of form design:

Form design follows analyzing forms. Since the purpose of a form is to communicate effectively through forms design, there are several major requirements.

1. Identification and wording:
2. Maximum readability and use:
3. Physical factors:
4. Order of data items:
5. Ease of data entry:
6. Size and arrangement:
7. Use of instructions:
8. Efficiency considerations:
9. Type of report:

Classification of forms:

A printed form is generally classified by what it does in the system. There are three primary classifications

1.Action: This type of form requests the user to do something.

Example: purchase orders.

2.Memory: This form is a record of historical data that remains in a file, is used for reference, and serves as control on key details.

Example: Inventory records, purchase records

3.Report: This form guides supervisors and other administrators in the activities. It provides data on a project or a job.

Example: profit and loss statements, sales analysis report

Types of forms:-

Flat form:

A flat form is single copy form prepared manually or by a machine and printed on any grade of paper. For additional copies of the original, carbon paper is inserted between copies. It is the easiest form to design, print, and reproduces; it has a low-volume use; and it is the least expensive. Often a pad of the flat forms is printed identical to the original copy of a unit set.

2. Unit-set/Snap out forms:

These forms have an original copy and several copies with one-time carbon paper interleaved between them. The set is glued into a unit for easy handling. The carbon paper is approximately 3/8 inch shorter than the copies. The copies are perforated at the glue margin for tearing out,



although the carbon is not perforated. Because of the perforation and the shorter carbon, the forms can be easily snapped out after completion.

3. Continuous strip/fanfold forms:

These are multiple - unit forms joined together in a continuous strip with perforations between each pair of forms. One-time carbon is inter-leaved between copies, which are stacked in a fanfold arrangement. The fanfold is the least expensive construction for large volume use. Computer printouts are invariably produced on them; they are virtually part of system design.

4. NCR (no carbon Required) paper:

Several copies can be made by pressing a chemical undercoating on the top sheet into a claylike coating on the top of the second sheet. The writing pressure forms an image by the coating material. The same process applies to the back of the second sheet for producing a carbon copy on the face of the succeeding sheet, and so on. It offers cleaner and long-lasting copies. One problem with NCR is the sensitivity of chemicals. It shows every scratch. It is costly.

File organization:-

A file is organized to ensure that records are available for processing. There are four methods of organizing files:

1) Sequential organization:

Sequential organization means storing and sorting in physical, contiguous blocks within files on tape or disk. Records are also in sequence within each block. To access a record previous records within the block are scanned. In a sequential organization, records can be added only at the end of the file. It is not possible to insert a record in the middle of the file without rewriting the file.

In a sequential file update, transaction records are in the same sequence as in the master file. Records from both the files are matched, one record at a time, resulting in an updated master file. In a personal computer with two disk drives, the master file is loaded on a diskette into drive A , while the transaction file is loaded on another diskette into drive B. Updating the master file transfers data from drive B to A controlled by the software in memory.

Advantages:

1. Simple to design
2. Easy to program
3. Variable length and blocked records available
4. Best use of storage space

Disadvantages:

1. Records cannot be added at the middle of the file.

2) Indexed sequential organization:

Like sequential organization, keyed sequential organization stores data in physically contiguous blocks. The difference is in the use of indexes to locate records. There are three areas in disk storage: prime area, overflow area and index area.

The prime area contains file records stored by key or id numbers. All records are initially stored in the prime area.



The **overflow area** contains records added to the file that cannot be placed in logical sequence in the prime area

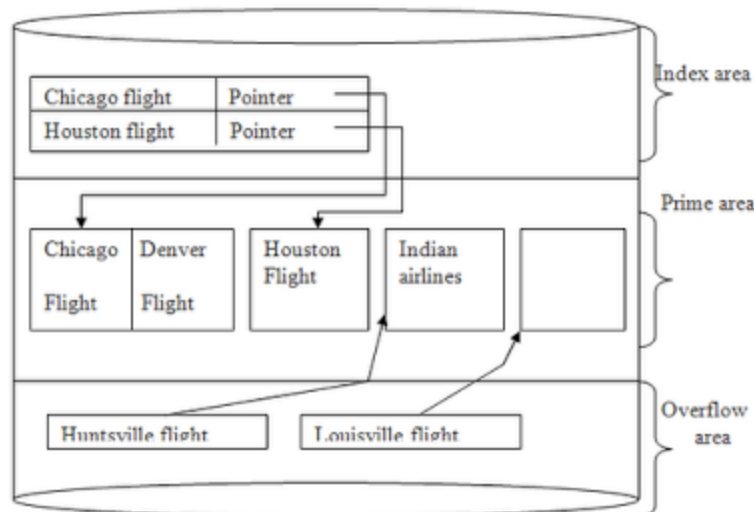
The **index area** is more like a data dictionary. It contains keys of records and their locations on the disk. A pointer associated with each key is an address that tells the system where to find a record.

Advantages:

1. Indexed sequential organization reduces the magnitude of the sequential search and provides quick access for sequential and direct processing.
2. Records can be inserted in the middle of the file.

Disadvantages:

1. It takes longer to search the index for data access or retrieval.
2. Unique keys are required
3. Periodic reorganization is required.

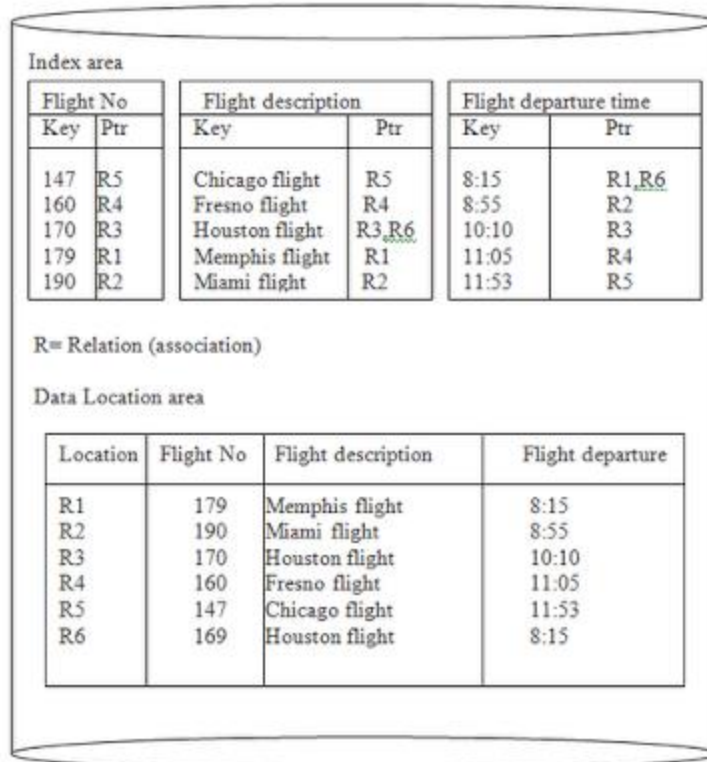


3) Inverted list organization:

Like the indexed- sequential storage method the inverted list organization maintains an index. The two methods differ, however, in the index level and record storage. The indexed sequential method has a multiple index for a given key, whereas the inverted list method has a single index for each key type. In an inverted list, records are not necessarily stored in a particular sequence. They are placed in the data storage area, but indexes are updated for the record key and location. The inverted keys are best for applications that request specific data on multiple keys. They are ideal for static files because additions and deletions cause expensive pointer updating.

Advantages:

1. Used in applications requesting specific data on multiple keys.



4) Direct access organization:

In direct access file organization, records are placed randomly throughout the file. Records need not be in sequence because they are updated directly and rewritten back in the same location. New records are added at the end of the file or inserted in specific locations based on software commands.

Records are accessed by addresses that specify their disk locations. An address is required for locating a record, for linking records, or for establishing relationships. Addresses are of two types:

1. Absolute
2. Relative.

An absolute address represents the physical location of the record. It is usually stated in the format of sector/track/record number. One problem with absolute address is that they become invalid when the file that contains the records is relocated on the disk.

A relative address gives a record location relative to the beginning of the file. There must be fixed length records for reference. Another way of locating a record is by the number of bytes it is from the beginning of the file. When the file is moved, pointers need not be updated because the relative location remains the same.

Advantages:

1. Records can be inserted or updated in the middle of the file.
2. Better control over record allocation.



Disadvantages:

1. Calculating address required for processing.
2. Impossible to process variable length records.

5) Chaining:

File organization requires that relationships be established among data items. It must show how characters form fields, fields form files and files relate to each other. Establishing relationship is done through chaining. It uses pointers.

Example: The file below contains auto parts that is a indexed sequential file sequenced by part no. A record can be retrieved by part no. To retrieve the next record, the whole file has to be searched. This can be avoided by the use of pointers.

Address	Key 1-Part No	Key 2-Part Type	Pointer
101	014	Muffler	076
102	021	Windshield	061
103	076	Muffler	199
104	061	Windshield	190
201	199	Muffler	END
202	190	Windshield	END

File design:-

Some of the basic terms used to describe the file hierarchy are as follows

Byte: A byte is an arbitrary set of eight bits that represent a character .It is the smallest addressable unit in today’s computers.

Data item (element): One or more bytes are combined into a data item to describe an attribute of an object. Sometimes referred as a field.

Record: The data items related to an object are combined into a record. There are two types of records

- Logical record maintains o logical relationship among all items in the record.
- Physical record is the way in which records are stored in a storage medium.

File: A collection of related records makes up a file. The size of a file is limited by the size of memory or the storage medium. There are two characteristics denoting the way files are organized

- Activity specifies the percentage of actual records processed in a single run.
- Volatility addresses the properties of record changes.

Attributes of file design:-

- File name
- Type
- Size
- Location
- Protection
- Time and date
- Lock flag
- Hidden flag
- System flag
- Maximum size
- Record length



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Program design:-

Data base: The highest level in the hierarchy is the database. It is a set of interrelated files for real time processing.

A program now requests data through the data base management system(DBMS), which determines data sharing.

Objectives of data base:

A data base is a collection of interrelated data stored with minimum redundancy to serve many users quickly and efficiently. The general objective is to make information access easy, quick, inexpensive and flexible for the user. In data base design several specific objectives are considered:

1. Controlled redundancy:
2. Ease of learning and use:
3. Data independence:
4. More information at low cost:
5. Accuracy and integrity:
6. Recovery from failure:
7. Privacy and security:
8. performance:

The terms that are normally used in DBMS are

1. **User's view** is a profile that the user expects to see on the report.
2. **Processing** refers to the changes made.
3. **Data model** is a framework of the user's view.
4. **Data file** is the area where the file is stored.

To manipulate the operations on the DB, a set of programs are maintained called Data Base management System (DBMS). The Main advantages of DB are

1. File consolidation
2. Program & file independence
3. Access versatility
4. Data Security
5. Program development
6. Program maintenance
7. Special information

In a data base environment, the DBMS is the software that provides the interface between the data file on disk and the program that requests processing. DBMS stores and manages data. The procedure is as follows:

1. The user requests a sales report through the application program. The application program uses a data manipulation language (DML) to tell the DBMS what is required.
2. The DBMS refers to the data model, which describes the view in a language called the data definition language (DDL). The DBMS uses DDL to determine how data must be structured to produce the user's view.
3. The DBMS requests the input/output control system (IOCS) to retrieve the information from physical storage as specified by the application program. The output is the sales report

Functions performed by the DBMS:

1. Storing, retrieving, and updating data.
2. Creating program and data independence. Either one can be altered independently of the other.
3. Enforcing procedures for data integrity.
4. Reducing data redundancy. Data are stored and maintained only once.



5. Providing security facilities for defining users and enforcing authorizations. Access is limited to authorized users by passwords or similar schemes.
6. Reducing physical storage requirements by separating the logical and physical aspects of the database.

System Security:

Security of a Computer System

- A state of being free from
 1. unauthorized use of the system and its resources,
 2. misuse of the system and its resources, and
 3. disturbance of the system's operations
- The field of study about techniques for achieving and maintaining such a secure state

Approaches to Security

- Prevention of Threats → Policies
- Exclusion of Unknown Entities → Identification and Authentication
- Hiding Important Information → Cryptography
- Detection of Potential Threats → Monitoring, Auditing, Detection, and Confinement

No *single* approach is sufficient for the security of the *entire* system.

→ Combine them in balance of their pros & cons

Aspects on Security

- Component Level
 - Hardware
 - Software
 - Human
- System Level
 - Integration
 - Consistency
- Organization Level

System security refers to the technical innovations and procedures applied to the hardware and operating systems to protect against deliberations or accidental damage from a defined threat.

System integrity refers to the proper functioning of hardware and programs, appropriate physical security and safety against external threats such as eaves dropping and wiretapping.

Privacy defines the rights of the users or organizations to determine what information they are willing to share with or accept from others and how the organization can be protected against unwelcome, unfair, or excessive dissemination of information about it.

Confidentiality is a special status given to sensitive information in a database to minimize the possible invasion of privacy.

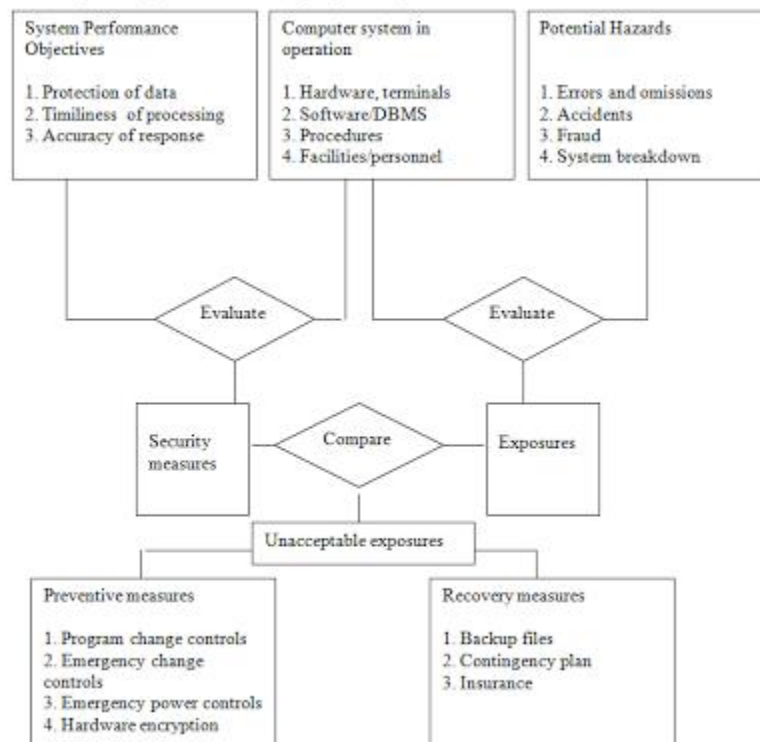
An organization that depends heavily on the use of databases requires special controls to maintain viable information. These controls are classified into three general categories:

1. Physical security or protection from fire, flood, and other physical damage.
2. Database integrity through data validation techniques.
3. Control measures through passwords, encryption, and monitoring users on a regular basis.



A procedure for protecting systems makes sure that the facility is physically secure, provides a recovery/restart capability, and has access to backup files. The potential threats within a firm are :

1. *Errors and omissions*
2. *Disgruntled and dishonest employees.*
3. *Fire.*
4. *Natural disasters.*
5. *External attack.*



Control measures:-

1. *Identification*
2. *Access controls*
3. *Audit controls*
4. *System integrity*

1. Identification :

There are three schemes for identifying persons to the computer. They are :

1. **Password** : A password is the most commonly used means for authenticating the identity to the people. Passwords should be hard to guess and easy to remember.
2. **Something you are, such as fingerprints or voice prints.** Voice prints is a reliable method for verifying authorized users. The technique essentially analyzes a person's voice against prerecorded voice patterns of the same person. An exact match allows access to the system.
3. **Something you have, such as the credit card, key, or a special terminal.** Magnetic stripe credit



card readers on terminals identify the operator to the system. The card along with a password gives added assurance of the authentication of the user.

2. Access Control :

Various steps have been taken to control the access to a computer facility. One way is to use an encoded card system with a log-keeping capability. The card serves as a key to unlock doors, including tape storage and other classified areas. The card is essentially a magnetic key and a "Keyport" is a lock. Inserting the card into the lockport unlocks the door. A card that includes a photograph of the bearer may double as an employee ID badge.

Encryption :

An effective and practical way to safeguard data transmitted over the telephone lines is by encryption. Data are scrambled during transmission from one computer or terminal to the other. A plaintext message is transmitted over an unprotected communications channel. To prevent unauthorized acquisition of the message, it is enciphered with a reversible transformation to produce a cryptogram or ciphertext. When it arrives at an authorized receiver, it is decrypted back to the plaintext data form.

3. Audit Controls:

Audit controls protect a system from external security breaches and internal fraud or embezzlement.

Neither the auditor nor the user can verify the system activities adequately, so the system must check itself. The internal controls required mean that programmers and analysts build controls into every system.

4. System Integrity :

The most costly software loss is the program error. It is possible to eliminate such error through proper testing routines. Parallel runs should be implemented whenever possible. Physical security provides safeguards against the destruction of the hardware, databases, and the documentation; fire, flood, theft, sabotage, and eavesdropping; and the loss of power through proper backup.

Recovery/Restart Requirements:

Restoring a damaged database is done by roll forward or rollback procedure.

Rollforward method involves updating a valid copy of the database with the necessary changes to produce a current version of the database.

Rollback method starts with the current invalid state and removes the records of the activity to produce the prior valid state of the database.

Backup is essential for recovery/restart procedure. If the database is physically damaged then it cannot be rolled back. Only roll forward can be done. For a sequential file a grandfather-father-son approach is followed. In a database environment, master files are not copied as they are updated. Instead transactions are posted directly to the file which replaces the original data. So to recover documents in such type of storage, backup is required.

System failures and recovery:



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There are three types of failures :-

1. catastrophic failure is one where part of the database is unreadable. To restore use roll forward method of recovery.

2. Logical error occurs when the activity of the database is interrupted with no chance to complete the current transactions. So when the system runs again, it is not sure if the changes have been updated or not. Data though available may be inaccurate. To restore the original contents, rollback method is used.

3. Structural damage. An example is a pointer incorrectly stored in a record that points to a unrelated or nonexistent data. If the problem cannot be corrected by software utility, then the database must be recovered to the most recent up-to-date point before the damage occurred.