

* System : →

System is an orderly grouping of interdependent components linked together acc. to a plan to achieve a specific purpose.

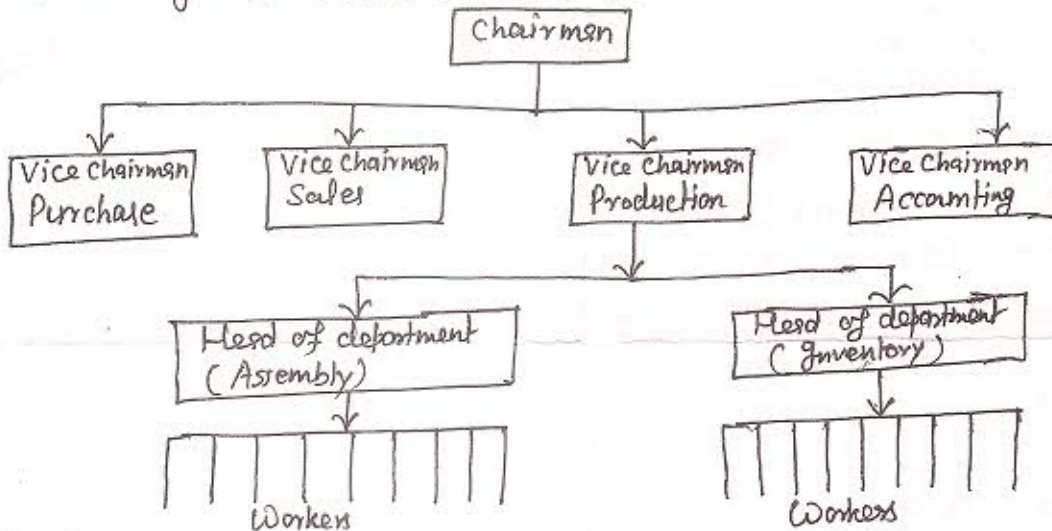
For example: — A business organisation is a system with its components as: — Marketing, Manufacture, Sales, Research, Shipping, Accounting Personnel, Administrative. All these components work together to create a profit.

* Characteristics : →

① Organisation/Order : →

Organisation refers to order and structure that determine the flow of control, communication and chain of commands. In other words, organisation refers to the arrangement of components or sub-system that helps to achieve the objectives.

For example: — A company is a system, made up of different departments which are its sub-systems. The employees are organized in a hierarchical order, with the chairman at the top leading downwards to the workers.



② Interaction : →

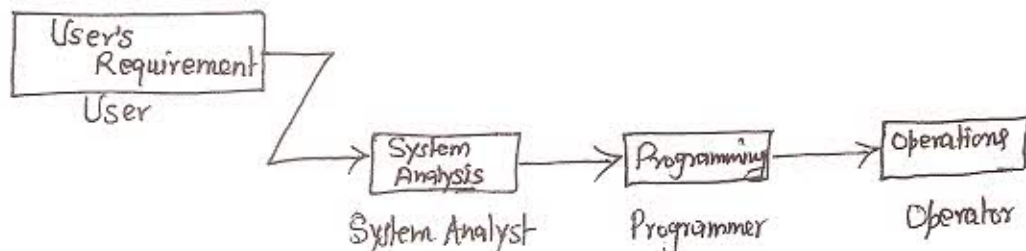
Interaction refers to the manner in which each component functions with the other co-existing components of system.

For example: — Advertising interacts with sales. In a computer system, the CPU must interact with the input device to solve a problem.

③ Interdependence : →

Interdependence implies that part of organisation or computer system depend on one another. One sub-system may depend on the input of another subsystem i.e. the output of one sub-system is the required input for another sub-system.

For example: — A user decides to computerize an application, an analyst analyse and designs it, a programmer does the programming & testing and then the application is run by the computer operator as shown in the figure. Each of these persons performs properly on the basis of the required input from other in the computer based systems.



④ Integration : → Integration is concerned with how a system is tied together.

⑤ Central Objective : → Every system has a predefined goal or objective toward which it works. A system cannot exist without a defined objective. For example : — A business system may have profit making as its central goal.

* Elements of System : → To reconstruct a system, various elements that must be considered are as follows : — ① Outputs ② Inputs ③ Processors ④ Control ⑤ Environment ⑥ Feedback ⑦ Boundaries & Interface.

① Outputs : — A system must be capable of producing an output that must be of value to the user. Output is the outcome of a processing.

② Inputs : — Inputs are the elements that enter the system for processing. The essential characteristics of input are : — (i) Accuracy : → If the data is not accurate, the output will be wrong. (ii) Proper format : → The input must be in a proper format. (iii) Timeliness : → If data is not available at the time, whole system may fail. (iv) Economical : → It is required that data must be produced at a low cost.

③ Processor : — Processor is the operational component of a system.

④ Control : — This element is needed to control all the activities governing / concerning input, processing and producing the output.

⑤ Environment : — It refers to the external elements the effect on the system. It determines how a system must function.

⑥ Feedback : — The information supplied by comparing results with standard and informing the control elements about the differences is termed as "Feedback". It is a way to measure / compare output against a standard output. Feedback may be positive or negative. Positive feedback supports the system performance. Negative feedback provides information for an action.

⑦ Boundaries & Interface : — The limits of system are specified by its boundaries. Every system has defined boundaries within which it operates. It enables to know which elements lie or do not lie within the system.

* Classification of System : →

Viewing the behavior of a system, a system can be classified into following types : —

(1) Physical & Abstract System : — Physical systems are concerned with tangible entities / components i.e. the components which we can touch. They can be seen & felt. Abstract systems are those systems which are non-physical or these systems are conceptual i.e. an education system, our social system.

(2) Deterministic & Probabilistic System : — Deterministic systems are those which are based on predetermined set of rules. The behaviour of deterministic system is completely known. The outputs / results or events are perfectly predictable i.e. computer program. Probabilistic systems are not based on predetermined or predefined rules. In these systems, only probabilistic estimates can be given. e.g. sale of coolers depend on summer. The system analyst deals with such systems.

③ Open and Closed System:—

System that interact with their surrounding or external environment are called open system. An open system receives or accepts input and delivers output to its environment. For example, an information system, business organisation. System that doesn't interact with their environment are called closed system. A closed system is self contained. Such systems are rare and are unsuccessful.

④ Man-made Information System:—

An information system can be defined as a set of devices, procedures, processes designed acc. to the criteria given by the users for purpose of planning, controlling and performing. It supports and improves day to day operations in a business as well as support the problem-solving and decision making needs of the users and management. The major info. systems are:—

(a) Formal Info. system:— A formal info. system is based on the organization. It is represented by the organisational chart. The chart depicts the position and their authority relationship which are indicated by boxes and connected by straight lines. It shows the pattern of authority, communication and work flow.

(b) Informal Info. system:— An informal info system is an employee based system. It is designed to meet personnel needs, vocational needs and the solution of work-related problems.

(c) Computer-based Info. system:— A computer based info. system use computers for purpose of handling info. and using the info. stored for the purpose of solving problems. CBIS are classified as:—

(i) TPS:—> The system required to obtain operational info. is known as Transaction processing system. A TPS can be defined as a CBIS that captures, classifies, stores, maintain, updates and retrieve transaction data for record keeping & for input to other types of CBIS.

(ii) MIS:—> The system required to obtain managerial information is known as management information system. MIS assist middle level management in problem solving and making decisions. They use the result by analyzing the data created by transaction processing system and some other information also to take decisions.

MIS helps to accomplish the following management related task:— planning, Direction, organisation, controlling and feedback. The purpose of management information system is to develop plans for achieving objectives, to organize for implementing plans and to control performance so that plans and actions occur on schedule.

(iii) DSS:—> To make strategic decision one needs strategic info. which is obtained from decision support system. Decision support system assist managers, who must make decision that are not high structured, often called unstructured or semistructured decisions.

A key factor in use of decision support system is to determine what information is needed. In well structured situation it is possible to identify information needs in advance but in an unstructured environment it is difficult to do so.

(iv) OAS:—> Office Automation system.

** SDLC : →

System development life cycle is a well-defined process by which a system is imagined, developed and implemented. The SDLC consist of following phase:—

① Preliminary Survey or Investigation : →

One of most difficult tasks of the system analyst is identifying the real problems of existing system. Without clear understanding of problem in the system, any further work done will lead to the wastage of efforts and time at a later stage. The purpose of preliminary survey is to evaluate project request.

② Feasibility Study : →

Depending on the results of the initial investigation, the survey is explained to a more detailed feasibility study. A feasibility study is a test of system proposal acc. to its workability, impact on the organisation, ability to meet user needs, effective use of resources and profitability. The feasibility study is concerned with three aspects. There are:—

(i) Technical Feasibility : →

Technical feasibility analysis determines whether the proposed system can be developed and implemented using existing technologies or whether new technologies are required. H/W, S/W, and network requirement for the new system are also determined in this step.

(ii) Economical Feasibility : →

Economical feasibility analysis evaluates the financial aspects of the project by performing a cost-benefits analysis and assessing both the tangible and the intangible benefits of system. By conducting this study the analyst can determine the following:— (a) whether the project is economically feasible? (b) whether there are sufficient benefits as compared to the cost incurred?

(iii) Operational Feasibility : →

Operational feasibility analysis determines whether there will be any problem in implementing the system in its operational environment.

③ System Analysis : →

System Analysis is the process of analysing a system & trying to find a way to modify it or create a new system to meet the user needs. The key questions arises in the system analysis phase:— (i) what is being done in the organisation? (ii) How is being done (iii) How frequently does it occur (iv) what is the volume of transactions and decisions? (v) How well is the task being performed (vi) Does a problem exist (vii) If a problem exist, how serious is it what is underlying causes?

To answer these questions, system analyst must consult a variety of processes. During analysis, data are collected on available files, decision point and transaction handled by the present system. Some tools are used in analysis like interview, on-site observation etc.

④ Design of System : →

The most creative and challenging phase of SDLC is the design of system. The purpose of design phase is to plan a solution of problem specified by requirement analysis. This phase is the first step in moving from problem domain to solution domain. The output of this phase is design document. This document is similar to a blue print or a plan for solution. The design activity is divided into two phases—(i) System Design : → Sometimes called Top level design, aims to identify the modules that should be in the system and how they interact with each other to produce desired results. (ii) Detailed Design : → In detailed design, the internal logic of each of the modules specified in the system design is decided. During this phase, further details of data structure and algo. design of each of module is specified.

In design phase two separate documents are produced. One for system design and one for detailed design.

⑤ Development of SW : →

In this phase, the analyst decide whether to buy a commercial SW or to develop new customize programs with the help of programmers. The choice depends on the cost of each option and time available to develop SW and availability of programmers. In large organisation, the work is entrusted to programmers, whereas in small orgn, the job is assigned to outside organisation.

Programmers are also responsible for documentation the programs. In documentation the programmers describe all the information needed to code the program and test the program.

⑥ System Testing : →

The main purpose of this phase is to identify and correct errors in the system. In system testing performance and acceptance standards are developed. The main objective of a system testing are as follows: — (i) To make sure that the system during operation will perform as per the user requirement. (ii) To compare turn around time of proposed system and newly developed system. (iii) To ensure that during the operation, incorrect inputted data and processing will be detected (iv). To make sure that useful files is protected or not in newly developed system.

⑦ Implementation and Evaluation : →

The goal of the implementation phase is to implement or install a system correctly, efficiently and quickly on a particular set of computers, using particular hardware and software. Implementation can be done in three ways: — (i) Direct Implementation (ii) Parallel Implementation (iii) Partial Implementation.

After implementation of system, it should be evaluated. Evaluation measures how well the original ambition of new system have been achieved that means through evaluation we can identify its strength and weakness.

Evaluation criteria - what should be evaluated in the new or changed system to see if it has been a successful project. Typically evaluation criteria include: — Speed, Accuracy, Quality of output, Cost of operation, Ease of use etc.

⑧ Maintenance : → Maintenance include all the activity after installation of SW that is performed to keep the system types operational. These are three types of maintenance : →

(i) Correction : → Correction means correcting or removing the error in the newly developed system.

(ii) Adoption : → Adoption means customizing the SW to run in the newly environment

(iii) Enhancement : → Enhancement means editing new functions and additional capabilities to the newly developed system.

*** Role of System Analyst: →

System Analyst is a person who conduct a methodical study and evaluation of an activity. The job of system analyst is to success the system projects by careful planning and thoughtful preparation. System Analyst plays the following important roles: →

① Change Agent: →

The analyst may be viewed as an agent of change. In the role of change agent, the analyst may select various styles to introduce change to the users organisation, as per requirement.

② Investigator: →

As an investigator, the analyst determines why the present system does not work well and what change will correct the problem. He/she extracting the real problems from existing system and creating information structure that uncover previously unknown trends that may have direct impact on the organisation.

③ Setting Priorities: →

In an organisation there are many types of users. Each user has different types of information needs. It may not be possible to satisfy the requirement of every one, due to limited availability of resources. So it would be necessary to give priorities to them. So, the priorities are to be set based on the importance of user's need.

④ Architect: →

As architect, the analyst also create a detailed physical design of candidate system.

⑤ Psychologist: →

The analyst plays the role of psychologist in the way, he/she reaches people, interprets their thoughts, assesses their behaviour and draws conclusion from these interactions. It is important that the analyst be aware of people feelings. The art of listening is important in evaluating responses and feedback.

⑥ Evaluating System (Evaluator): →

System must be thoroughly tested. The time at which evaluation is to be done and how user comments are to be gathered and user needs to be decided by the analyst.

⑦ Motivator: →

The analyst present the proposed system or candidate system to the management and the users. Here, the analyst's role a motivator becomes obvious during the first few weeks after implementation.

✱

* Qualities of System Analyst : →

System analyst's skills are divided into two categories :— Interpersonal, Technical

(a) Interpersonal Skills :— The interpersonal skills relevant to system work include the following :—

- (i) Communication :— An analyst is required to give presentation about the new design to a group of users. Good oral presentations and satisfactory replies to questions are essential to convince (satisfying, assure firmly) management and users about the usefulness of information system.
- (ii) Understanding :— That means, having ability to identifying problems, grasp of company goal and objectives.
- (iii) Teaching :— That means, having the ability to educating people.
- (iv) Selling :— That means, having the ability to selling ideas and promoting innovations (नई पद्धति) in problem solving using computers.

(b) Technical Skills :— The technical skills relevant to system work include the following :—

- (i) Creativity (ii) Knowledge of people (iii) Knowledge of Data processing Principles
- (iv) Problem Solving (v) Project Mgt. (vi) Dynamic Interface (vii) Well educated with sharp mind.

* Case Tools for System Analyst : →

Commercially available systems provide tools for each phase of system development life cycle. The following tools are :—

- ① System Requirement specification documentation tool.
- ② Data Flow diagramming tool.
- ③ System Flow chart generation tool.
- ④ Data Dictionary creation.
- ⑤ Formatting and checking structured English process logic.
- ⑥ Decision table checking.
- ⑦ Screen design for data inputting.
- ⑧ Form design for output.
- ⑨ ER diagramming
- ⑩ Database normalization and dependency information

Importance : → Case tools stands for computer aided software engineering tools. As the name implies they are computer based programs to increase the productivity of analysts. They permit effective communication with users as well as other members of development team. They integrate the development done during each phase of SDLC. They assist in correctly assessing the effects and cost of changes so that maintenance cost can be estimated.

Tools are used throughout the system design phase. CASE tools are classified as upper CASE tools and lower CASE tools. The tools above described are upper CASE tools. Tools are available which will generate screen code from higher level description such as structured English and decision tables. They are called lower CASE tools.

** Project Selection : ->

- Introduction : -> System Analysts don't start working on any project they desire. They receive a lot of requests from management for starting different types of project. When projects are formally requested, the system analysts, under the management's direction, conduct a preliminary investigation to analyse the reason for request and collect various facts to respond to the request in a systematic way.

- Reasons for project Initiation : ->

1. Greater processing speed
2. Greater processing capabilities
3. Accuracy and improved consistency
4. Fast retrieval
5. Communication
6. Integration of business areas
7. Reduced costs
8. Better security.

- Source of Project Requests : ->

- (A) Request from Deptt. Managers : -

Department managers are often not satisfied with the amount of time that staff takes to complete job. Accuracy is another problem. In this case, the managers will discuss these problem with other administrators regarding their clerical as well as processing work to approve development of computer based system for office administration.

- (B) Request from System Analysts : -

Sometimes system analysts find areas where it is possible to develop projects. In such cases, they may prefer either writing system proposal themselves or encouraging a managers to allow the writing of a proposal on their behalf.

- (C) Request from senior executives.

- (D) Requests from outside group : -

Development outside the organisations also lead to project request. For example, government contractors are required to use special cost accounting systems with government stipulated (to demand as agreement) features.

- Managing Project Reviews & Selection : ->

There are various committees that select and review projects for development. There are :-

- ① Steering Committee : -> This committee is also called operating committee, operating council, or project selection board. The committee receives proposals and evaluate them. Their decision are made on basis of :-
 - Cost of project
 - Benefits of project to the orgn.

- ② Info. system Committee : ->

The info. system committee which consist of managers and analyst in the info. system department. All request are directly submitted to info. system committee. If a project is a long-term and one then senior executive are also consulted who will decide to approve or reject the long term project.

- ③ User-Group Committee : -> In some orgn.; the responsibility for project selection is given to the users.

* The Project Request Form: →

Project request form should contain the following:—

- (i) What is a problem?
- (ii) What are the details of the problem?
- (iii) How significant is the problem?
- (iv) What does user feel in the solution?
- (v) How will the information system help?
- (vi) Who else knows about this and could be contacted?

The project selection committee is responsible to review the proposals, carefully and finally select those project which are most beneficial to the organisation. Therefore, a preliminary investigation is often requested to gather detail which are asked in the project request forms.

*** ER Model: →

The entity relationship (ER) data model are used to model application database. It allows the representation of explicit constraints as well as relationships.

- Enterprise: → An enterprise is any kind of organisation such as a bank, a university, manufacturing plants or a hospital.
- Entity: → An entity is a person, place, thing, even or concept about which information recorded. In a schooling environment, examples of entities are, students, Teaching staff, Non-teaching staff etc.
- Attributes: → The properties that characterize an entity or entity set are called its attributes.
- Domain: → The set of possible values that a given attribute can have is called an Domain. For example, the set of values that the attribute EMPLOYEE_Soc_Sec_No. can assume is a +ve integer of nine digits.
- Data Value: → A data value is the actual data or information contained in each data element (attribute). The data element "Room_No." can take values like "101".
- Entity Type or Entity Set: → An entity type or set is a collection of entities that have the same attributes, or in simple words it is a group of similar objects of concern to an organisation for which it maintain data. Examples of entity sets are, job position, course, employee, students etc.

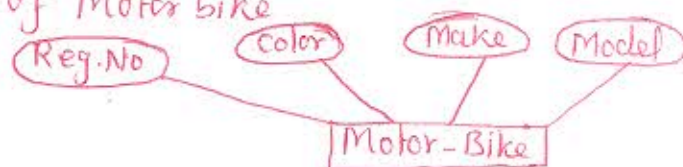
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* Types of Attributes : →

1. Single Valued Attributes : → An attribute which has a single value for a particular entity is known as a single valued attribute. For example, age of an employee entity.
2. Multi-valued Attributes : → An attribute which has a set of values for the same entity is known as a multivalued attribute. For example, color of a motor bike.



3. Composite Attributes : → The attributes which can be divided into smaller independent attributes are called composite attributes. For example, Name of an employee of the employee entity.

FName → First Name e.g. Employee Name
 MName → Middle Name FName MName LName
 LName → Last Name Krishan Lal Bharti

4. Simple Attributes : → The attributes which cannot be divided into smaller subparts are called simple or atomic attributes. For example, Soc-Sec-No. in employee entity.

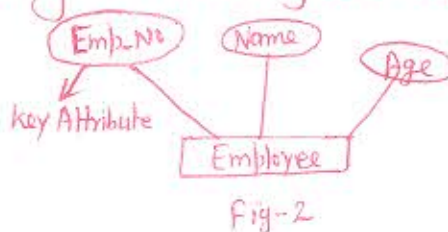
5. Null Value Attributes : → An attribute for an entity has a null value if either the value of that attribute is not known. For example, if a person does not have any degree then the college degree attribute value will be null.

6. Derived Attributes : → An attribute which can be derived from another attribute is known as a derived attribute. e.g., age of an employee entity can be determined from today's date and birth date of the employee entity.

7. Stored Attributes : → An attribute which cannot be derived from another attribute is known as a stored attribute. For example, birth date of an employee.

8. Complex Attributes : → It is a combination of a composite and multivalued attribute.

9. Key Attributes : → A key attribute is an attribute that has a distinct unique value for each entity in an entity set. e.g., Emp.No. in an Employee entity type.



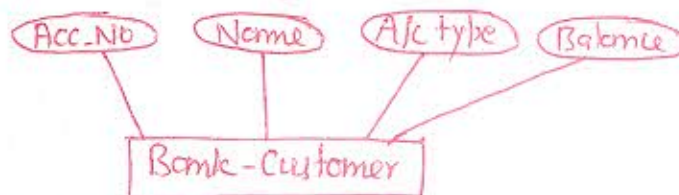
*** Weak Entity Type: →

An entity type that does not have any key attribute is called a weak entity-type. The weak entity type is also called the child (irregular) entity type. e.g.



*** Strong Entity Type: →

Entity type that have key attributes are called strong entity type. The strong entity type is also called entity type. e.g.



*** Relationship: →

An association among entities is called a relationship. We looked at relationship indirectly when we converted a 1:M (one to many) association into a strong entity, weak entity, and relationship. A collection of relationship of same is called a relationship set.

* Types of Relationship: →

- ① Binary Relationship: → A relationship is a binary relationship if the no. of entity sets involved in the relationship is two.
- ② Ternary Relationship: → A relationship is a ternary relationship if the no. of entities sets involved in the relationship is three.
- ③ N-ary Relationship: → A relationship is n-ary relationship if the no. of entity sets involved in the relationship is N (multiple).

* Relationship Constraints: → There are two types of relationship constraints.

- ① Participation Constraints.
- ② Cardinality Ratio.

① Participation Constraints: → It specifies whether the existence of an entity depend on another entity via the relationship type. There are two types of participation constraints.

(a) Total Participation: → In total participation, every entity in entity set must be depend on another entity. e.g. if a organisation policy states that every employee must work for a department. Then an employee entity can exist only if it is related to a department entity via WORKS-FOR relationship.



Total participation is also known as existence dependency.

(b) Partial Participation : →

In partial participation, some entities in entity set are depend on another entity. For example, it is not necessary that all employee manage specific department.

(2) Cardinality Ratio : → Cardinality ratio for a binary relationship specifies the number of relationship instance that an entity can participate in a relation set. There are four cardinality ratio.

(a) One-to-One (1:1) 

(b) One-to-many (1:m) 

(c) Many-to-many (m:n) 

(a) One-to-one (1:1) : → The relationship bet. a department and a manager is usually one to one —



(b) One-to-many (1:m) : → The relationship bet. manager and employee is one-to-many, because there are several reporting managers employee reporting to the manager.



(c) Many to one (m:1) : → The relationship bet. dependent and employee is many-to-one.

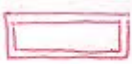


(d) Many-to-many (m:n) : → The relationship bet. employee and Project is many-to-many because each employee could be involved in a no. of different projects and a no. of employee could be working as a given project.



* ER Diagram Notations : →

 — Entity type

 — Weak Entity type



— Relationship Type

 — Attribute

 — Key Attribute



— Multivalued Attribute



— Composite Attribute



— Derived Attribute.

*** Feasibility Study: →

A feasibility study is a test of system proposals, acc. to its workability, impact on the organisation, ability to meet users needs, effective use of resources and profitability. The Feasibility refers to the determination of whether it is practical and beneficial to build that system. This study helps in determining whether the system requested is feasible or not.

* Objectives: →

- ① To identify the responsible user.
- ② To identify the problem in the current system.
- ③ To determine goal of proposed system / candidate system.
- ④ To find out cost and saving of alternatives.
- ⑤ To acquire a sense of scope of system.
- ⑥ To determine whether it is feasible to develop new system.

* Types of Feasibility: →

① Technical Feasibility: →

Technical feasibility analysis determines whether the proposed system can be developed and implemented using existing technologies or whether new technologies are required. H/W and S/W, network requirement for the new system are also determined in this type. The technical feasibility must be considered for development of new business information system.

② Economic Feasibility: →

Economic feasibility analysis evaluates the financial aspects of the project by performing a cost-benefit analysis and assessing both the tangible and intangible benefits of the system. By conducting this

(स्पष्ट) feasibility the analyst can determine the following: →

- (a) Whether the project is economically feasible.
- (b) Whether there are sufficient benefits as compared to the cost incurred.

③ Operational Feasibility: →

Operational feasibility analysis determine whether there will be any problem in implementing the system in its operational environment, look at issue such as integrating the new system with existing system in the organisation and assesses how the system fit with strategic business plan and strategic information plan of the organisation.

④ Social or Behavioural Feasibility: →

It is determination of whether a proposed project will be acceptable to the people or not. An estimate should therefore be made of how strong a reaction the users staff is likely to have towards the development of a proposed system, that involves computer use in their day to day working.

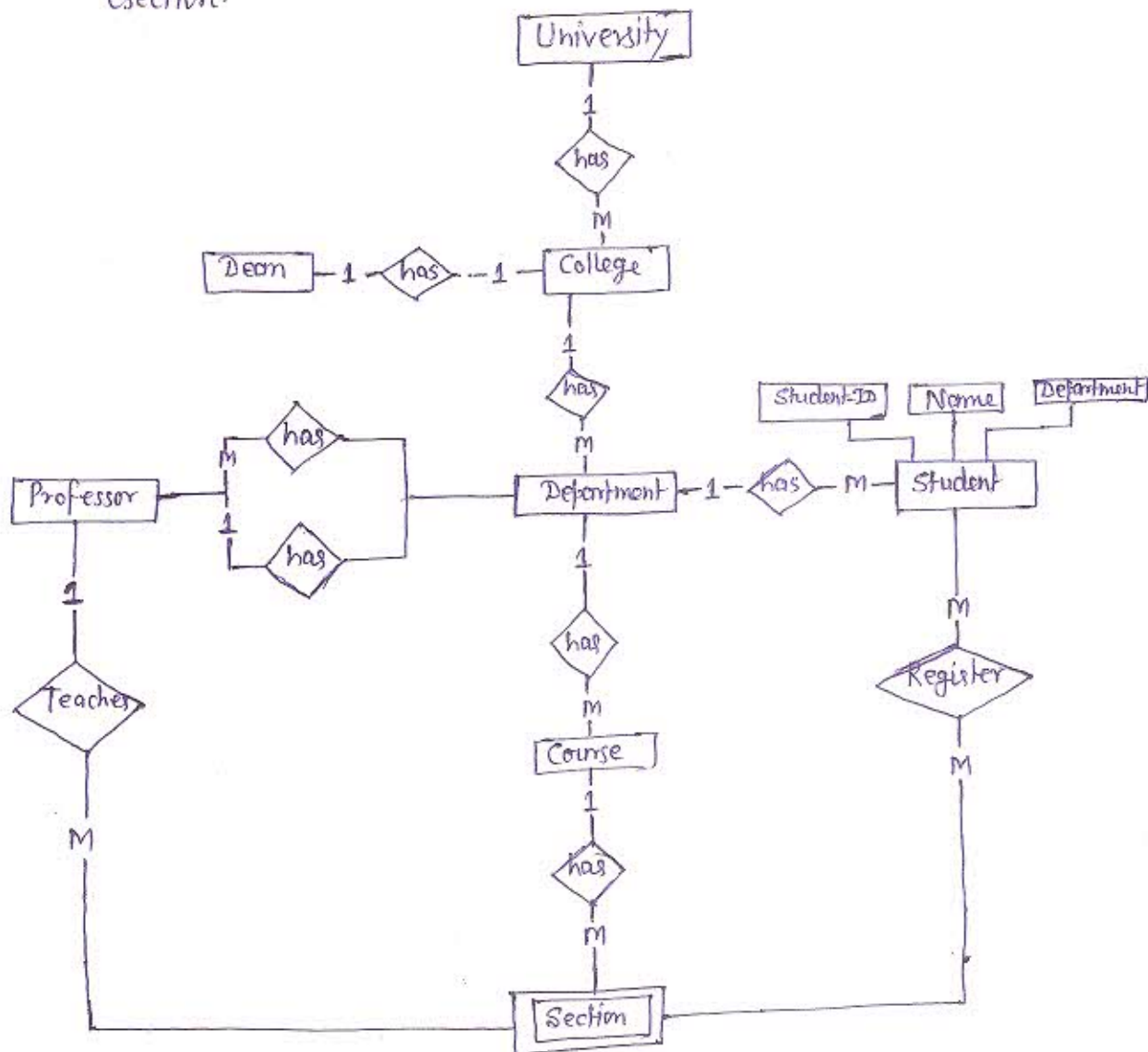
⑤ Management Feasibility: →

It is determination of whether a proposed project will be acceptable to management. If management does not accept a project, the analyst will consider the project as a non-feasible one.

* Entity-Relationship Model : →

In E-R Model, object of similar structures are collected into an entity set. The relationship bet. entity set is represented by a named ER relationship and 1:1, 1:M, or M:N, mapping from one entity set to another. It is a pictorial representation of database entities relationship.

* Example : → Make an ER diagram for the university database with the following description: - ① The university is organised into colleges. Each college has Dean and each college is organised into number of departments. ② Each department has a number of courses and no. of students. ③ Each student has unique Student_ID, Name and department. And multiple student registered in multiple sections. ④ Each course has multiple sections. And each department has no. of professors. ⑤ Each professor teacher in multiple section.



Date, 2/2/11

**** Legal Feasibility : →**

Legal Feasibility is to determine whether a proposed project is under rules, acts,

**** Time Feasibility : →**

Time feasibility is to determine whether a proposed project can be implemented fully within a fixed time frame. If a project takes too much time it is likely to be rejected.

***** Steps in Feasibility : →**

① Form a leader with a team : → First of all, the project management orgn. forms a team with a leader for feasibility study. The team consists of one or more system analysts and programmers with a project leader. The senior analyst and programmer with project leader is generally appointed as project leader who is responsible for planning and managing the development activities of system.

② Prepare general system flow charts : → The next step is to prepare generalised system flow chart of current system. The flow chart needed for detailed evaluation are also prepared. These flowcharts describe the general working of the system in a graphical way.

③ List potential alternative / candidate system : → This step identifies and list potential alternative / candidate system that are capable of producing the output. The h/w that can handle the system requirements is also considered in this step. For this vendors are contacted for info on the processing capabilities of the system available.

④ Identify meaningful proposed system characteristics : → The major characteristics of proposed system are identified and listed by each analyst and then discussed with project leader.

⑤ Prepare the proposed system flow chart : → After identifying the characteristics of proposed system, the analyst prepare their system flow chart. System flowchart of the proposed system are compared with the planned flowchart system to ensure that they meet the objectives.

⑥ Determine the technical feasibility : → Technical feasibility is a measure of practicality of a specific technical solution and the availability of the technical resource and expertise.

⑦ Determine the Economic Feasibility : → Economic feasibility is a measure of cost-effectiveness of the system/project and its solution. This is called cost-benefit analysis. The analyst identify the cost and benefits of the proposed system to ensure that project is economically feasible.

⑧ Determine the operational Feasibility: → Operational feasibility is a measure of how well the solution will work in the orgn. It is a measure of how people feels about the system. The analyst determine the operational feasibility of the project.

⑨ Submit the feasibility report to the management: → The analyst also prepare the feasibility report during the feasibility study. At the end, the feasibility analysis report is submitted to management. Project leader also gives the oral presentation of feasibility study to the management.

*** Feasibility Report: →

The feasibility report is prepared by the analyst during the feasibility study is submitted to the management. It is the final report having the findings and conclusions of the study. Management will review the report and take a decision on the project based on it. Feasibility report includes: →

- An executive summary of system.
- Clear scope of system.
- Description of both the current system and proposed system.
- Details on the methods used for the study.
- Scope and system boundaries.
- Problem statement along with—current system description, proposed system description, How the proposed system will solve the problem description.
- Availability and required necessary technology.
- Detailed cost/benefit statement.

*** Tools for Structured Analysis: →

The goal of system development is to deliver the system ^{to fulfill} in the line with user's requirement. Analysis is the heart of process.

Structured analysis is a set of techniques and graphical tools that allow the analyst to develop a new kind of system specifications that are easily understandable to user. Analyst work primarily with their pencil or paper.

Structured analysis consider goals and unstructured tools for analysis. The new goal specify the following:—

- ① Use graphics wherever possible to help communicate better with the user.
- ② Differentiate bet. logical and physical system.
- ③ Build a logical system model to familiarize the user with system characteristics and interrelationship before implementation.
- ④ The approach focuses on what the system does rather than how it is done.

Completed & ✓

- ⑤ It starts with understanding the physical system and extracts the logical requirements from it. The focus is on logical requirements rather than physical aspects of system.
- ⑥ Various techniques and tools are used to construct a logical system which shows the system characteristics and interrelationship understandable by the user.
- ⑦ The main tool used in structured analysis is DFD i.e. Data Flow Diagram. Data Flow Diagrams are the diagrams which depicts the flow of data through the system and processes of system in a general form.

** DFD (Data Flow Diagrams) : →

A DFD also known as "bubble chart" has purpose of clarifying system requirements and identifying major transformation that will become programs in the system design.

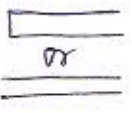
A DFD consist of a series of bubbles joined by the lines. It describe the logical operation of a system and show the work or processing performed by that system. DFD's only represent the flow of data through the system. DFD shows all essential components and have they fit together in the system.

* Goals of DFD : →

- ① To provide an overview of that ^{data} a system would process.
- ② To provide hierarchical break down of the system.
- ③ To show what files are used and where the result flows (to be successful)
- ④ To document information flow within the system.
- ⑤ To illustrate the essential components of a process/system and the way they interact

The main reason behind the popularity of DFD technique is that it is very simple to understand and use. And it is a graphical representation which is good for communication bet. user and analyst.

* DFD Symbols : →

Symbol	Meaning	Comments
	External Entity	May be one customer.
	Data flow	May be physically contained in a purchase order invoice, Ph.No.
	Process that transforms Data flow	May be a clerk, computing discounts or a cataloged procedure or a combination of manual and electronic activities.
	Data store	Can be database or disk.

- ① External Entities : → A square represents an external entity. External Entities are named with appropriate name e.g. In the banking system a customer opening an account is an external entity.

Customer ← External entity

The external entities are physical entities. A external entity is not responsible for any task performed by the system.

- ② Data Flow : → A directed arrow represents the data flow. It represents the path over which data travel in the system. The data flow can take place between two processes, file and process, an external entity and a process in the direction of data flow. ~~and~~ Data flow can not take place bet. files or external entities.

- ③ Process : → A process is represented graphically as a circle or a bubble. It transforms data from one form to another by performing some tasks with the data. It must also have a name which describe what the function does. It is expressed in terms of verb object like CREATE, GENERATE, PRODUCE, COMPUTE, DETERMINE, VERIFY etc. Process have identification number also from top to bottom and left to right.

- ④ Data Store : → An open rectangle is a data store. A data store is a place where data is hold temporarily from one transaction to the next or is stored permanently. Only processes may connect with data stores. It represents a logical file, a data structure or physical file on disk. Each data store is connected to a process by means of a data flow symbol.

* Types of DFD : →

- ① Context DFD : → The emphasis is on the relationship between the system and its environment. The system as a whole is represented by a bubble and the external entities are shown as square from which input flow and to which output is directed. No information about the structure of system itself is pictured in a context DFD.

- ② Diagram 0 : → A diagram 0 is a diagram showing the system itself. It pictures the major processes along with the external entities, data store and data flow. It is single top-level diagram of the system and does not describe each process in detail.

- ③ Detailed DFD : → Detailed DFD are explian of higher level presentation and are detailed pictures of major processes or sub system.

* Advantages of Data Flow Diagrams : →

- ① It gives further understanding of interested of the system and sub system.
- ② It is useful from communicating current system knowledge to the user.
- ③ Use as part of system documentation files.
- ④ DFD helps to substantiate the logic underlying the data flow of organisation.
- ⑤ It gives the summary to the system.
- ⑥ DFD is very easy to follow errors and it is also useful for quick reference to the development team for locating and controlling errors.

* Disadvantages of DFD : →

- ① DFD is likely to take many alteration with the user.
- ② Physical consideration are usually left out.
- ③ It is difficult to understand because it ambiguous (संदिग्ध, अस्पष्ट) to the user who have little knowledge.
- ④ DFD shows weak input and output details.

*** SYSTEM DESIGN : → 11/02/11

The design phase focuses on the "How to" approach the creation of a new system. The main objective of design phase is to produce the model of system. The design phase focuses on the detailed implementation of system recommended in the feasibility study.

System design is highly creative phase which focuses on how to make a system that is

- fully functional
- Reliable
- Easy to understand
- Verifiable
- Consistent
- Easy to operate.

Q. What are the essentials of good design?

Ans. To produce a good design, following are the essentials/objectives : →

(1). Changeability : →

Changeability is the ease with which a system may be changed. The system should be modifiable depending on the changing needs of the users or changes in environment or policies etc.

- (2) Correctness : → The system design should be correct that is the system design is free from defects.
- (3) Efficiency : → Efficiency is the extent to which a system performs its intended functions with a minimum consumption of computing resources. Efficiency also involves the accuracy, timeliness and comprehensiveness of system's output.
- (4) Reliability : → The system design should be reliable. Reliability is the ability of a system to perform a required function under stated condition for a stated period of time.
- (5) Security : → Security is an important aspect of design. Security implies/includes following — Confidentiality, Privacy and data security.
- (6) Practicality : → The system must be stable and capable of being operated over a long period by competent but average intelligent persons. There is no use of designing a system that needs geniusness (great mental ability) to maintain and operate.
- (7) Maintainability : → The system design should be so simple that it can be easily maintainable by other designers.
The designed system should also be :—
User friendly, Program friendly, Ensure that system features meet user requirements, cost-effective, easy to use, acc. to design standards.

** Logical Design : →

Logical system is the preparation of design specifications for converting input data into output results. It focuses on — understanding user requirements, identifying data requirements, suggesting a logical organisation of data, suggesting a logical procedure to produce the desired output with available inputs.

After estimating user's requirements, a system designer identifies data requirements. This includes — identifying data source, the nature and type of data that is available etc.

** Physical System Design: →

The physical system design is mapping the logical design into the physical h/w of a computer system. The physical design produces the working system by defining the design specification that tell programmers exactly what the proposed system must do. The physical design includes: Specify the input/output media, Design the database, Design the programs, specify backup procedures, make a test plan, specify way new hardware/software, specify implementation plan, prepare a conversion schedule and a target date, specify training procedure.

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*** Modularisation: → Modularisation is the decomposition of a system into manageable components called module where each module can be coded separately. A module is a unit of program which forms a part of a software performing a specific task. In Pascal and C language modules are called functions, in Java and C++ modules are called classes.

* Properties of modular system: →

- ① Each module is a well defined subsystem which is easy to understand and useful in other application also.
- ② Modules can separately compiled, tested and debugged.
- ③ Programming of different modules is easy ~~between~~ because the programmer has to write small problem programs rather than a large and complex problem programs.
- ④ A good module can be used in other module.
- ⑤ Each module has a single, well defined purpose.

Thus to minimize the complexity of problem and make it manageable by sub-dividing it into smaller segments is called modularisation or decomposition.

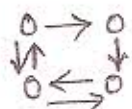
** Coupling: →

Coupling is the strength of interconnection bet. modules and it is the measure of degree of interdependence bet. modules. Two modules with high coupling are strongly interconnected and thus, dependent on each other. The design with high coupling will have more errors.

- "Loosely Coupled" system are made up of modules which are relatively independent.
- "Highly Coupled" system where a great deal of dependence bet. the modules.
- "Uncoupled" modules have no interconnection at all, they are completely independent.



Uncoupled:
no dependencies



Loosely coupled
some dependencies



Highly Coupled
Many dependencies.

The modules of ISW system are created and coupling bet. the modules is decided at the time of system design which can not be reduced during implementation.

A good design will have low coupling. It is thus said that coupling is to be minimized is a good design. This is because low coupling ensures that the modules can be coded, tested and modified separately. Also it is easier to understand without understanding the other modules.

Coupling is measured by the number of interconnection bet. modules. Coupling increases as the no. of calls bet. modules increases.

* Types of Coupling : →

- Content Coupling : → This is the least desirable coupling. This type of coupling occurs when one module modifies local data values or instruction in another module or one module branches into the middle of another module.
- Common Coupling : → Two modules are common coupled if they share some global data area or data structure. It must be avoided because to change the shared data one must have to find and modify all the procedure that access it.
- Control Coupling : → When module A transfers control to module B by procedure call, it is called control coupling. This is the proper way to pass control around the program.
- Stamp Coupling : → Two modules are stamp coupled if they communicate via a composite data item like a structure in C.
- Data Coupling : → Two modules are data coupled if they communicate via an elementary data item which is passed as a parameter bet. the two, e.g. an integer, a float, a character etc.

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** Cohesion : →

Cohesion is the concept which tries to capture the relation bet. elements of the same module. Cohesion of a module represents how tightly bound the internal elements of the module are to one another.

Cohesion is a measure of degree to which the elements of a module are functionally related. The modules that perform only one task are said to be more cohesive than modules that perform multiple task.

Types of cohesion are : →

- (1) Coincidental Cohesion : → This weak degree of cohesion is found in a module whose elements have no meaningful relationship to one another. It is the worst type of cohesion.
- (2) Logical Cohesion : → It is the next higher level of cohesion where several logically related functions or data elements are placed in the same module.
- (3) Temporal Cohesion : → It is same as logical cohesion except that the elements are executed at the same time.
- (4) Procedural Cohesion : → A module is said to possess procedural cohesion if the set of all functions of module are all part of procedure in which a certain order for achieving an objective.
- (5) Communicational Cohesion : → When modules operate on the same input data or contribute towards the same output data, Communicational cohesive modules may be performing more than one function.
- (6) Sequential Cohesion : → A module is said to possess sequential cohesion if it consist of those processing elements which have the output of one as the input of next.
- (7) Functional Cohesion : → It is said to exist if different elements of a module co-operate to achieve a single function.

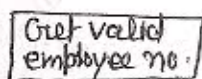
*** Structure Chart : →

Structure chart is a graphical representation which shows —

- System partition into modules
- Hierarchy of component modules
- Relation bet. processing modules
- Interaction bet. modules.
- Info. passed bet. modules.

Structured charts are developed before the writing of program code. They are not intended to express procedural logic. This task is done by flowcharts and pseudocode. Structured charts assist the analyst in developing wsw that meets the objectives of good wsw design.

(1) Rectangle: $\rightarrow$ A rectangle is used to represent a module. The module name is written in the rectangle. e.g. Module to validate employee number



(2) Arrow: $\rightarrow$ Arrows indicate calls. An arrow from a module A to another module B means module A calls module B. B is called the subordinate of A and A is called the super ordinate of B.

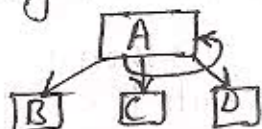
A $\rightarrow$ B

(3) Arrow with a circular tail: $\rightarrow$ An arrow with a circular tail is used for passing data.

(4) Arrow with a shaded circular tail: $\rightarrow$ Arrow with a shaded circular tail is the control flag used for message purpose.

(5) Diamond: $\rightarrow$ Diamond is used for representing decisions. Depending on the decision, one of the sub-modules can be called.

(6) Arc with arrowhead: $\rightarrow$ Arc with arrowhead represents repetition. Suppose A has subordinate B, C and D with A repeatedly calling the modules C and D. This can be represented by an arc with arrowhead joining the subordinates C and D to A as shown



*** Top Down Design: $\rightarrow$

The top down approach starts from the higher level and proceeds through higher level to lower levels. Top down approach for a system starts with the final goal which the system is to achieve. Once the complex task to be performed by the system is decided, this task is decomposed or split into subtasks which are smaller in size, less complex, each easily manageable & solvable.

A subtask, if it is complex, may further be subdivided into simple, less complex and easily manageable subtasks.

Advantage: $\rightarrow$ ① This technique of program development is similar to human approach to problem solving.

② While designing the logic, the programmer is always aware of his objective.

③ The stepwise planning avoids the unnecessary confusion.

*** Bottom-up Design : →

The bottom up design approach starts with modules then combines these modules to produce large ones, to combine these to provide even larger ones and so on till we get a big module which is the whole of desired system.

For a bottom-up approach to be successful, the design should be heading with a good idea. Without a good idea about the operations needed at the higher levels, it is difficult to determine what operations the current level should support.

If a system is to be built from existing system, this approach is more suitable as it starts from some existing modules.

*** Input Design : →

A major step in design is the preparation of input and design of output reports in the form acceptable to the user. In input design, user-originated input are converted to ~~design~~ a computer-based format. This computer-based format is called as input form or source document.

Objectives of Input Design : →

- ① Input form must be complete & accurate.
- ② Input design should be such that if errors have been introduced, they should be detected and rectified.
- ③ The input form should be designed in such a way that data entry becomes easier.
- ④ To ensure that the input form is acceptable to the user.
- ⑤ Input design should lead to high productivity.
- ⑥ To produce a cost-effective method of input.
- ⑦ Input form should be attractive to the users.
- ⑧ To keep the process simple so that the people who will use it in the way that is comfortable for them.

Input Design process has the data recording, data transcription i.e. transfer of data to an input form, data transmission i.e. transmitting or transporting data to the computer, data validation i.e. checking the input data by the program when it enters the computer system, Data correction i.e. correcting the errors that are found at any of earlier stages.

*** CRT Screen Design : →

Many online data entry devices are CRT screens that provide instant visual verification of input data and a means of prompting the operator. The operator can make any changes desired before the data go to the system for processing. A CRT screen is actually a display station that has a buffer for storing data. A common size display is 24 rows of 80 characters each 1920 character.

There are two approaches to designing data on CRT screen — manual and utility methods. The manual method uses a worksheet much like a print layout chart. The menu or data to be displayed are blocked out in the areas reserved on the chart and they are incorporated into the system to facilitate formalize data entry.

* Objectives : →

- ① Use the same format throughout the project.
- ② Use easy to learn and consistent terms, such as add, delete and create.
- ③ Provide help or tutorial for technical terms or procedures.
- ④ The interface should fail in case of data entry error.
- ⑤ The number of key strokes must be minimum for feeding of any data or for giving any command.
- ⑥ The screen must have a multi-windows presentation.
- ⑦ Improved processing speed.
- ⑧ Color the screen design.
- ⑨ It must have interactive dialog during data entry.
- ⑩ Editing through display screen.

17/2/11	Data Entry Screen for student	10:15:25
RNo. Student Name Father's Name Class		
Press F1 for help	<<ok>> <cancel>	Press <ESC> to exit

*** Output Design / Report Design : →

Computer Output is the most important and direct source of information to the user. Efficient, intelligible output design should improve the system relationship with the user and help in decision making. A major form of output is a hardcopy from the printer. The system is accepted by the user only by its output. If the output is not of good quality, user is likely to reject the system.

The following media device are available for providing computer based output. — MICR Readers, Line Matrix, Daisy wheel printers, computer output microfilm, CRT screen display, Graph Plotters, Audio Response.

* Objectives of Output Design / Report Form Design : →

- ① Designing output to serve the intended purpose.
- ② Providing the output on time.
- ③ Designing the output to fit the user.
- ④ Making sure the output is where it is needed.
- ⑤ Choosing the right output method.
- ⑥ Delivering the Appropriate Quantity of output.

*** Form Design : →

Form is that which serves as a tool for taking data from the people and giving information of the system. e.g. Purchase order, a pay cheque. It provides information for making decisions and implementing operations. Using forms, one can obtain information efficiently & store information economically & in the best way.

It is the physical carrier of data & information. They are the user request for some action. They provide the basis for decision making by the system development team for improving functioning of the system. They are the vehicles for most communications and the blue-print for many activities.

They ask for directions on how to read them. Using forms, you do the following :—

- (a) obtain information most efficiently.
- (b) Disseminate (scatter abroad) information easily.
- (c) Store info. effectively and economically.

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** Classification of Forms : →

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- (1) Action Form : → An action form request the user to do something, get action e.g. purchase order, shop order, application form. These type of form are used to order, instruct and organise. The forms are filled by the users and sent for processing.
- (2) Memory form : → A memory form is a record of historical data that remains stationary in a file. This data is generally used for reference e.g. Inventory record, purchase record etc.
- (3) Report form : → A report form guides supervisors and other administrators in their activities. e.g. Profit & loss statements, sales analysis reports. Report forms become a basis for decisions that are to be taken.

* Requirement of Form Design : →

1. Understandable Heading
2. Physical Factors
3. Order to data-item
4. Max. readability and use.
5. Size and arrangement
6. Logical flow of information
7. Ease of data entry

* Types of Forms : →

- ① Flat Form : → A flat form is a 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 bet. copies.
- ② Unit-Set/ Snapshot Form : → These forms have an original copy and several copies with one-time carbon paper interleaved bet. them.
- ③ Continuous Strip/ Fanfold Forms : → These are multiple unit forms joined together in a continuous strip with preparation bet. pair of forms.
- ④ NCR (No carbon required) Paper : → Several copies can be made by pressing a chemical undercoating on the top sheet into a clay like coating on the top of second sheet.

* Form Control : → Form control is a procedure for providing improved and effective form, reducing printing costs, securing adequate stock at all times. First step in a procedure for form control is to collect, group, index, stock and control the forms of orgn. Each form is identified and classified by the function it performs and whether it is a flat, a snapshot form or something else. Once classified a form is evaluated by the data it requires, where it is used, how much it overlaps with other forms.

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** Database System : →

Database is a collection of related file that act as centralized data bank for various data processing applications.

A database management system (DBMS) is a software system that allow access to data contained in a database.

The objective of the DBMS is to provide a convenient and effective method of defining, storing and retrieving the information contained in the database.

* Data : → It is a set of any valid alphanumeric values used in database i.e. It is represented with the help of characters like. Alphabets (A-Z), digits (0-9) or special characters (+, -, <, >).

* Data item → A set of characters which are used together to represent specific data element. For example name of employee in employee database. It is also known as field or attributes.

* Record : → It is a set of related data item. For example, a payroll record for an employee contains such data field as name, age, qualification etc. It is also known as tuple or row.

* File : → It is collection of record.

* Data Processing : → is a process of convert data into the information and it can also convert information into the data.

⊗ Characteristic of Database : →

- ① Represent Real world Application.
- ② Specific Purpose.
- ③ Perform Specific Operation.
- ④ Relationship bet. data and records.

⊗ Classification of DBMS User : →

- ① Naive User : → Users who need not be aware of presence of the database system or any other system supporting their usage are called naive user.
- ② Online User : → These are users who may communicate with the database directly via an online terminals or indirectly via a user interface and application program.
- ③ Application Programmer : → Professional programmers who are responsible for developing application programs or user interfaces utilized by naive and online user fall in this category.
- ④ DBA : → DBA is a person or group of person responsible for overall control of database. He is also responsible for granting permission to the user of database and store profile of each user of the database.

** Advantages of DBMS or Database System : →

- ① Reduction of Redundancies : → DBMS control redundancy by ensuring that data are not repeated many times. So reduce the redundancy.
- ② Shared Data : → A database allow the sharing of data under its control by any no. of application programs or users.
- ③ Integrity : → Data Integrity means that the data contained in the database is both accurate and consistent.
- ④ Security/Privacy : → DBMS assures privacy and security.
- ⑤ Data Independence : → Data independence can be define as the capacity to change the schema at one level of database system in such a way that, the schema at next right level need not be changed. There are two type — Logical Data Independence, Physical Data Independence.

** Disadvantage of DBMS or Database System : →

- ① High Hardware Cost : → Additional memory and processing power may be required to run the DBMS, resulting in need to upgrade the hardware.
- ② High cost of DBMS : → Because a complete DBMS is very large and it is expensive.
- ③ Higher Programming Cost : → Because a DBMS is a complex tool with many features, it requires experienced programmers resulting in extra payment for their hire and expertise.
- ④ Complex
- ⑤ High Conversion Cost.

** Functions of DBMS : →

- (i) Data Definition
- (ii) Data Manipulation Language.
- (iii) Data Security and Integrity
- (iv) Data Dictionary
- (v) Performance

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Component of DBMS & Structure of DBMS : →

- * Data Definition Language Compiler : → The DDL compiler converts the data definition statement into set of tables. This tables containing the metadata concerning the database are in a form that can be used by other components of DBMS.
- * Data Manager : → The data manager is the central w/o component of DBMS. It is sometimes referred to as the database central system. One of function of data manager is to convert operation in the user's queries coming directly via the query processor or indirectly via an application program from the user's logical view to a physical file system.
- * File Manager : → File manager is responsible for structuring of files and managing the file space.
- * Disk Manager : → The disk manager transfers the block or page requested by the file manager so that the later need not be concerned with physical characteristics of underlying storage media.
- * Query Processor : → The query processor is used to interpret the online user's query and convert it into an efficient series of operations in a form capable of being sent to the data manager for execution. The query processor uses the data dictionary to find the structure of the relevant portion of database and use this information in modifying the query and preparing an optimal plan to access the database.
- * Telecommunication System : → Online users of a computer system, whether remote or local, communicate with it by sending and receiving messages over communication lines. The messages are routed via an independent w/o system called a communication system or a communication control program.
- * Data Files : → Data file contain the data portion of database.
- * Data Dictionary : → Data dictionary contains the information about entity, attributes, mapping and cross reference information. DBMS must provide a data dictionary function.
- * Access Aids : → To improve the performance of DBMS, a set of access aids in the form of indexes are usually provided in a database system.

*** Hardware (Equipment) & Software Selection : →

Hardware (equipment) slw selection begins with requirements analysis, followed by a request for proposal and vendor evaluation. The final system selection initiates contract negotiations. It includes purchase price, maintenance agreements and the amount of updating or enhancements to be available by vendor over the life of the system.

Knowledge of computer and of slw is helpful as a basis for selecting h/w equipment / software. Searching for best product requires specialized knowledge and a serious approach. 22/2/11

*** A procedure for h/w (Equipment) / software selection : →

The various steps are taken into consideration to make up the selection process : →

- (i) Requirement Analysis : — Requirement analysis sets the tone for h/w (equipment) / slw selection.
- (ii) System Specification : — It is the detailed description of type ~~and~~ of job and the actual applications to be handled by the system. It also includes system objectives, flowcharts, input-output requirement, file structure and cost. The specifications must also describe each aspect of the system clearly consistently and completely.
- (iii) Request for Proposal : — REP includes following : —
 - (a) Complete statement of the system specifications, programming language, price, range, terms and time frame.
 - (b) Request for vendor's responsibilities for conversion training and maintenance.
 - (c) Warranties and terms of license
 - (d) Request for financial statement of vendor.
 - (e) Size of staff available for system support.
- (iv) Evaluation and validation : →

The evaluation phase focuses on vendor proposals and determines the one best suited to the user's need. It focuses on price, availability and technical support.

System validation ensures that vendor can in fact, match his claims, especially system performance.

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(v) Vendor Selection : →

This step determines the vendor with the best combination of reputation, reliability, service record, training deliver time, finance terms and conversion schedule.

(v) Post-Installation Review

(vi) Signing of agreement : → consist of price & other term settled.

(vii) System is accepted : → The system is accepted and part of payment is released at this stage.

*** Criteria For Software Selection : →

Prior to selecting the slw, the project team must set up criteria for selection. Various performance categories are:-

- ① Readability : → means that slw should be written in such a way that a person other than the programmer who has written the slw can understand it without any difficulty.
- ② Integrity : → refers to the accuracy of the computation and responsible.
- ③ Reliability : → The slw should perform the required actions within acceptable margins of error.
- ④ Maintainability : → slw should be designed and developed in such a way that their modification becomes an easier task.
- ⑤ Efficiency : → Efficiency signifies that the slw should be executed fast and occupy less memory space.
- ⑥ Generality : → Generality means that slw should be of general nature so that they can be used under different situations and requirements.
- ⑦ Modularity : → The use of modular programming structure enhance the accuracy and clarity of program.
- ⑧ Capacity : → refers to the capability of slw package to handle the user requirement for size of files, number of data elements, volume of transaction and reports and no. of occurrences of data elements.
- ⑨ Portability : → refers to running the same slw on different computer system without any or minor

⑩ Performance → It is a measure of the capacity of software package to do what it is expected to do.

⑪ Minimal Cost → Cost is a major consideration in deciding bet. in house and vendor software.

⑫ Security : → It is a measure of the likelihood that a system's user accidentally or intentionally access or destroy unauthorized data.

** Personnel Involved in System Development

or
Personnel Estimates

Planned 3/2/11

- ① System Analysts : → System Analysts determine the requirement of end users. After complete analysis he hands it over to the database designer, who proceeds with the actual designing of the database.
- ② Application Programmers : → The application programmer responsible for writing application programs that use the database, typically in language such as COBOL or PL/1 to meet the user requirement.
- ③ Data Base Administrator (DBA) → DBA is a person or group of persons responsible for overall control of database system.
- ④ Database Designer : → Responsibility of database designers are:
 - (i) Schema Definition :— He/she creates the original database schema.
 - (ii) Storage Structure and Access Method Definition : → i.e. writing a set of definitions translated by data storage and definition.
 - (iii) Schema and physical Organisation Modification : → i.e. writing a set of definition to generate modification to appropriate internal system table i.e. data dictionary. Hence, Database Designers are responsible for :—
 - Identifying the data to be stored in the database.
 - Choosing appropriate structure to represent and store this data.

5. DBMS Designer: →

The DBMS system designer knows the h/w requirements of the system and through his analysing and designing capability, he produces an efficient system design for the DBMS.

6. DBMS Implementor: → The implementors are those who help for h/w and s/w implementation of the entire system.

7. Total Developers: → Total developers helps to develop the s/w tools. It is their job to provide complete management, help and other database creation and maintenance tools.

8. Operators: → The operator, who know how to operate the entire system and fully responsible for proper running and operation of h/w parts of complete system.

9. Maintenance: → The maintenance not only include repairs of h/w and proper working. It also include the detection and corrections or error from software.

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Unit - 3

☁ Data Dictionary : →

A data dictionary is a catalog - a repository - of elements in a system. It is a list of all the elements included in a set of data flow diagram describing a system. A data dictionary stores the details and description of dataflow, Data store and processes.

Without a data dictionary, DFD are just pictures with no details. If an analyst want to know - how many characters are there in a data item, by what other names it is referenced in the system, where it is used in the system, can find the answers in a properly developed data dictionary. Data dictionary assists the analyst in determining the system requirements.

☁ Need for a Data Dictionary : →

Data Dictionary is needed :-

- (1) To manage the details in large systems.
- (2) To communicate a common meaning for all system elements.
- (3) To document the features of the system.
- (4) To facilitate analysis of the details.
- (5) To identify, clarify and define system requirements.
- (6) To evaluate characteristics of the system.
- (7) To locate errors and omission in the system.
- (8) To build the database and write programs during design phase.
- (9) To record the details of each element and data structure.

☁ Components of a Data Dictionary : →

(a) Data element : →

The smallest unit of data, which can be ^{not} further decomposed is known as data element. e.g. any number digit or an alphabet. The data elements entry consists of following items:-

- (i) Data Name :— Unique names are given to data item. The name should be meaningful.
- (ii) Data Description :— It is the brief description of what the data elements represents.

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- (iii) Aliases : $\rightarrow$ Aliases are synonyms or other names for the elements. e.g. Invoice may be called Statement, Bill or Price.
- (iv) Length : $\rightarrow$ Length identifies the no. of spaces that are required for each data item.
- (v) Data Value : $\rightarrow$ In some processes, only specific data values are permissible. e.g. in many organisation, one-letter prefix to indicate the department e.g. Prefix A denotes the Accounting Department.

(b) Data Structure : $\rightarrow$

A data structure is a set of data items that are related to one another. Data structures are used to define or describe the system components.

Data flow are the data structure in motion, whereas data store are the data structure at rest.

Data structures are built on four relationship of components which may be data element or other data structure.

<u>Relationship</u>	<u>Meaning</u>	<u>Symbol</u>
Sequence relationship	and	+
Selection relationship	either/or	[]
Iteration relationship	iteration of	{ }
Optional relationship	optional	()

For example, the data structure for adding a customer order at particular organisation's catalog division :—

Customer_order = Customer_name + Customer address + { total item }

Customer_name = First name + (Middle name) + Last name

Mode-of-payment = [cash | Draft | Money_order]

Iteration notation is used to represent the repeated occurrence.

Customer_order = Customer_name + Customer_address + { total_items }

Both customer_name and customer_address are compulsory. The total_items represents the number of items being ordered by the customer.
= means equivalent to.

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An optional element is one that may or may not be present as a component of composite data element. For example, a name may or may not have a middle name. Middle Name is optional element in the composite data element Customer_Name.

The selection notation represents the choices that the data element consist of. For example

Mode-of-payment = [cash | Draft | Money-order]

| is used to separate alternative choice in the [] construct.

☁ Advantage of Data Dictionary : →

1. It is used to locate errors in the system description.
2. It helps both the user and the system analyst to understand all inputs, outputs, calculations and all components.
3. It is used to build the data base and write programmes during design phase.

☁ Disadvantage of Data Dictionary : →

1. Data Dictionary is a very tedious and time consuming job.
2. It is not acceptable to many non-technical users.

*** Decision Tree : →

A decision tree is a diagram that presents conditions and actions sequentially. It shows which condition to consider first and which next. It also shows the relationship of each condition and its relevant action. A decision tree has ;—

Nodes that depict conditions, Branches that depict possible paths and Action with conditions and branches.

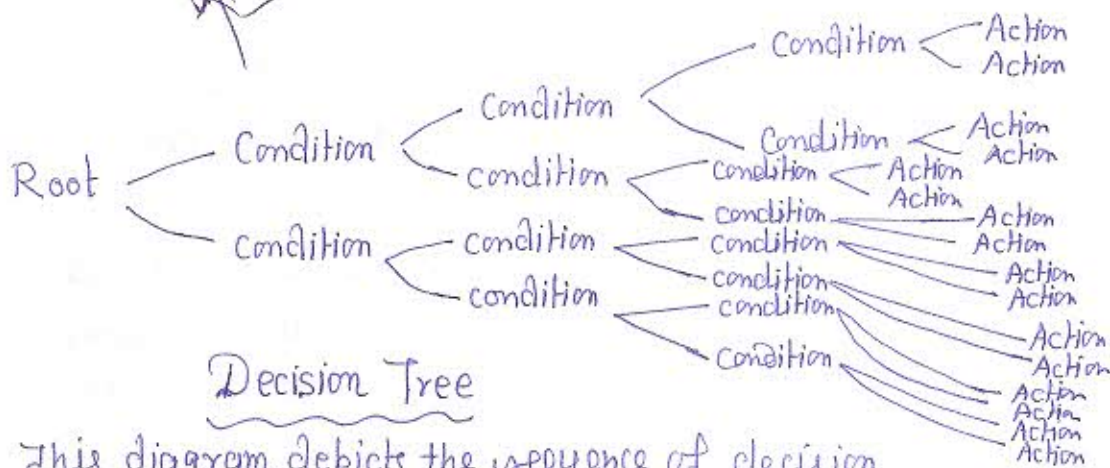
Each of its branches stand for any one of the logical alternatives and because of the branch structure it is called as tree.

☁ Characteristics of Decision Tree : →

1. Root of tree is the starting point of a decision tree/sequence.
2. Branches follow depending upon the conditions and decisions.
3. The decision process starts from left to right along a particular branch by making a series of decisions.
4. Each decision is followed by next set of decisions.
5. The nodes in the tree represents conditions.
6. The right side of the tree lists the action to be taken depending upon the sequence of condition followed.

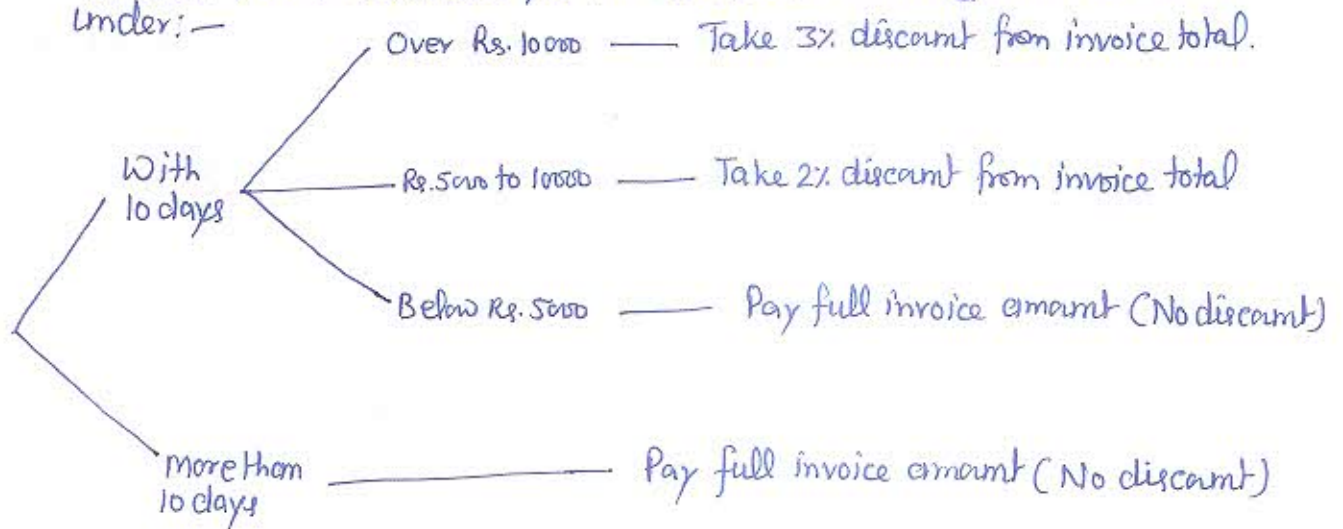
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This diagram depicts the sequence of decision from left to right.

☁ Example : → Consider that the invoice must always be paid within 10 days of its receipt and the discount depends on the amount of invoice. The decision tree for the discount authorization can be as under: —



(Discount Tree for Discount Authorization)

This decision tree clearly shows two specified condition for taking discount. (i) The invoice must be paid within 10 days of receipt. (ii) The percentage of discount depends on the value of invoice.

It makes clear that under some conditions, the organisation can take the action of deducting 3% and under some other conditions a 2% discount and under all other conditions, no discount is offered.

☁ Advantages of Decision Tree : →

- (1) It is a sketch of logical structure which is easy to construct and understand. Also non-technical users easily understand them.
- (2) It shows the priority in which the conditions are to be tested or addressed.

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- (3) It is very useful way of depicting policy in brief.
- (4) Developing a decision tree helps the analyst to formally identify the actual decision that must be made.
- (5) It helps the analyst to consider / determine the sequence of decisions. For example, in the above example, one can easily determine that one condition, the amount of the invoice, does not matter until the condition of payment duration is met.
- (6) Decision tree is useful to express the logic when a value of variable or action is dependent on nested decision.
- (7) It is very effective in describing the business problems involving more than one dimension and parameters.
- (8) It is used to verify logic and problems that involve a few complex decisions and limited number of actions.
- (9) It provides the overview of flow of control built in computer programs.

Disadvantage of Decision Tree: →

- (1) It is not always the best tool for decision analysis.
- (2) It is not practical for situations with a large number of conditions and branches.
- (3) The more the no. of sequence of steps and combinations of conditions, increased is the complexity of decision tree.
- (4) A large number of branches, with many paths through them could instead of helping analyst.
- (5) For a complex problem, analysing various situation is very difficult and can confuse the analyst. In such cases, decision tables are considered.

Decision Table: →

Decision table is a matrix representation with row and column entries. It shows conditions and actions. Decision rules are included in a decision table. The decision rules state what procedure to follow when certain conditions exist. The decision table is divided into four parts by two horizontal double lines. The part above the horizontal double lines pertains to the conditions being tested and outcome of these conditions.

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Condition Stub	Condition Entry
Action Stub	Action Entry.

The top left side of table lists the conditions while the top right side lists the answer (Yes or No) to these conditions. Thus condition stub shows that various possible conditions and condition entry deals with the truth value of a condition. If a condition is true, then write Y against it otherwise N.

The bottom half of the decision table lists the action to be performed. The bottom left side of the table lists the actions to be taken and the bottom right side of the table indicates whether an action should be taken or not. Thus action stub shows the various actions taken against different conditions and action entry is used to find out which action is taken corresponding to a particular set of conditions. If a cross mark (X) is put then it implies that the particular action should be taken. If a dash (-) is put, then it implies that the action should not be performed.

* Steps for developing Decision tables : →

- (1) Define the problem accurately that has to be solved by a computer.
- (2) Determine the relevant factors to be considered in making decisions. This identifies the conditions involved in the decision.
- (3) List out all the ~~direct~~ conditions to be tested in the problem.
- (4) To identify the actions that can take place under varying conditions.
- (5) List out the corresponding actions that should be taken with each combination of conditions.
- (6) Form a decision table using two rows.

* Types of Decision Table : →

- (i) Limited Entry Decision Tables : →

A decision table in which question is written in the condition stub and the answers in the condition entry part is called limited entry decision table.

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(2) Extended Entry Decision Table : →

A decision table in which question is written in the condition entry and their answers in the condition stub part is called extended entry decision tables.

(3) Mixed Entry Decision Tables : →

A decision table in which some questions are extended into the condition entry part and others are limited to condition stub is known as mixed entry decision table.

Ex) Example : → The following rules are used to open a new bank account.

- (a) If depositor's age is 18 or above and if the deposit is Rs. 5000 or more, the account is called as A.
- (b) If the depositor's age is under 18 and if the deposit is Rs. 5000 or more, the account is called as B.
- (c) If the depositor's age is 18 or above and if the deposit is below Rs. 5000, the account is called as C.
- (d) If depositor's age is under 18 and if the deposit is below Rs. 5000, do not open an account.

Corresponding to above statement write the limited entry decision table to classify a new account.

For the above problem, following are the conditions and the actions : —

- (a) If the depositor's age is 18 or above (condition 1) and if the deposit is Rs. 5000 or more (condition 2), the account is called as A (action 1).
- (b) If depositor's age is under 18 (condition 3) and if the deposit is Rs. 5000 or more (condition 2), the account is called as B (action 2).
- (c) If depositor's age is 18 or above (condition 1) and if the deposit is below Rs. 5000 (condition 4), the account is called as C (action 3).
- (d) If depositor's age is under 18 (condition 3) and if the deposit is below Rs. 5000 (condition 4), do not open the account (action 4).

following are the conditions and actions :→

Condition 1 : Depositor's age ≥ 18

Condition 2 : Deposit $\geq$ Rs. 5000

Condition 3 : Depositor's age < 18

Condition 4 : Deposit $<$ Rs. 5000

Action 1 : Classify as account A.

Action 2 : Classify as account B.

Action 3 : Classify as account C.

Action 4 : Don't open account.

* Limited Entry Decision Table for Bank Account Classification :→

	Rule 1	Rule 2	Rule 3	Rule 4
Condition 1 : Depositor's Age ≥ 18	Y	N	Y	N
Condition 2 : Deposit ≥ 5000	Y	Y	N	N
Action 1 : Classify as Account A	X	—	—	—
Action 2 : Classify as Account B	—	X	—	—
Action 3 : Classify as account C	—	—	X	—
Action 4 : Don't open Account	—	—	—	X

* Advantage of Decision Tables :→ completed 15/03/11 1st/11

1. They present a clear and complete analysis of the problem.
2. They provide an efficient understanding of the problem.
3. Modification / alteration & additions can easily be made.
4. They have a standard format.
5. The table shows cause & effect relationship.
6. Decision tables are easier to draw than flowcharts when several conditions are to be tested & decisions are to be taken.
7. It is easier to follow the table.
8. It summarises all the outcomes of a situation and suggests the suitable actions.
9. Complex tables can easily be split into simpler task.
10. Table users are not required to have computer knowledge.
11. Easily covers all logical possibilities.

* Disadvantage of Decision Tables: →

1. Do not depict the flow of logic of a given problem.
2. Far away from high level languages and can not easily be translated into source programs.
3. It is an additional tool. The use of both - flowcharts & decision tables - may impose an additional burden.

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☁ Distributed Database: →

A distributed database is a single logical database that is spread physically across computer in multiple locations that are connected by data communication links. In distributed database the user at any location can access data anywhere in the network as if the data were stored at the user's own location.

☁ Distributed Database Management System (DDBS): →

The software that manages the distributed database and provides an access mechanism that makes this distribution transparent to the user is known as Distributed Database Management System.

☁ Distributing Processing: →

It shares the database's logical processing among two or more physically independent sites that connected through a network.

☁ Advantages of the DDMS: →

1. Sharing: → Users at a given site are able to access data stored at other sites and at same time retain control over the data at their own site.
2. Availability & Reliability: → The greater accessibility enhance the reliability of the system.
3. Incremental Growth: → As the organisation grows, new sites can be added with little or no change.
4. Parallel Evaluation: → A query involving data from several sites can be subdivided into subqueries and the parts evaluated in parallel.
5. Reflect Organisational Structure.
6. Improved Performance.
7. Economic.
8. Modularity.

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Q Disadvantages of Distributed Database: →

1. More Costly: → Increased complexity and a more extensive infrastructure means extra labour costs.
2. Difficult to Maintain Integrity: → In a distributed database, enforcing integrity over a network may require too much of network resources to be feasible.
3. Database Design More Complex.
4. Lack of standard.
5. Inexperience.
6. Security.

Q Functions of DDBMS: →

A DDBMS must have atleast the following fns: →

1. Application Interface to interact with end user or application programs and with other DBM's with the distributed database.
2. Validation to analyse the data request.
3. Mapping to determine the data location of local or remote fragments.
4. I/O interface to read or write data from or to permanent local storage.
5. Transformation to determine which data request components are distributed and which ones are local.
6. Security to provide data privacy at both local & remote database.
7. Backup and recovery to ensure the availability and recoverability of the database in case of failure.
8. Query Optimization to find the best access strategy i.e. which database fragment must be accessed by the query and how much data update, be synchronized. (occur at same time).
9. Database administration for the database administrator.
10. Transaction management to ensure that the data move from one consistent state to another.
11. Formatting to prepare data recovery privacy at both local and remote databases.

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Distributed Data Processing :->

Arrangement of networked computers in which data processing capabilities are spread across the network. In DDP, specific jobs are performed by specialized computer which may be far removed from the user and from other such computers. This arrangement is in contrast to 'centralized' computing in which several client computer share the same server or a cluster of servers. DDP provides greater scalability, but also require more network administration resources.

Types of Distributed Database Management System (DDBMS): ->

(i) Homogeneous DDBMS :->

In homogeneous DDBMS, all the nodes use the same DDBMS software and have the same applications on each node. They have common scheme and can have varying degree of local autonomy. (सजातंत्र)

(ii) Heterogeneous DDBMS :->

In heterogeneous DDBMS each nodes may run different DDBMS software, which need not be based on the same underlying data model. So the system may be composed of hierarchical, relational, network, object-oriented DBMS's.

Distributed Database Design :->

One of main aims of a distributed database is to maintain a better control of the organisation's data. So while distributing the data at different geographically dispersed sites the following three issues must be considered while designing the distributed database.

- 1) How to partition the database into fragments? i.e. Data fragmentation.
- 2) Which fragments to replicate i.e. Data Allocation.
- 3) Where to locate those fragment and replicas i.e. Data Allocation.

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☁ Data Fragmentation: → The relation is partitioned into several fragments. Each fragment is stored in different site. There are three different schemes for fragmenting a relation: — Horizontal fragmentation, Vertical fragmentation & Mixed fragmentation.

☁ Advantages of Fragmentations: →

- (i) Ease of Query
- (ii) Fragmentation of fragments
- (iii) Efficiency
- (iv) Security
- (v) Better Performance

☁ Disadvantage of Fragmentation: →

- (i) Integrity
- (ii) Problems in Defining Best Fragmentation.
- (iii) Inconsistent Speed of Access.

☁ Data Replication: → The system maintains several identical replicas (copies) of the relation. Each replica is stored in different site, resulting in data replication. The alternative to replication is to store only one copy of relation. Hence, if relation r is replicated, a copy of relation r is record (stored) in two or more sites.

* Advantage of Data Replication: →

- (i) Availability: → If one replica site is down, data can be accessed from another site.
- (ii) Cost Effective: → It can reduce the cost of data request.
- (iii) Increased Performance → Queries can be executed more efficiently

* Disadvantage of Data Replication: →

- (i) Increased overhead and management.
- (ii) Expensive
- (iii) Large Storage Space Requirement.

Q Data Allocation :→

Each relation or fragment of the relation must be assigned to a particular site in the distributed system. This process is called data allocation or data distribution. The choice of sites and the degree of replication depend on the performance and availability goals of the system and on the type & performance frequencies of transaction submitted at each site. For example, if certain transaction that access particular parts of the database are mostly submitted at a particular site, the corresponding set of fragments can be allocated at that site only.

Q Application of Distributed Databases :→

- i) Airlines ii) Military command and control
- iii) Corporate MIS iv) Hotel chains
- v) Manufacturing - especially multipoint manufacturing.

REAL TIME SYSTEM

A real time system or online data processing system is one that has the capability of processing and updating computer files using terminal quickly enough to affect decision-making. There are occasions where it is necessary that data is processed immediately. In real time system all operations like validation, updation and transaction are performed simultaneously.

Real time is one, in which response time must be given to an external request within a limited period of time. Example of real time can be an airline seat reservation system, a request for a seat booking must be made within a few minutes that the customer is prepared to wait.

* Process Control :→ The process control generally implies the control by a computer of an industrial process such as refining of oil or the manufacture of machine tools. The main function of the operating system in process control is to provide maximum reliability with the minimum of operator intervention.

* File Interrogation System :→ It consists of large set of data or database, which can be interrogated for information. The response to information requests must occur within a short time, and the database must be capable of being modified as information is updated. Examples are management information system, where the database consists of information on company performance and medical information, in which the database is a set of patient records.

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* Transaction Processing : → Transaction Processing systems are characterised by a database, which is frequently being modified, It's widely used in Airline reservation & Banking.

* Banking System : → The bank's computer system could be designed to process customer data right as it enters the system in which case no delay would exist in handling of saving data customer account. It would be accessed, identified and properly updated. This on-line system referred to be real time systems.

In the process the speed is very important. No customer can wait even for minutes for the transaction. Head office need to perform the transaction immediately and all accounts must be updated immediately. Trained persons are required to perform operations.

* Airline Reservation System : → In an Airline reservation system the immediate need of reply is very important. Consider many different dealers at distant places booking one Airline tickets for the same day, for same class. It is very important that updated information should come on each dealer while booking a seat. Otherwise the situation may arise where more than two passengers would be booked at the same seat. Thus requires immediate updation and transaction of records. Airline system also keep database of all passengers flying from a particular flight. This database is kept for security as well as for many other reasons just as in case of accident etc.

* Traffic Control System : → Traffic control system is another important area of real time applications. In this category real time system are used to reflect green, yellow and Red light in a time bound fashion and that too in a prescribed order. It is very important to care that no two signals of opposite side should have same colour of light. This require proper handling of hardware and a time based scheduling. Traffic control signals can also be used of as 24-hours service provider. This special slw is used for ticking of clock and adjustment of light to occur in proper and timely order.

* Requirement of real time System : →

1. System will require use of data communication equipment to feed data into system from remote terminals.
2. The use of direct access device to store data.
3. Communication links are very important and they need to be maintained.
4. System will also be associated with some form of information retrieval system via some VDU or some other forms of inquiry system.
5. Backup system for real time processing are very complex as files are mostly open.

* Merits of Real Time System : →

1. These system are helpful for random data input at random time interval as event occur.
2. Files of data permanently up^date and online.
3. No need for costly and time-consuming data preparation.
4. Enable excellent perfection of management information for decision.
5. 24-hours service provider.
6. Very quick retrieval system.

* Demerits of real time system : →

1. Need for extremely computer backup system.
2. Development costs are very high.
3. Trained staff is needed.
4. Extra h/w is needed.
5. Communication links are very important and require special attention.

State Transition Diagram : →

the time dependent behaviour of a system. An STD is a way of describing

- * System State : → A state is an observable mode of behaviour of the system. At any particular time STD can only be in one state but a system behaviour could be described by more than one state transition diagram.

* State Transition Diagram Notation :->

A typical state transition diagram is shown below in the figure. This diagram shows the behaviour of a typical telephone answering machine.

The major components of the diagram are states and arrow representing state changes. There are variety of alternative notations for state transition diagrams.

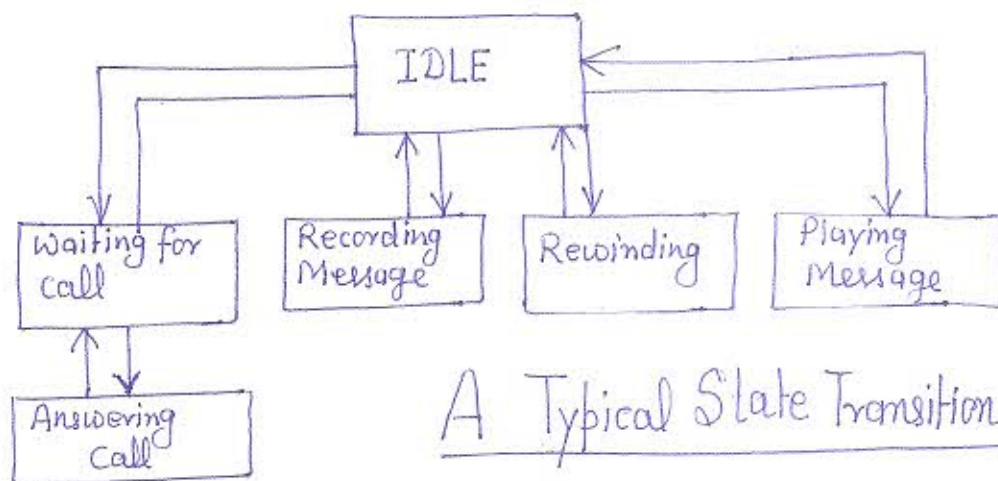


fig-1

A Typical State Transition Diagram

Thus, typical system states might be any of the following :-

- Waiting for user to enter password.
- Waiting for next command.
- Waiting for instruction data
- Idle.

* Condition and Actions :->

To make our state transition diagram complete, we need to add two more thing; the conditions that cause a change of state and the actions that the system takes upon its change state. As figure 2 illustrates, the condition and actions are shown next to the arrow connecting two related states.

A condition is some event in the external environment that the system is capable of detecting; it will typically a signal. This will typically cause the system to change from a state of waiting for x to a new state of waiting for y or carrying out activity x to carrying out activity y. But as a part of change of state, the system will typically take one or more actions. It will produce an output, display a message on the user's terminal, carry out a calculation and so on.

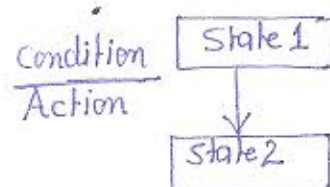
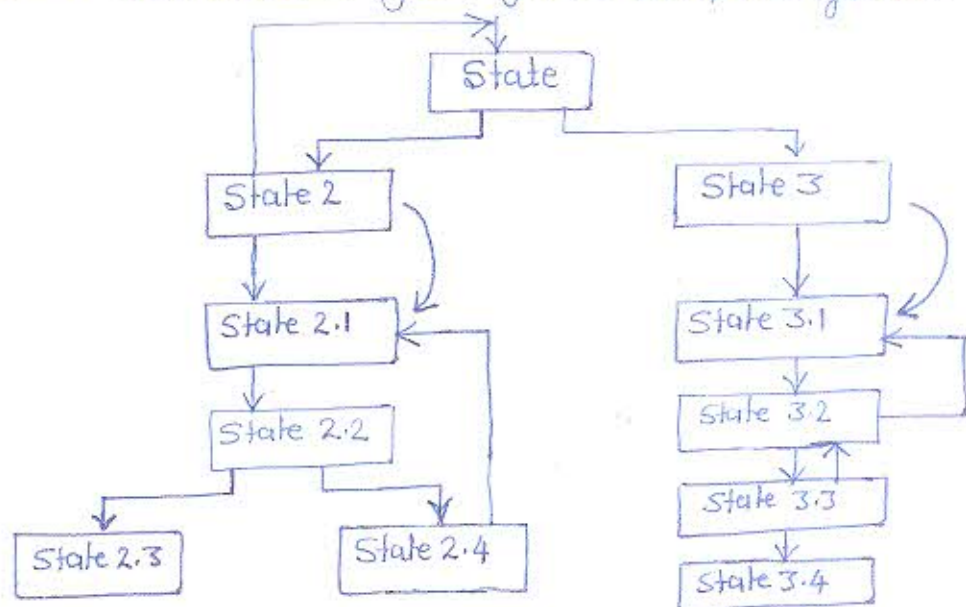


fig-2

* Partitioned Diagram : →

In a complex system there may be dozens of distinct system states. If we try to show them all on a single diagram, it would be difficult. Thus we used levelling or partitioning with data flow diagram. We can use partitioning with STDs. Fig. shows an example of two level of state transition diagram for a complex system.



(Two level of STD)

Note that in this case, any individual state of higher level diagram can become the initial state for a lower level diagram that further describe higher level state, and the final states in lower level diagram correspond to the exit conditions in the associated higher level state.

* Building The STATE TRANSITION DIAGRAM : →

Steps for building STD are : →

1. You can begin by identifying all possible system states, representing each one as a separate box on a sheet of paper.
2. Select the state with normal behaviour.
3. Specify the actions to produce the observable behaviour in the destination state for each transition.
4. Specify the conditions that make a transition.
5. If the system is complex, partition the diagram in several STD.

19/4/11

Subject: System Analysis and Design

Class: - BBA-6th sem

M.M-50

Time:-3 hrs

Note:-Attempt any five questions by selecting at least one question from each unit.

Unit-1

Q-1 Elaborate the process of System Development life cycle. Also briefly describe the role of system Analyst?

Q.2 what is feasibility study? What type of feasibility studies would you consider for the development of a new business information system? Describe significance of each?

Unit-2

Q.3 Distinguishing among form design, screen design and report design. Explain?

Q.4 a) What is Data Flow Diagram? Illustrate through an example.

b) Enumerate various performance categories that should be analyzed prior to equipment selection.

Unit-3

Q.5 Differentiate bet following:-

a) Decision Table , decision tree and data dictionary

b) Logical design & physical Design.

Q. 6 a) Explain the concept of distributed database concept.

b) What is DBMS ? Explain its component?

Unit-4

Q.7 (a) What is a state transition Diagram? Explain through an example?

(b) Explain real time systems in brief?

Q.8 (a) Explain the cohesion & coupling in brief?

(b) Write short notes on following:

a) Structure chart

b) personnel estimates.

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