1st system definition

" A system is an integrated collection of component which satisfy function necessary to achieve the system goal and which have relationship to one another that give the system and defines its structure".

2st system definition

A physical system is set of element which operate together to achieve an objective ." A system is set of element forming an activity or processing procedure /scheme seeking a common goal or goal by operating on data and /or energy and /or matter in time reference to yield information and /or energy and /or matter."

Example:-

System	Basic components
Education	Student ,teacher, building, textbooks
Computer	Keyboard, display unit, arithmetic unit, logic unit ,program

Characteristics Of A System

There Are Five Characteristics of Which Are Common to all System.

1) **Basic Components**
2) **Interaction And Structure**
3) **Goal**
4) **Behaviour**
5) **Life Cycle**

1) **Basic Components:-**
   - Every system has a set of interrelated elements or basic components.
   - The basic components are the various identifiable parts of a system.
   - They are the moving parts of a system.
   - So,basic components may be men, matrials , machine, information.

Example:-

System	Basic component
Education	Student, Teacher, Building, Text books.
Computer	Keyboard, display unit, arithmetic unit, logic unit, program

   - If a system is a large enough then it is composed of many subsystem.
   - Each subsystem is made up of several smaller subsystem unit until we reach some parts that individually are not subsystems.
   - These parts are known as basic components.
   - These components of a system are interrelated & they have certain interdependence.
   - They certain relationship among themselves.

Example:
   - In Education system ,the student use the text books,the teacher teaches the students and administrators use building and so on.

2) **Interaction and structure :-**
   - The basic components interact among themselves.
   - These must be activity or processing procedure between the elements of a system.

Example :-

- In the computer system, what is being keyed in gates processed by the arithmetic unit or logic unit or both.
- The display unit shows the processed information.
- Thus in any system, the elements display activity or interaction.
- Interaction can establish relationship between components.
- These relationship define the boundary between a system and its environments are called its structure.

3) Goal:-

- A system is organized whole.
- It has a purposed or goal.
- Without a common objective a system start moving in all direction and co-ordination among the parts will be lost.
- The goal or purpose unifies and integrated the activities of the components.

Example:-

- Consider the human body as a system , if the legs move in one directions and the eyes in other direction and the mind in the third direction, what will happen to the body?
- Thus , a system must work as a 'whole' integrating all its activities to achieve the common goal.

4) Behaviour:-

- Behavior is the way a system reacts to its environments.
- Behavior is determined by the procedure or instructions designed to make sure that components behave in ways that will allow a system to achieve its goal.
- While a procedure describes what ought to be done, behavior describes what is actually done.

Example:-

- When human body skin touches something extremely hot , the nervous system causes that part of the body to withdraw rapidly from the hot source.
- The reaction is the behavior and the instruction as to how to react are the procedure.

5) Life cycle:-

- Like human body, every system has birth, life and death.
- Buildings, automobiles have their own life cycle.
- The life cycle includes evolution, wear, replacement, repair and finally an end to the system ‘s existence.

Types of system

1) Conceptual and physical system.
2) Deterministic and probabilistic systems.
3) Open and closed systems.
4) Natural and artificial systems.
5) Man machine systems.

1) Conceptual and physical system.

- Systems can be abstract (conceptual or analytical) or physical (empirical).
- An abstract conceptual system is an orderly arrangement of independent ideas.
- Conceptual systems are concerned with theoretical structures, which may or may not have any counterpart in the real world.
- Economic theory, philosophy and general theory of relatively are example of conceptual systems.
- Thus conceptual system are systems of explanations or ideas constructs.
- In practical management, plans, accounting system structures and procedures are conceptual systems.
- Physical systems are generally concrete operational systems made up of people,
- Materials, machines, energy and other physical things.
- Physical systems can display activity or behavior.
- Management systems, computer systems, business organization are physical systems.

2) Deterministic and probabilistic systems.

- Systems can also be classified as Deterministic and probabilistic.
- A deterministic systems operates in a predictable manner.
- If one knows the state of the system at a given point of time then it is deterministic system if one can predict the next state without error.

Example:-

- The economic forecasting is probabilistic. Similarly, in an inventory system, average demand etc. are probabilistic.
- In a computer system the outputs are deterministic.

3) Open and closed systems.

- An open system is one that interacts with its environment.

- A business organization is an open system because it exchanges men, material,
- Money and information with the environment.
- An open system does not provide for its own control or modification
- It does not supervise itself.
- It needs to be supervised by people.
- If the high speed printer used with computer systems do not have a switch to sense to whether paper is in the printer, then a person would have to notice when the paper runs out and signal(push a switch) the system to stop printing.
- A closed system is a system which is self-contained.
- It does not exchange material, information or energy with its environment.
- Closed system will finally run down or become disorganized.
- A computer system is a relatively closed system.
- A relatively closed system is one that has only controlled and well defined inputs and outputs.
- It does not disturbances from outside the system.

4) Natural and artificial systems:-

- Solar system, water system and human being as a system are example of natural system.
- A business organization, computer system, air conditioning, social system, economic system and management information is examples of artificial system.

5) Man machine system:-

- Normally, most of the artificial systems are man-machine systems.
- A motor car is a machine system.
- But a motor car cannot work without a person.
- Computer system is a machine system.

Types of User

Basically there are four types of user

1) **Hands-on end user**
2) **Indirect end user**
3) **User manager**
4) **Senior management**

(1) Hands-on end user:-

- Hands-on end user actually interacts with the system.
- They feed input data or receive output, using terminal.

Example:-

- Airlines reservation agent use terminal to query the system about passenger, flight &ticket information.

(2) Indirect end user:-

- Indirect user benefit from the result or report produced by these system but do not directly interacts with the H/W or S/W.
- These users may be manager of business function using the system

(3) User manager:-

- User manager have management responsibilities for application system.
- These users may be upper-level managers for business functions that make heavy use of information system.
- While these people may not actually use the system directly or indirectly, they retain authority to approve or disapprove investment in the development of application & have organizational responsibility for the effectiveness of the system.
- These upper level user must be involved in major system development effors.

(4) Senior management:-

- Senior manager are taking increased responsibility for the development of information systems.
- All four types of users are important.

- Each has essential information about how the organization function and where it is going.
- However, systems analysts are often the ones who supply the ideas the imagination- about ways to use computers effectively.

Types of management users	Characteristics
• Hand-on end user	• operates the system • direct interaction through systems equipment
• Indirect end user	• User report or information produced by system but does operate equipment.
• User manager	• Overseas investment in development or use of the system. Has organizational responsibility for control of system activities.
• Senior management	• Incorporates competitive & strategic uses of information system with corporate plans & strategies. Evaluates organization's exposure to risk from information systems failure.

System Development Life Cycle (SDLC)

In the classical or traditional approach, SDLC concentrates on feasibility analysis, cost-benefit analysis, project management, hardware and software selection and personnel consideration. The basic idea of SDLC is that there is well defined process by which a system is conceived, developed and implemented.
The six stage of SDLC which performed in two steps.

- The two steps of SDLC are
  1) System Analysis
  2) System Design

System Analysis and System Design together involve six stages.

A) System Analysis Involves

1. Problem Identification
2. Feasibility study and cost benefit analysis
3. System Requirement analysis

B) System Design Involves

4. System Design specification and programming
5. System implementation, follow-up and maintenance
6. Evaluation of the system

A) System Analysis Involves

1) Problem Identification:-

One of the most difficult task of system analysis is identifying the real problem of the existing system.
Experienced analysis spend considerable time in this task.
Without clear understanding of the problem in the system, any further work done will lead to wastage of time and energy at a later stage.
So, several questions must be posed before identifying the correct problem at this stage itself.

The Question may include

- What is the actual problem?

- What are the causes for this problem?
- Is it important to solve this problem?
- What types of benefits can be expected once the problem is solved? And so on.
- An important question is about how the problem can be notified?
- The problem may come to the notice of the system analyst any one or more sources listed below.

Internal environment	External Environment
1) Company Management	1) Customers
2) Employes of different departments	2) Management consultants
3) Internal auditors	3) Outside Auditors
4) Financial Records	4) Competitions

The types of the problem which arise may be different.
The types of problems which are normally encountered in the systems are listed below:

1) Problem of reliability:-

The system may not work properly all the time or for the same procedure the system may give different results.

2) Problem of validity:-

Reports contain wrong information.

3) Problem of accuracy:-

Reports have many errors.

4) Problems of economy:-

The system is costly to maintain.

5) Problem of timeliness:-

Reports are often late; queries are not answered in time.

6) Problem of capacity:-

Inadequate processing capacity, transmission capacity and strong capacity, this is evident in rapidly growing organizations.

7) Problem of throughput:-

Here more capacity may be available but less work is being done.

Example :-five programmers doing the work which two programmers can accomplish. so this deals with the problem of efficiency of the system.

2) Feasibility study and cost benefit analysis:-

Feasibility study include is carried out whenever there is complex problem or opportunity.

It is in fact a preliminary investigation which emphasizes the "look before you leap" approach to any important project.

A feasibility study is undertaken to determine the possibilities or probability of either improving the existing system or developing a completely new system.

Need for feasibility study :-

- Answer a question whether a new system is to be installed or not?
- Determine the potential of the existing system.
- Improve the existing system.
- Define the problem and objective involved in a project.
- Avoid costly repairs at a later stage When the system is implemented.
- Avoid the hardware approach.

Example: getting a computer first and then deciding how to use it.

Method

- To conduct a detailed feasibility study, firstly expert committee called "steering committee" is appointed.
- This committee generally consists of system analysts, representatives from the departments which are likely to benefit from the project and chairman who is generally a key person in the organization.

The committee will look into :-

1. Technical feasibility
2. Economic feasibility and
3. Operational feasibility of the project

1. **Technical feasibility :-**
   - Can the work for the project with present equipment current procedures, existing software technology and available personnel?
   - If new technology is needed what alternatives will be needed in the present structure and work ?
   - The technical feasibility should ask question related to :
     1) Adequacy of available technology

2) Adequacy of hardware
3) Availability of computer
4) Operating time and support facilities etc.

2. **Economic feasibility :-**
   - Firstly identified alternatives
   - Determine costs and expected saving of each of the alternatives.

The cost must include both onetime costs and recurring costs

- **Onetime costs may include :-**
  - Feasibility study cost.
  - The costs for converting from present system to new system.
  - Construction or remodeling of computer room/facilities
  - Cost involved in software packages

Recurring costs may include:-

- Rental or porches of equipment's
- Salaries of personnel
- Supplies
- Equipment maintenance
- In general, costs should be calculated for a five year period.
- The computer involve large amount of money spand in the beginning.
- In should be calculated against saving that it would produce in the long run
- So , return on investment in the information system is a must at the stage itself.

Return on investment analysis

- C

$$R.O.I = \frac{\text{NET Earning}}{\text{Total Investment}}$$

- R.O.I clearly indicates whether you are working on a right problem or not.

3. Operational or behavioral feasibility:-

- Will the system be used, if it is implemented? Will there be resistance from users? Will there be resistance from users? This is necessary because "equipment do not cry but people do cry ".
- The existing personnel normally worry about job security, loss of peer group, changes in job context and so on whenever new system are proposed.

- If their voices are not heard at this stage, the problems will be magnified at the implementation stage and appear as direct or indirect resistance to new system.

3) System Requirement Analysis:-

The requirement analysis is the determination of the Requirement for a new system.

Once the system analyst has determined that a problem exists and has obtained permission to do something about it, then the Requirement analysis can being.

Requirement analysis for the new system should identify the user Requirement first.

This will enable the system to be more user friendly rather than designer friendly.

- **Hence, the Requirement analysis will determine.**
  - **1)** What outputs are needed?
  - **2)** What inputs are needed to obtain these outputs?
  - **3)** What operations it must perform to obtain These outputs?
  - **4)** What resources must be used?
- **Different ways to assess the user requirement include:-**
  - **1)** Asking users directly.
  - **2)** Interviews.
  - **3)** Questionnaires.
  - **4)** Counting transaction and document often by sampling.
  - **5)** Developing various flowcharts.

- Requirement analysis is one of the most importance part of the system designing process.
- The Requirement analysis stage should produce a requirement statement specifying enough details about the system requirement.
- This statement gets passed on the designer phase in SDLC.
- Finally it is necessary to document and diagrams and presentation graphics so that system designer can understand the Requirement clearly.

4) System Design Specification and Programming:-

Now we move from system analysis to system design we are in fact moving from the conceptual to the physical aspects of the life cycle.

I.e. we are moving from "what" part to "how" part in system development this requires great imagination with due emphasis on ground realities.

Obviously this challenging!

Now the stage is set for the system to be defined in terms of its specifications.

- **These specification are**
  1) Output designs
  2) Input designs
  3) Procedures
  4) Information flow
  5) Files and database
  6) Manually used forms
  7) Program specification etc.

- In addition, information on personnel, money, hardware, facilities and their estimated costs must be available.
- The estimated cost should not be much off the mark from the actual costs of implementation.
- Thus system design is the detailed technical specification including construction of programs and program testing.
- The designer uses certain standard tools and techniques to organize and work through the system specifications like output design, input design etc.

These traditional tools are:-

1) System flowcharts
2) IPO (input processing and output) and HIPO (Hierarchy of input processing and output) charts.
3) Decision tables.

- In the input design the data to be input, calculated or stored are described.
- **The designer then decides in the file design the following aspects:-**
  1) Types of files
  2) Files structure
  3) Files organization including access method
  4) Choice of storage medium and a validity of hardware

5) Implementation, follow up and maintenance:-

- Implementation may not be a creative process but certainly is a different task.
- This is because users have to accept the system.
- Hence human consideration will have to be attended very carefully.
- Users training and availability of users reference manuals with procedures to start “trouble shooting” are must.
- **Implementation include:-**

1. Site preparation
2. Installation of new equipment
3. Users training, seminars

4. Use of new input and procedures

- Maintenance is the 'real end' of the life cycle but it is most expansive and consumes energy, cost and time in the long run.
  The following graph is indirective of this idea.

- After a new system has been implemented, problems and errors must be fixed.
- This requires 'system maintenance' as an ongoing process.
- Generally hardware maintenance.
- In case of software, vendor provide newer versions which help system enhancements thereby increasing processing capabilities.
- Hence the system analysts needs to concentrate more on "document maintenance" and system efficiency.
- When the system maintenance becomes more costly and time demanding, new system will have to be thought of, thereby completing the full system life cycle.

6) Evalution of the system

- Evaluation is nothing but the feedback for the system.
- This is the third and final checkpoint of SDLC.
- Naturally Evaluation considers the strengths and weaknesses of a system.
  It includes.

1) **Development Evolution:-**
- This decides whether the system is developed on time and within the budget.
- Also it includes assessment of development methods and tools.

2) **Operational evaluation:-**
   These considers
- Response time
- Ease of use
- Reliability of computation
- Enough storage capacity etc.

3) **User management assessment evaluation**
- Hoe often manages use the information system and how far they are satisfied then judge the real worth of a system.
- If management is satisfied then generally the organization also is satisfied.
- Thus evaluation alone provides a large amount of information to reduce the system.

Difference between system analysis and system design

System Analysis

- System analysis is the examination of the problem.
- It is concerned with identifying all the constraints and influences.
- It deals with data collection and a detailed evaluation of present system.
- It portrays logical model of the system through data flow diagrams and data dictionaries.

System Design

- System design is creator of the information system which is the solution to the problem.
- It is concerned with the co-ordination of the activities, job procedures and equipment utilization in order to achieve system goals.
- It deals with general design specification, output, input files and procedures.
  It also deals with program construction, testing and user acceptance.
- It provides technical specification and reports with which the problem can be start.

Data Flow Diagram

- Data flow diagram is a graphical tool for defining systems inputs, processes & outputs.
- DFD represents flow of data through the system.
- A graphical tool used to describe & analyze the movement of data through, a system manual or automated including the processes, stores of data & delays in the system.
- The DFD are used in modern methods of system analysis.
- They are simple to the extent that the types of symbols & rules are very few.
- Data flow diagrams are the central tool & the basic from which other components are developed.
- The transaction of data from input to output through processes may be described logically & independently of the physical components associated with the system. They are termed logical data flow diagram.
- Physical data flow diagrams show the actual implementation & the movement of data between people, departments & workstations.
- DFDs serve two purposes:-
  - Provide a graphical tool, which can be used by the analyst to explain his understanding of the system to the user.
  - They can be readily converted into a structured chart, which can be used in design.

System used in DFDs:-

- Most DFDs use four types of symbols which represent system components such as:-
  1. **Data flow**
  2. **Processes**
  3. **External entities**
  4. **Data stores**
- The use of specific items associated with each element depends on whether Yourdon or gane & sarson approach is used.
- Each component in a data flow diagram is labeled with a descriptive name.
- Process names are further identified with a number that will be used for identification purposes.
- The numbers assigned to a specific process does not represent the sequence of processes.
- It is strictly for identification & will take on added value when we study the component that make up a specific process.
- The process represented by a circle is also known as “BUBBLE” (sometimes DFDs are referred as “BUBBLE DIAGRAMS”).

1) Data flow:-

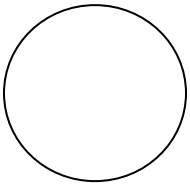
- Data moves in specific direction from an origin to a destination in the form of a document, letter, telephone call or virtually any other medium.
- The data flow is a "packet" of data.

Yourdon

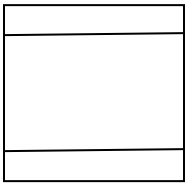
Gane & Sarson

2) Processes:-

- People, procedures, or devices that use or produce (transform) data.
- The physical component is not identified.
- Flow of data is transformed.
- E.g. verify credits, update inventory file.



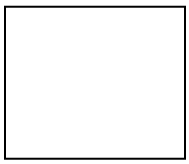
Yourdon



Gane & Sarson

3) External Entities:-

- External sources of destination of data, which may be people, programs organizations or other entities, interact with system but are outside its boundary.
- The terms source are interchangeable with origin & destination.



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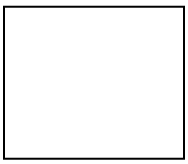
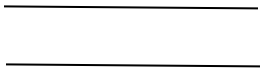


Gane & Sarson

4) Data stores:-

- Data are stored or referred by a process in the system.
- The data store may represent computerized or non-computerized devices.
- E.g. customer master file.



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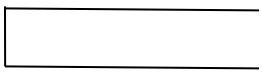


Gane & Sarson

Types Of Data Flow Diagram

1) **Physical data flow diagram**
2) **Logical data flow diagram**

1) Physical data flow diagram:-

- An implementation-dependent view of the current system, showing what tasks are carried out & how they are performed.
- DFDs that show how things happen & which are the actual physical component involved are known as physical DFDs.
- Physical models are easier to visualize.
- **Physical characteristics include:-**
  - Name of people
  - Forms & document names or numbers
  - Names of departments
  - Master & transaction files
  - Locations
  - Names of procedures
- **The use of physical data flow diagram is desirable for three reasons:-**
  - It is much easier to first describe the interaction between physical components than it is to understand the policies that are used to manage the application.
  - Physical data flow diagram are useful for communicating with users, users relate easily to people, location & documents, since they work with each entity every day. Users can quickly point out when a step is incorrect or missing.
  - Physical data flow diagrams provide a way to validate or verify user's current view of the system with the way it is actually operating.

2) Logical data flow diagram:-

- An implementation-independent view of system, focusing on the flow of data between processes without regard for the specific devices, storage locations or people on the system.
- The logical DFDs show "what is going on".
- Logical DFDs help to get a clear idea of what the system has to achieve without getting into details like who is going to do it? How one is going to do it? Etc.
- **A logical data flow diagram is derived from the physical version by doing the following:-**
  - Show actual data needed in a process, not the documents that contain them.

- Remove routing information; that is, show the flow between procedures, not between people, offices or locations.
- Remove tools & devices.
- Remove control information.
- Remove unnecessary processes, such as that do not change the data flows, stand-alone from the devices on which they occur, or represent a unique process within the system.

Difference between Physical DFD & Logical DFD

Physical Data Flow Diagram

- Data flow names include the implementation facts as names, numbers, timing etc.
- Process names include the name of the processor i.e. person, department, computer system etc.
- Data stores identify their computer & manual implementation. (Clerk notebook etc.)
- This is more realistic & implementation oriented. PDFD are more detailed in nature.

Logical Data Flow Diagram

- Data flow names describe the data they contain. They do not refer to the form or document on which they reside.
- Process names describe the work done without referring to e.g. account receivable, order processing etc.
- Physical location of data stores is irrelevant. Many times, the same data store may be shared by many subsystems & processes.
- This is more logical in format. This is more abstract than PDFD & less dependent on implementation steps.

Data Dictionary

- Data dictionary is a catalog of all elements in the system.
- It is a document of all elements that collects co-ordinates and confirms what a specific data used by the different people in the organization.
- It is a reference work for finding names and attributes of data elements used throughout the system.
- These elements centre on data in way they are structured to meet the user's requirement.
- The major elements are data flows, data stores and processes.
- Data dictionary stores details and description of these elements.

Systems Analyst

Who is a System Analyst?

- Individuals who perform the system investigations as distinct from those merely involved in the detailed computer programming are called "System Analysts".
- The programmer work within the framework provided by the systems analyst.
- If the framework or the outline is poorly designed; then the result is bound to be much off the mark.
- A system analyst is like an architect and his work assumes greater importance because he has to design a system for the future.
- Thus a systems analyst designs information systems which meet organizational objective, promote integration of activities, and facilitate control and which are flexible.
- System analysis is the brain for data processing.
- Though computer is a powerful tool in the systems analyst's work, in the final analysis, it is the systems analyst who determines what data should be processed and how, when and where.
- **So, a system analyst's job consist of:-**
    - Gathering facts about existing information system.
    - Analyzing the basic methods and procedures of current information system.
    - Determining information needs.
    - Modifying, redesigning and integrating the existing procedures in the new system specifications to provide the needed information.

Role of system analyst:-

- The system analysis is a difficult task and it requires a multifunction personality.
- **At different times, he will play some or all of the following roles:-**
    1) **Systems analyst- an agent of change**
    2) **Systems analyst- a motivator**
    3) **Systems analyst-an organizer**
    4) **Systems analyst- an architect**
    5) **Systems analyst- an intelligent salesperson**

1) System analyst – an agent of change:-

- A system analyst works towards the future in uncertain and different.
- Change is the only thing which is permanent and the systems analyst has to prepare a vehicle to work in that changing environment.
- The greatest hurdle for him is that people resist (continuous) change.

- To overcome this, he has to secure user acceptance though user participation in the creator of new environment.
- For this, he has to be persuader (believe something) as well as controller.

2) System analyst – a motivator:-

- Acceptance cannot be forced down the throats (controlling) of system users.
- Proper identification of right personal and exacting feeding (information) of right motivating

3) System analyst – an organizer:-

- A system is the system analyst's conceptual child.
- Hence he has to be clear about all activities of the system.
- The sequence of activities, their purpose and their consequences must be clear to him.
- He is responsible for the execution of all activities and events and hence that of the system.
- The role of the organizer includes puzzle solver whenever problems arise.
- He is also an evaluator of his own system.

4) System analyst – an architect:-

- A system analyst must have a fairly good idea of his final system at the raw material stage itself.
- He prepares blue print, modifies, and provides aesthetic (set of principles) values to his product.
- **Example:** system analyst may bring in a better changed environment for the users. It may bring in changed attitudes towards systems. Hence he is a simplifier, an artist and a sculptor (an artist who make 3 dimension figures), all rolled into one.

5) System analyst – an intelligent salesperson:-

- A good system analyst is one who can sell a refrigerator to an Eskimo.
- System selling is harder than that because the system analyst has to sell it to a user, who knows the existing system in and out.
- To sell his system he should be a good communicator and genuinely interested in understanding the real needs of the user.
- In fact, system selling takes place at all stage of design and later at all levels of the organization.

Fact Finding Techniques:-

- The specific methods analysts use for collecting data about requirements are called"fact finding techniques".
  1) **Interview**
  2) **Questionnaire**
  3) **Record inspection or Record review**
  4) **Observation**

1) Interviewing:-

- Analysts use interviews to collect information from individual or from groups.
- It is an art better learned from practice than from books.
- Interviews provide analysts with opportunities for gathering information from respondents who have been chosen for their knowledge of the system under study.
- It is an invaluable technique to gather qualitative information, opinions, policies, suggestions, underlying problems, descriptions of activities & problems etc.
- The respondents are generally current users of the existing system or users of the proposed system.
- In some instances, the respondents may be employees who provide data for the proposed system.
- This method of fact-finding can be especially helpful for gathering information from individuals who do not communicate effectively in writing or who may not have the time to complete questionnaires.
- Interviews allow analysts to discover areas if misunderstanding unrealistic expectations & even indications of resistance to proposed system.
- Interviews are suitable for in depth searches.
- Interviews can be either structured or unstructured.

  Structured interview

  - Structured interviews use standardized questions in either an open response format.
  - The former allows respondents to answer in their own words.

  Unstructured interview

  - Unstructured interviews, using a question and answer format, are appropriate when analysts want to acquire information about a system.

Advantages interviewing:-

- You can observe a lot just by watching.
- People talk with eyes.

- Interviewer is directly on "on-line" with the people connected to the system.
- The responses are quickly received.
- Limited interviewer training needed.
- Result in shorter interviews.

Disadvantages interviewing:-

- Cost of preparation is high.
- Respondents may not accept high level of structures.
- High level of structure may not be suitable for all situations.
- Extra information may be gathered.
- Takes extra time to collect essential facts.

2) Questionnaires:-

- Questionnaires may be used as a supplement (a thing added to something) to interviews.
- More people can be reached & answered can be confirmed.
- The uses of questionnaire allow analysts to collect information about various aspects of a system from a large number of persons.
- The use of standardized question formats cans more reliable data than other fact finding techniques.
- This method does not allow analysts to observe the expressions or reactions of respondents.
- Analysts often use open-ended questionnaires to learn about fillings, opinions & general experiences or to explore a process or problem.
- The questionnaires can have open-ended question like – what are the major and minor problems in the existing system.
- Closed questionnaires control the frame of reference by presenting respondents with specific responses from which to choose.
- A closed ended questionnaire will have fixed response like – what is the average salary in your department?
    1) Less than Rs. 3000/-
    2) Rs. 3000/- to Rs.5000/-
    3) Rs. 5000/- to Rs. 10000/-
    4) Rs. 10000/- & above.
- A questionnaire can be considered as a structured interview form.
- The high cost of developing & distributing questionnaires demands that analysts carefully consider the objective of the questionnaire & determine what structure will be most useful to the study and most easily understood respondents.
- **The following points must be kept in mind while designing questionnaires:-**
    I. The objective of the questionnaire must be clear.

II. The structure must be useful for the study.
III. Question must be easily understood.

- **Questionnaires are useful for:-**
  I. Gathering numerical data.
  II. Getting relatively simple opinion from large number of people.
  III. Obtaining collective opinion etc.
- Questionnaires provide valuable data.
- Questionnaires are also useful to get feedback in a post implementation audit.
- **Open-response question form:-**
  - **Example: -** obtain information about critical design features for employees "some employees have suggested that the way to improve order processing is to install a computer system to handle all calculations that staff members now do with calculators so they can focus more on other processing steps. Under what circumstances would you encourage development of such a system?"
- **Closed-response question form:-**
  - **Example: -** obtain insight into system likes & dislike. "Your experience has given you a good deal insight into the way this organization handles sales orders. Think about the way orders are received, processed & disposed of. I would like you to answer some specific about this".
  - What steps work well? What steps do not?
  - Where do most problems occur?
  - Where are there fewest problems?
  - What can be done to increase speed?

3) Record review:-

- Many kinds of records & reports can be proving analysts with valuable information about organizations & operations.
- In record reviews, analysts examine information that has been recorded about the system & users.
- Thus a good analyst always gets information from documents.
- An existing system can be better understood by examining documents, forms & files.
- This record review can take place at the beginning of the system study or later in the study for comparing actual operations with what the records indicate.
- **Record may include:-**
  - Written policy manuals.
  - Rules regulations.
  - Forms and documents.
- **The following question may be useful in analysis of forms:-**
  - Who uses these forms?

- Do they include all the necessary information?
- How readable & easy to follow is the form?
- Is it ideal for analysis? Etc.

- Records include written policy manuals, regulations & standard operating procedures used by most organizations as a guide for managers & employees.
- They do not show what activities are actually occurring, where the decision-making power lies or how task performed.
- They can help analysts understand the system by familiarizing them with what operations must be supported & with formal relations within the organization.

4) Observation:-

- Observation allows analysts to gain information they cannot obtain by any other fact finding method.
- Through observation, analysts can obtain firsthand information about how activities are carried out.
- This method is most useful when analysts need to actually observe how documents are handled, how processes are carried out & whether specified steps are actually followed.
- **Observation can look for:-**
  - Operational inefficiencies.
  - Alternate procedures.
  - Interruptions in the normal flow of work.
  - The usage of files & documents.
  - Informal communication channels etc.
- On site observation provides close view of the working of the real system.
- He can observe people, objects, documents & occurrences of events.
- **Observation shows the analyst**
  - **What should happen:-**
    - Standard operating procedures.
    - Controls & checks for accuracy.
    - Properly completed document.
    - Efficient & timely, completion of work.
  - **What actually occurs:-**
    - Delay in doing work.
    - Information recalled from memory.
    - Skipped steps.
    - New controls needed.

Decision Table

- A decision table is a matrix of rows & columns.
- Decision rules state what procedure to follow
- This method has been used since the mid-1950, when it was developed at general electric for the analysis of business function such as inventory control, sales analysis, transportation control etc.
- A decision table (DT) is a visual means for showing how a rule applies to repetitive situations.
- The DT is a tool of the programmer as well as that of the system analyst.
- When the solution to a problem involves logical decisions, the various condition & possible actions involved can be represented in the form of table.
- This table is known as decision table.
- This table is known as decision table.
- **The physical layout of a DT is a given below:-**

Header	**Rule (r) identifier**				
Condition statements or condition stub			**Condition entry Sub(CE)**		
Action statements or action stub			**Action Entry (AE)**		
Note :(NB)					

Decision Table: Characteristics

The decision table is made up of four sections:-

1. **Condition statements**
2. **Condition Entries**
3. **Action statements**
4. **Action Entries**
    - The condition statement identifies the relevant conditions.
    - Condition entries tell which value, if any, applies for a particular condition.
    - Action statements list the set of all steps that can be taken when a certain condition occurs.
    - Action entries show what specific action in the set takes when selected conditions or combinations of condition are true.

- Sometimes notes are added below the table to indicate when to use the table or to distinguish it from other tables.

Example:-

A bank XYZ will grant loans under the following conditions:-

1) If a customer has an account with the bank & has no loan outstanding, loan will be granted.
2) If a customer has an account with the bank but some amount is outstanding from previous loans, then loan will be granted if special management approval is obtained.
3) Reject loan applications in all other cases.

We can translate this into a decision table:

Step-1: List all condition and actions.

Conditions: I) The existence of a bank account with the bank XYZ

II) (A) the customer previous loan status.

(B) Management Approval.

Actions: **1)** Grant Loan

2) Reject loan Application

Step-2: combine conditions which only describe the only two possibilities of a single condition.

There are four possible combinations in this case:

Rules	Condition	Action
1	**Customer has A/C & no dues from previous loan**	**Grant Loan**
2	**Customer has A/C & no dues from previous loan &he has management Approval.**	**Grant Loan**
3	**Customer has A/C & some dues from previous loan & he has no management approval**	**Reject loan Application**
4	**Customer has no A/C**	**Reject loan Application**

Placing these in decision table:

(H)	Decision Table-1	R1	R2	R3	R4
(CS)	C1:Customer has bank A/C	Y	Y	Y	N
	C2:Customer has no dues	Y	N	N	-
	C:3Customer has management approval	-	Y	N	-
(AS)	A1:Grant Loan	X	X	-	-
	A2:Reject Loan Application	-	-	X	X

- The maximum number of rules is in general 2^n where n is the number of conditions.
- E.g. one condition leads 2^1=2 rules; two conditions lead 2^2=4 rules and so on.
- Condition Stub identified as
  - C1, C2, C3……..
- Condition Entry Symbol:-
  - Y (Yes), N (No), - (Blank).
- Action Stub identified as
  - A1, A2, A3……
- Action Entries Symbol:-
  - X (application), - (blank).

Advantage of Decision Table

- Managers can be relieved form making for routing matter where decision rules can be clearly structured.
- DT is to make the communication between the manager & the system analyst or programmer easier.
- The manager can represent his decision process through DT to the system analyst in a form that can be readily converted to flow diagram for computer programming.
- Also DT is a method of documentation that is easily prepared, change & update.
- Since DT is in summary form & standardized format, it is easier to use

Disadvantages of Decision Table

- DT does not contain the flow by logic of a solution to a given problem.
- When there are too alternatives, DT cannot list them all.
- It is not easy to translate it into source program.

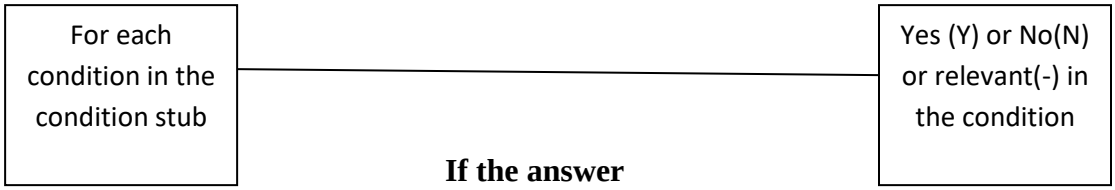
Types of Decision Table

Decision tables are of two types:-

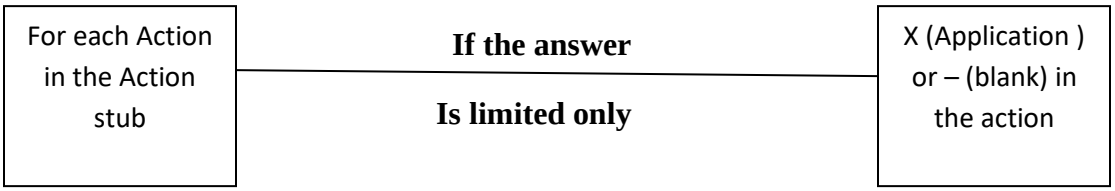
1) **Limited Entry Decision Table**
2) **Extended Entry Decision**

1) Limited Entry Decision Table:-

- In the limited entry table, the entries give simple 'yes' and 'no' answer to condition and action statements.



Limited condition Entry Decision Table



Limited Action Entry Decision Table

- If the reply in both the condition and action entry parts are limited as mentioned above the DT is known as 'Limited Entry DT'.

2) Extended Entry Decision Table:-

- The extended-entry form replaces Y and N with action telling the reader how to decide.
- In this format, the condition & action statements themselves are not complete, which is why the entries condition more details than Y and N.
- In extended entry decision table, the statements made in the stub pointes are incomplete.
- Both the stub & entry portions of any particular row in the table must be considered together to decide if a condition or action is relevant to a given rule.

Decision Trees

Decision Tree: Characteristics:-

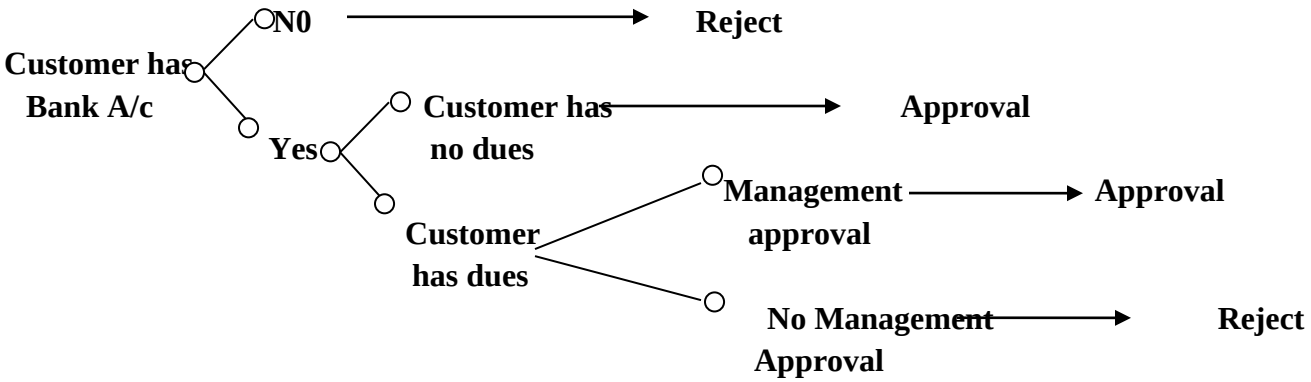
- A decision tree is a diagram that present conditions & action sequentially & shows which condition to consider first, which second & so on.
- It is also a method of showing the relationship of each condition & its permissible action.
- The root of the tree, on the left of the diagram, is the starting point of the decision sequence.
- The particular branch to be followed depends on the conditions that exist & the decision to be made.
- Progression from left to right along a particular is the result of making a series of decisions.
- Following each decision point is the next set of decisions to be considered.
- The nodes of the tree thus represent conditions & indicate that a determination must be made about which condition exists before the next path can be chosen.
- The right side of the tree lists the action to be taken, depending on the sequence of conditions that is followed.

Example:-

A bank XYZ will grant loans under the following conditions:-

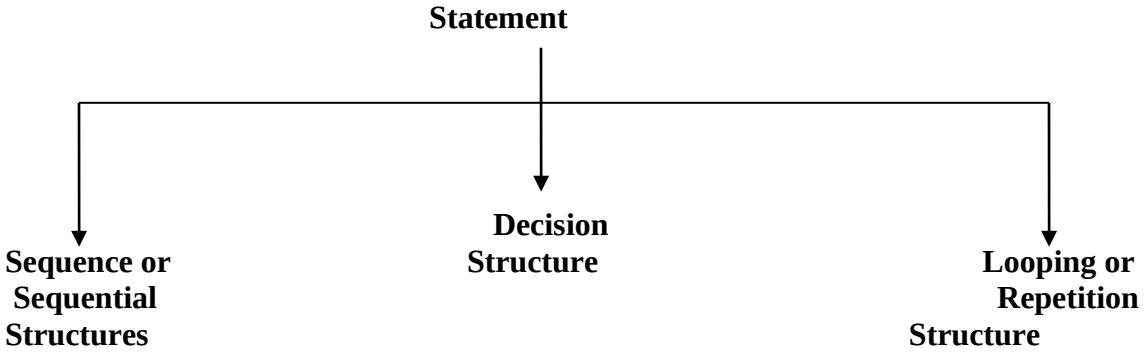
1) If a customer has an account with the bank & has no loan outstanding, loan will be granted.
2) If a customer has an account with the bank but some amount is outstanding from previous loans, then loan will be granted if special management approval is obtained.
3) Reject loan applications in all other cases.

We can translate this into a decision tree:-



Structured English (SE)

- Structured English (SE) describes procedures.
- The procedures may be a process in DFD.
- Thus Structured English aims to get the benefits of both programming logic & natural language i.e. English.
- Structured English can be described as a procedure/process specification tool.
- Structured English are useful for reference to data dictionaries & to define any process in data flow diagrams.
- This tool complements DFD's & DD's.
- Structured English can be used not only as system analysis tool but also as a system design tool.
- This tool helps to communicate business requirements effectively to computer programmer & knowledge workers.
- Structured English specifications still require analysts to identify the conditions that occur in a process, decision that must be made when these conditions occur, & alternatives action to take.
- The terminology used in the structured description of an application consists largely of data names for elements that are defined in the data dictionary for develops for the project.
- **Structured English uses there basic types of statements to describe process.**



- These structures are very useful in decision analysis, program writing and S/W development.

1) Sequential Structures:-

- Sequential structures are single declarative statements that denote a single step or action in a process.
- The statements follow one another in a logical sequence.

- They do not include branching or looping.
- In general, several sequence instruction borrowed together describe a process.

Example: - Take admission in college.

- **Full REGISTRATION FORM.**
- **Pay FEES**
- **Submitted the original DOCUMENT.**

- The length of the sequence can be more than one line.
- The data flows, data stores & data elements are written in capital letters.
- Sequential structure are equally useful in computing arithmetic operation like AND, OR, NOT.

2) Decision Structures:-

- Decision structure occurs when two or more action can be taken, depending on the value for a specific condition.
- One must access the condition & then make the decision to take the stated actions or sets of action for that condition.
- The decision structure allow branching instructions providing room for "yes" or "no" decisions.

For Example:-

- Male or Female
- First Year students or Second Year Students

- In this structure, the keywords like IF, THEN and ELSE are used.

Example:-

A bank XYZ will grant loans under the following conditions:-

I. If a customer has an account with the bank & has no loan outstanding, loan will be granted.
II. If a customer has an account with the bank but some amount is outstanding from previous loans, then loan will be granted if special management approval is obtained.
III. Reject loan applications in all other cases.

Solution:-

IF Customer has Bank Account
THEN
IF customer has no dues from previous loan account
THEN allow loan facility
ELSE
IF management approval is obtained
THEN allow loan facility

ELSE

Reject.

ELSE reject.

- Decision structures are not limited to two condition action combinations alone. There can be more conditions.

3) Looping Structures:-

- The looping structure allows us to specify that a sequence of instructions to be repeated until some condition or desired result is satisfied.
- Some of the ways of writing repetition structures are DO….WHILE structure, REPEAT…UNTLL structure etc.
- In routine activities, it is common to find that certain activities are repeated while a certain condition exists or until a condition occur.
- DO…..WHILE STRUCTURE: here a condition is tested before a set of instruction are processed.
- REPEATED….. UNTIL STRUCTURE: here the group of sentences is executed first & then the condition is tested.
- Let us extend the example given under decision structure to assess for more number of loan application.

WHILE there is more loan application DO

BEGIN

Get next loan application

IF Customer has Bank Account

THEN

IF customer has no dues from previous loan account

THEN allow loan facility

ELSE

IF management approval is obtained

THEN allow loan facility

ELSE

Reject.

ELSE reject.

END

- **General guidelines for writing structured English procedures**
  - Name each procedure to match the DFD names.
  - Write one procedure specification for each primitive process in DFD.
  - Do not use GOTO; PERFORM statements because they destroy the natural flow of procedures.

System prototype method (SPM)

- Prototype is a system development methodology which is gaining rapid acceptance.
- Constructing a working model of the final system as quickly as possible .The method is called “PROTOTYPE”.
- A Prototype is a working system –not just an idea on paper that is developed to test ideas & assumption about the new system.
- The term prototype does not contain all the features or perform all the necessary function of the final system.
- It include sufficient element to enable individuals to use the proposed system to determine what they like & don’t like & to identify feature to be added or changed**.**
- **Example:**
    - Like any computer system it consist of working software that accepts input perform calculation produce output or perform other meaningful activities.

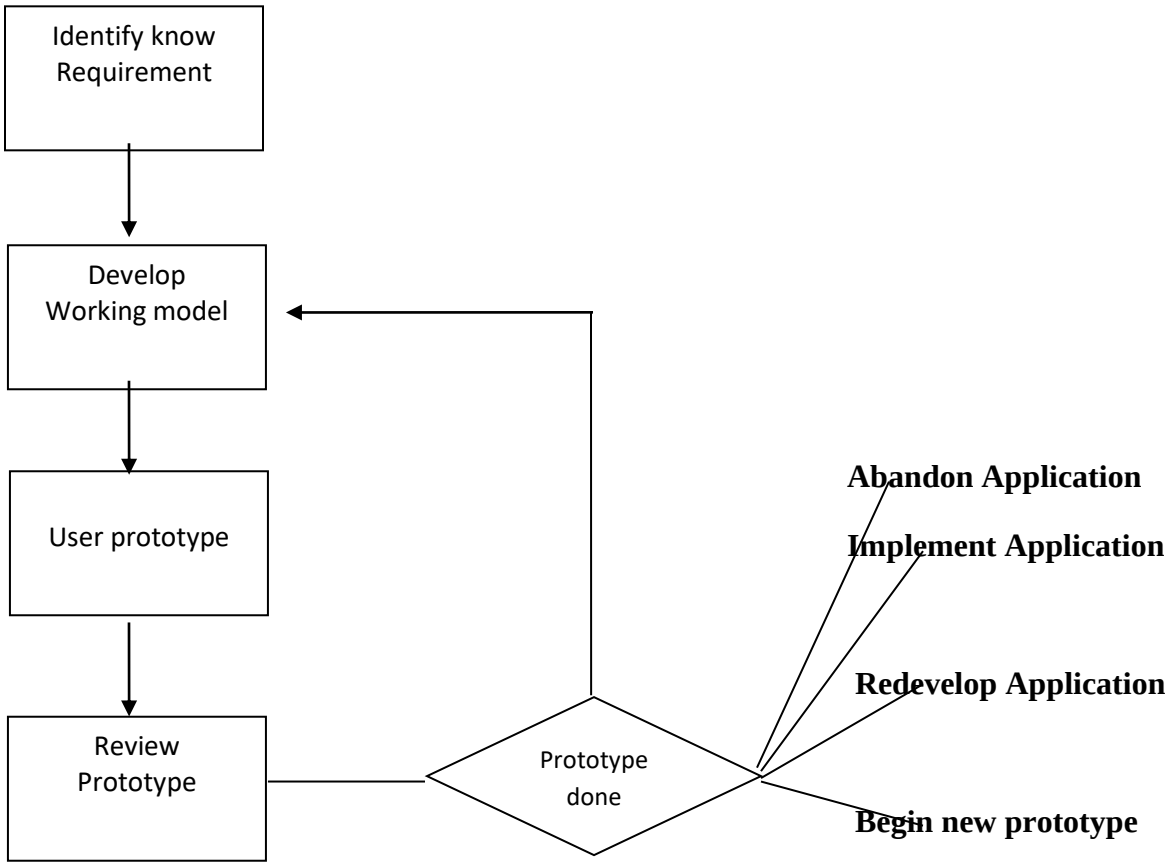
Application prototyping has following characteristics:-

- The prototype is a live, working system.
- The purpose of prototyping is to test out assumptions made by analysts & users about required system features.
- Prototypes are created quickly.
- Prototypes are relatively inexpensive to build.

When prototype useful?

- The requirements are difficult to advance.
- The requirements may change significantly during development.
- The ideas & assumption about a new system to be experimented quickly by the user at last cost.

Step in prototype method (prototype process) (Figure)



1) Identify known requirement:-

- The determination of application is as important under the prototype development method as when using the classical system development life cycle method or structured analysis.
- Therefore, before a prototype us created, both user and system analysts work together to identify the requirements that must be met.
- They determine the purpose the system will serve & the scope of it's capabilities.

2) Develop working model:-

- Prototyping uses an interactive development process.
- Prior to the first iteration, systems analysts describe the prototype method to the users, explaining what activities will occur & in what sequence & discussing the responsibilities of each participant.
- It is useful to begin the prototyping process by developing a general plan so that individuals know what to expect from each other & from the development process .
- A time table for the startup & proposed completion of the initial iteration is a helpful aid & should be constructed at this time.

- To begin the first iteration, user & analyst jointly identify the data that are needed in the system & specify the output the application must produce.
- Typically two to three meetings are required to establish the initial specification.
- The analyst also estimates the prototyping cost.
- Construction of the initial prototype is performed by the system analyst, using any of several tools.

➢ **In developing the prototype, these component are prepared:-**

- Conversion between user & system.
- Input screens& formats.
- Essential processing modules.
- System output.

3) use prototype:-

- It is user's responsibility to work the prototype & evaluate its feature & operation.
- Experience with the system in the actual application setting should provide the familiarity needed to determine what changes or enhancements are necessary.

4) Review prototype:-

- During the evaluation system analysts will want to capture information on what user like & dislike.
  - ➢ The information will influence the feature the next version of the application should have.
- Changes to the prototype are planned with user before they are made.
- The analyst is responsible for actually making the modification.

5) Repeat as needed:-

- The process described may be repeated several times to evolve the application.
- Four to six iteration is typical.
- This process ends when both users & analyst agree that the system has evolved to include the necessary features or when it is evident that is no additional iteration.

Use of prototype:-

- When prototype process complete, a decision is made about how to proceed.
- There are **four** ways to proceed after the information gained from developing & using the prototype has been evaluated :

➢ **Discard the prototype & abandon the application project.**
➢ **Implement the prototype.**
➢ **Redevelop the application.**
➢ **Begin another prototype.**

1) Abandon the application:-

- Both & application are discarded.

- Developing the prototype provided information from which to determine that the application or the intended approach is inappropriate to justify additional development.
- In some cases, circumstances may have changed so that the application is no longer needed.

2) Implement prototype:-

- The features and performances of the prototype will meet user records either permanently or for the foreseeable future.
- Sometimes the prototype becomes the actual system needed.
- In this case, it is implemented as is, no further development occurs.
- **This decision is most likely to be made under one or more of the following circumstances:**
    - The prototype evolved let to an application consisting of the required features, capabilities & performances characteristics.
    - The application will be used in frequently & spend or efficiency of operation is not essential.
    - The application does not affect or interact with other application or data in the organization & meets the needs of its immediate users.

3) Redevelop prototype:-

- Development of the prototype provided sufficient information to determine the features necessary in the full application**.**
- This information is used as the starting point for development of the application in a manner that makes the best possible use of resource.
- Completion of the prototype process is not the end of the development process.
- It singles the beginning of the next activity – full application development.

4) begin new prototype:-

- Information gained by development of the initial prototype suggests alternative strategies or circumstances.
- A different prototype is constructed to add to information about application requirement.
- The information gained by developing & using the prototype will sometimes suggest the use of an entirely different approach to meet the organization's need.
- It may show that the features of the application must be dramatically different if the existing prototype is inappropriate to demonstrate & evaluate those features.

Disadvantage of prototype

- Prototype considers only two component hardware & software but not personal involved controls or procedures.

Prototype takes longer time to develop with the third generation languages such as FORTAN, COBOL & BASIC.