**SYSTEM CONCEPTS**

#### What is system?

The word system is derived from the Greek word “systema” which means the organized relationship among the functioning units.

However the word system always comes with an adjective, whenever we talk about a system such as educational system, political system, accounting system etc. But if we carefully analyze these systems we can find that there are some features common to all the systems.

These are the characteristics of the system which help us to understand the working definition of the word system.

#### Definition

A system is an orderly grouping of independent components linked together according to plan to achieve a specific objective.

## CHARACTERISTICS OF SYSTEM

The characteristics of the system are

1. Basic components
2. Interaction and structure
3. Goal
4. Behavior
5. Life cycle

#### Basic components

As per the definition of system the functioning units means the basic elements of the system which are interrelated, are the basic components of the system.So these basic elements are nothing but the identifiable and moving parts of the system.

Following are some examples of system and its basic components.

#### 

#### SYSTEM BASIC COMPONENTS

#### Educational system Students, teachers, books, computers.

#### Computer system Monitor, CPU, keyboard.

#### Interaction and structure

#### An important feature of the system is the basic components must interact among themselves. It is not only collection or grouping of elements. If an organization is considered as a system then purchase department must interact with stores and production department, production with PPC and so on. Also they are interdependent on each other. If we consider, computer as a system then if some information is keyed it gets processed by arithmetic or logic unit or both and the final result is displayed on the screen. So this interrelation activity of the components makes the system dynamic.Such a relationship among the components which define the boundary between the system and environment is called as the structure of the system.

#### Goal

#### In order to achieve the goal of the system we should first understand the meaning of I. Central objective II. Integration III. Synergistic effect

#### Central Objective :

#### Central objective means the common goal, because without common goal system will start moving in all directions. As a result coordination among all the parts (Components) will be lost.

#### Integration:

#### It is combined work of all the components in order to achieve the goal of the system. There must be coordination among all parts of the system So in order to have such coordination the system must work as a’ whole’, integrating all its activities to achieve the desired result.

#### Behavior:

#### Behavior is the way the system reacts to its surrounding environment. Behavior is determined by the procedures designed to make sure that components behave in ways that will allow system to achieve common goal.

#### For example: If we touch an object which is hot, the nervous system makes our body to withdraw immediately from the hot source. So heat is input from environment, reaction is the behavior and instruction in the nervous system (how to react) is the procedure. Procedure describes what ought to be done and behavior describes what is actually done.

#### Definition:

#### System is integrated collection of the components which satisfy functions necessary to achieve the system goals and which have relationship to one another that defines structure of the system.

#### A system is a set of elements forming an activity or scheme seeking a common goal by operating on data in time reference to yield information.

## ELEMENTS OF THE SYSTEM

All the characteristics of the system are determined by the system elements, their properties and relationships. The system elements are

1. Input
2. Processor
3. Output

These elements are common to all systems. These are the elements by which all systems are described. They are set in a fixed position which helps the system analyst to design & work with system more easily.

1. **Input :** It is defined as energizing or start up component on which system operates. It may be raw material, data, physical source, knowledge or any energy to decide the nature of output.
2. **Processor :** It is defined as the activity that makes possible the transformation of input to output. When data is processed through computer it is processed through logical steps. However these steps are required to be instructed in series to the computer.
3. **Output :** It is end result of the operation. In other words it is the purpose or the main objective for which the system is designed. Though output is largely dependent on input, its nature or format may vary vastly from the input.

For example: If data keyed is in numerical form it may display output which is in form of graph or pictorial form.

### INFORMATION SYSTEM ENVIRONMENT

Following model represents a system with its elements which keeps the system in equilibrium.



Control

Output

Feedback

Process

Input

In order to build any system only the knowledge of its elements does not serve the purpose, there should be fundamental clarity of some important concepts which are essential to build the efficient system & to keep it in equilibrium.

The major concepts are

* + 1. Boundary & environment
    2. Subsystem
    3. Interface
    4. Feedback control
    5. Black box

1. **Boundary & environment:** Every system has its limits that determine the sphere of influence & control is called as Boundary of the system. Everything within the circumscribed space is called system & everything outside it is environment. Flow from environment to the system is its input while a flow from system to its environment is the output. Boundary of the system may exist physically or conceptually.

Environment

Environment

1. **Subsystem:** A complex system is difficult to implement when consider as a whole. However if we divide it into smaller functional units which are of manageable sizes then every small function unit becomes a subsystem. In the formation of subsystem the components performing same or similar functions are grouped.

System

**For example:** In a business organization system, marketing, production, sales can be considered as subsystems.

***Module*:** A collection of function or data. In other words module encapsulates related functions. Ideal module is that module which can be reused in other development projects.

1. **Interface:** The interconnections & interactions among the subsystems are termed as interfaces. In fact each interface implies a communication path. Number of interfaces increase with number of subsystems.
2. **Feedback control:** In order to improve the performance of any system feedback control mechanism can be used as a tool or device to control or modify the input of the system after analyzing the output properly.
3. **Black box:** Black box is the subsystems at lowest level where the inputs are defined, outputs are determined but the processor of the system is not defined means it difficult to understand how the transformation of input to output takes place.

Processor not defined

Define Input



Black Box

Determine output

### TYPES OF THE SYSTEM

We will have comparative study of different types of system.

#### Conceptual & Physical system

1. **Conceptual (abstract)** system is an orderly arrangement of independent ideas.

**For example:** Economic theory, Theory of relativity.

1. **Physical system:** These are the concrete operational systems made up of people

, material, machines energy & other physical things.

**For example:** Management information system.

Physical systems being operational systems can display activities or behavior. While conceptual system as it works on different ideas or concepts it displays theoretical structures.

#### Natural & Artificial systems

* + - 1. **Natural systems:** All the naturally occurring systems are called as natural systems

**For example:** Solar system.

* + - 1. **Artificial system:** All man made systems are called as artificial systems.

#### Open & Closed systems

* + - 1. **Open system:** Open system is that system which interacts with its environment. **For example:** Any business organization system exchanges its material, manpower, money & information with its environment.
      2. **Closed system:** Closed system is that system which does not interact with its environment. It has only controlled & well defined input & output.

**For example:** Television is itself is closed system which controls its sharpness, brightness automatically with sensors.

#### Deterministic & probabilistic system:

* + - 1. **Deterministic system:** It is a system which operates in predictable manner.Stepwise execution is always possible & output is sure.

**For example:** computer system.

* + - 1. **Probabilistic system:** It is a system which operates in unpredictable manner & degree of error is always possible. Also output is not sure.

**For example:** Weather forecasting system.

#### Integrated system

System integration is the combination of related subsystems to form a larger subsystem or total system.

**For example:** Airline reservation system.

## MIS: MANAGEMENT INFORMATION SYSTE

**M**

Following pyramid represents different management levels of an organization.

EIS DSS

MIS TPS

Top level management

Middle level management

Low level management

This is integrated Man-Machine system that provides information to support planning & in decision making.

### TPS: Transaction processing system

#### Functions:

1. It updates history files.
2. It prepares summarized & processed transaction
3. It generates detailed transaction reports.

#### Application areas:

1. Banking system
2. Sales accounting system.

#### Users of the system:

Lower level management of the system.

#### Benefits:

1. Stores all transactions.
2. Helps to trace out the problem,
3. Gives current status of all the organizational entities.

### MIS: Management information system

#### Functions:

It makes use of output from the TPS as input and generates meaningful reports

* 1. **Application areas:** Marketing, production, personnel departments.
  2. **Users:** Middle level management

#### Benefits:

1. Helps in planning.
2. Helps in decision making.
3. Suitable for analysis.

### DSS : Decision support system

#### Functions:

* 1. This system makes use of internal data from MIS for studying trends &
  2. External data collected from environment to understand the environment.

#### Benefits :

* 1. It helps to prepare analytical & planning models.
  2. It assists top level management in decision making.

#### Application area:

Production planning control system

### ESS: Executive information system

It is structured & automated system provides rapid access to timely information & management reports. This system is supported with online information services such as electronic mail to keep the management updated with all current happenings in major areas.

#### Main features:

* 1. User-friendly
  2. Fast
  3. Updated with graphics & reports.

## INTRODUCTION TO STRUCTURED METHODOLOGIES

A system development methodology is an orderly & integrated collection of various methods, tools & techniques. There are many approaches to the development of computer system, such as

1. System development life cycle(SDLC)
2. Structured system analysis & design method (SSADM)
3. System prototype method (SPM)

SDLC is traditional approach which is rigid, concentrates more on physical aspects than logical aspects for the system development & has to be done at the end of the project.

All these drawbacks have been overcome by SSADM which uses symbols than narrative description. It focuses on logical aspects of the system than physical aspects as it concentrates on ‘what’ occurs than ‘how’ it occurs. SSADM presents graphic model of the system which involves DFD that represents data movements, data stores & processes of the system. This methodology uses tools like DD, structured English, decision table, decision tree for system analysis.

System design in SSADM is transforming logical design into physical design. This includes –input-output design, file & database design program design & control design.

**SOFTWARE DEVELOPMENT LIFE CYCLE**

* .

## INTRODUCTION

#### Definition: System development life cycle (SDLC)

SDLC is well defined process by which the system can be conceived, developed & implemented. It can be performed in two stages. Each stage involves three steps. Two phases are 1.System Analysis 2.System Design

## FIGURE SDLC

#### SDLC

|  |  |  |  |
| --- | --- | --- | --- |
| PROBLEM IDENTIFICATION  FEASIBILITY STUDY | | | |
|  | REQUIREMENT ANALYSIS | |  |
|  | |  | |
|  | |  | |
|  | DESIGN, CODING, TESTING | |  |
| IMPLEMENTATION & MAINTENENCE    SYSTEM EVALUATION | | | |

 SYSTEM ANALYSIS



SYSTEM DESIGN

## SYSTEM ANALYSIS

System analysis means identification, identification & critically examining the system & its parts(subsystem) for the purpose of achieving the goals(objective) set for the system as a whole, through modifications, changed interrelationships of components, deleting or merging & separating of components. It may involve upgrading of system as a whole.

System Analysis is important because

1. It helps to understand complex structures.
2. It specifies functional requirements of the subsystems to the total system.
3. It helps in understanding & comparing functional impacts of subsystem to the total system.
4. It provides inter-compatibility & unity of purpose of subsystems
5. Finally it helps in placing each subsystem in its proper

perspective (place) so that system as a whole can effectively achieve the central objective with minimum resources.

#### System Analysis:

In order to analyze the system properly it is performed in three steps, I Problem identification

**I** Feasibility study & cost benefit analysis III System requirement analysis

#### Problem identification:

Problem identification is the most difficult but important task in system analysis .Because, if the problem is not properly identified it may lead to wastage of time & energy in later stage. For problem identification the focus is on three aspects.

1. Source (cause) of the problem
2. Type of the problem
3. Nature of the problem
4. **Source (cause) of the problem :** The root cause of the problem may be internal or external. Sources listed in different environments

#### Internal Environment External Environment

1. Company Management 1) Customer
2. Employs of different department 2) Consultancy services
3. Internal auditors 3) External auditors
4. Financial services 4) Government policies

#### Types of the problem:

The normally encountered problems in the system are related to the I Reliability of the system.

**I** Validity

III Accuracy IV Economy V Timeliness VI Capacity VII Throughput

I Reliability: This problem arises, if for the same procedures the system gives different results or it may not work properly all the time.

**I** Validity: Reports show misleading information or results. III Accuracy: Reports display many errors.

Iv Economy: The system is costly to maintain.

Timeliness: Reports are late or queries are not answered in time.

v Capacity: Inadequate processing, transmission or storing capacity.

V I Throughput: Exactly contradictory problem of capacity means more capacity is available but less work is being done, which affects the efficiency in other way.

#### Nature of problem :

Some questions must be posed to find out the exact nature of the problem such as, I What is the actual problem?

**I** How complex it is?

III What are the causes of the problem? IV What are the likely solutions?

V Once the problem is solved what type of benefit is expected?

Answers to all these questions provide the exact nature of the problem. Once the exact nature of the problem with its cases & type is identified, the possible opportunities or solutions are checked and here the feasibility study starts.

#### Feasibility study

Feasibility study is useful to evaluate the cost & benefits of the system requested. There are three major aspects of feasibility study.

1. **Technical feasibility:** It focuses on the existing computer hardware, software & personnel. The need of these three factors is verified & procurement or installation is done accordingly.
2. **Economical feasibility:** It considers cost & benefit analysis of the proposed system. If the benefit overweighs the cost then only project is approved. The economic feasibility helps to find out development cost.

Development cost can be categorized under two heads.

* 1. One time cost such as
     + Investigation or survey cost,
     + Cost of converting present system to new one
  2. Recurring cost such as
     + Salaries of personnel,
     + Training of staff,
     + equipment maintenance

1. **Operational or Behavioral feasibility:** It considers the acceptability of the system. It checks pre & post implementation procedures & thereby tries to find out the troubleshooting areas of the system. If any business is to be computerized then proposed system requires efforts to
   1. Convince the user of the system for the acceptance
   2. Educate the staff means to give knowledge of the system
   3. Train the staff means to provide all the skill set for the required system.

#### Requirement Analysis

Requirement analysis is basically determination of requirements for new system. Determination of requirements means studying the existing system & collecting the details about it to find out the users requirement first. Requirement analysis can be done with the help of three activities,

* + - 1. Identification of basic requirements
      2. Investigation of basic requirements
      3. Specification of basic requirements

1. **Identification of basic requirements:** In order to identify the basic requirements it is necessary to find out how the system works & where the improvement is required. This can be done by imposing major questions such as

I What are the problems in existing system? **I** What users expect from proposed system?

III What are the various process involved related with the problem?

Iv What data is used & produced during the process? v Which controls are used currently?

1. **Investigation of requirements :** Requirement investigation uses fact findingmethods such as

I Interview

**I** Questionnaire

III Observations

Iv Record review

v Brainstorming

v I Desk research

These fact finding techniques are used for gathering information about the system. This activity is very important and documentation description of features of the system is also done for future analysis. Requirements are documented & presented using special tools like system flow charts, data flow diagrams and presentation graphics which in turn helps the designer to design the system.

1. **Specification of requirements:** Requirement specification is a deal between developer & end user. The data collected from end-user is not always sufficient. So it has to be analyzed to verify whether it meets the organization’s demands or not. Sometimes user may specify additional features that should be included in new system. This process of requirement specification is done by identifying

I Data used in various activities

**I** Different controls needed in system III User’s transactional requirements

Iv User’s decisional requirements

v User’s organization dependent requirements

This activity requirement specification can be well demonstrated with help of following case.

#### Case study: Material Procurement System





Sale forecasting

Inventory norms, target

Amount of material

Forecast of price & rates

Inventory in hand

Material requirement

Bill of material

Purchase budget

In Material Procurement System

1. Data used is:- Sales forecast annual requirement, ordering cost, storing cost, lead time.
2. Controls required such as reorder level.
3. Transactional requirement:- Lead time
4. Decisional requirement-Some decisions are structured that is rule based, manageable and some decisions are unstructured that is not as per rule.

Decisions are taken by considering present or future situations. Important is right decisions should be taken at right time.

For example in material procurement system, if material reaches re-order level then purchase indent must be raised that is the structured decision which must be taken in appropriate time.

#### ADVANTAGES: System Analysis

1. It helps in setting proper system goals
2. Determines the boundary of the project by giving due consideration to the limitations of the available resources.
3. It focuses on the boundary and scope of the project undertaken.
4. Also checks limitations of available resources.

## SYSTEM DESIGN

System analysis defines ‘What is to be done, and system Design defines ‘How it is to be done’ System design is the most challenging and creative phase of SDLC. System analysis is the fundamental process of the system development life cycle while design is the concluding phase of SDLC.System design processes through following three steps,

* System design specification and programming
* System testing ,implementation & follow-up
* System maintenance &Evaluation of the system.

#### System Design Specification

System design has to focus on four important aspects

1. Architecture design
2. Interface design
3. Database design
4. Program design
5. **Architecture design:** Architecture design focuses on the basic infrastructure hardware, software & networking infrastructures that the system will use.
6. **Interface design:** Interface design specifies how the user will move through the system. It means the navigation methods such as menu, forms, and reports.
7. **Database design:** The database & file design defines what data will be stored & where it will be stored.
8. **Program design:** Program design defines the programs that are required to be written & exactly what is program will do.

The collection of derivable such architecture design, interface design program design and file design is the system specification.

#### Program Specification: (Coding)

Once the design is completed it must be translated into machine language. Proper choice of software is made on the basis of

1. Clearly outlined software specification provided by designer.
2. Need & cost of the software, availability of programmers.

The basic activities involved in this phase are

i Checking of program specification

* 1. Expanding (detailing) of specification.
  2. Breaking the system modules into smaller programs.

i v Allocating these programs to the respective team members of the development team

v Writing codes in selected software language. v i Documentation of each program.

#### Testing:

Basic objective of testing is to find the errors. Testing gives the guarantee that the software does not fail & it will run according to the specification and in the way the user expects it.

1. The basic activities involved in testing are Testing individual program, its logic and interfaces among the various programs.
2. Running on specific data so as to check quality of code and thereby establishes the standards.
3. To check accuracy of desired result.

#### Implementation :

Once the system is tested it is ready for implementation. Implementation includes following activities.

I Planning the implementation schedule. **I** Procurement of hardware.

1. Installation of software.
2. Recruitment of operating personnel.
3. Motivation and training to the personnel.
4. Educating user through meetings & seminars. VII Conversion of data files from old one to new one.

VIII After final change over gradually phasing out of the old system.

#### Follow-up:

There is need to have personnel to look after the system during operation and production which we call as follow-up.

#### Maintenance:

After new system has been Implemented problems and errors appear as no system can be considered as full proof. This requires system maintenance which is ongoing process. Normally hardware and software venders look after their products. Since documentation helps in maintenance, documents maintenance is the demanding task of system analyst. Maintenance ‘tail end ‘of the life cycle but it is the most expensive as it consumes energy, cost time in long run which can be made clear by the graph.

Maintenance



Time

Development

Software cost

When system maintenance becomes more costly and time demanding it leads the urge (birth) of new system. Here SDLC gets completed.

#### Types of maintenance:

1. Corrective maintenance: It has to do with the diagnosis and the removal of residual errors in the system when it is delivered ( means immediate problems till operational set up) as well as the intentionally introduced errors in software during maintenance.
2. Adaptive Maintenance: It is concerned with adjustment of the application with the environment .For example: newly introduced hardware or operating system.
3. Perfective maintenance: It involves changing the software to improve some of its qualities. For example: To add more features related to usability of software such as userfriendlyness etc.

#### Evaluation of the System:

Evaluation is done to estimate the weakness and strength of the system.

I Development evaluation: This decides whether the system is developed on time and within the budget.

**I** Technical evaluation: It includes assessment of development methods & tools.

III Operational evaluation: It focuses on 1) response time for getting results, 2) ease to use, 3) reliability of process,4) adequacy of storage capacity 5) assessment of users attitudes.

## SYSTEM DESIGN CHART

#### STEPS IN SYSTEM DESIGN:



**Analysis**

Procedure design

File design

Input design report

Output design report

Cost justification & candidate system design

No



Submission of design for approval

Design documentation

Abandon project

Design accepted

Yes

Design testing coding



Go for implementation

#### NOTES