Unit – 1 Concept of System, System Analysis and System Design

- **Introduction of the System with examples**
- **Elements and characteristics of the system**
- **Types of system**
- **Introduction of System Analysis and System Analyst**
- **Role of System Analyst**
- **Introduction to System Design**
- **Comparison between System Analysis and System Design**

What is a System?

The word 'System' means different things to different people. Even the dictionary definitions are varied. This is because the word 'System' covers a very broad spectrum of concepts and fields.

In our everyday life, we talk of educational system, computer system, solar system, transportation system, communication system, the body's nervous system, weapons system, accounting system, production system and so on. If we carefully analyze different systems, we find that there are five characteristics which are common to all these systems. The five **characteristics of the systems** are:

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 simply the various identified parts of a system. They are the moving parts of a system. Thus the basic components may be men, materials, machines, information, concepts or energy. For example:

System	Basic Components
Education	Students, teachers, building, administration, text books.
Philosophy	Ideas, people.
Computer	Keyboards display unit, arithmetic unit, logic unit, programs, and magnetic discs.
Defense	Men, equipment, buildings, rules.
Accounting	Records, rules, procedures, equipment and personal.

If a system is large enough then it is composed of many subsystems. Each subsystem is then made up of several smaller subsystems until we reach some parts that individually are not subsystem. These parts are known as basic components. In other words, the components exist at the lowest level. Note that these components of a system are interrelated and they have certain interdependence. They have a certain relationship among them. For example, in education system, the student uses text books, the teacher teaches the student, the students and administrators use building and so on. Another important point to note about these basic components is that they possess certain properties or characteristics of their own.

2) Interaction and Structure:

An important feature of a system is that the basic components interact among themselves. A system is not just an inanimate thing. There must be activity of processing procedure between the elements of a system. For example, in the computer system, what is being keyed in gets processed by the arithmetic unit or logic unit or both. The display unit shows the processed information. Similarly, in the

accounting system accounts persons refer to the records, follow certain procedures, use the equipments like typewriter, calculator, computer etc. Thus in any system, the elements display activity or interaction. Hence a system has to be dynamic in nature.

3) **Goal:**

A system is an organized whole. It has a purpose, goal or objective. Without a common objective a system starts moving in all directions and co-ordination among the parts will be lost. The goal or purpose unifies and integrates the parts of the components. All subsystems and components work more effectively together in the system than if they were acting independently. Consider the human body as a system. If the legs move in one direction and eyes in another and the mind in the third direction, what will happen to the body? Hence 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 environment. Behavior is determined by procedures or instructions designed to make sure that components behave in ways that will allow a system to achieve its goals. While a procedure describes what ought to be done, behaviour describes what is actually done. When human skin touches something extremely hot, the nervous system causes that part of the body to withdraw rapidly from the hot source. The heat is the input from the environment. The reaction is the behaviour and the instructions in the nervous system as to how to react are the procedures.

5) **Life Cycle:**

Just like a human body, every system has birth, life and death. Buildings, automobiles, equipments have their own life spans. Whatever be the system, the life cycle includes evolution, wear, obsolescence, aging, replacement, repair, and finally an end to the system's existence.

Thus we can define a system in any one of the following manners:

"A system is an integrated collection of components which satisfy functions necessary to achieve the system's goals and which have relationships to one another that give cohesion to the system and define its structure."

"A system is a set of elements forming an activity or a processing procedure / scheme seeking a common goal or goals by operating on data and/ or energy and / or matter in a time reference to yield information and / or energy and / or matter."

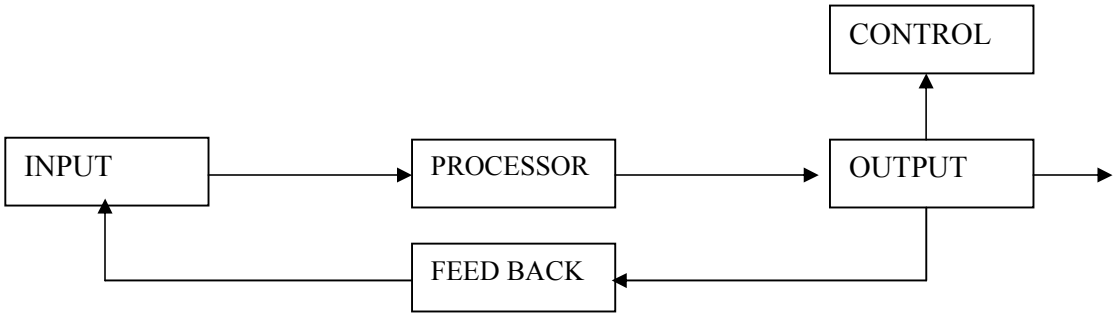
The Elements of a System:

The characteristics of a 'system' are determined by a given set of system elements and their properties and relationships . The system elements are.

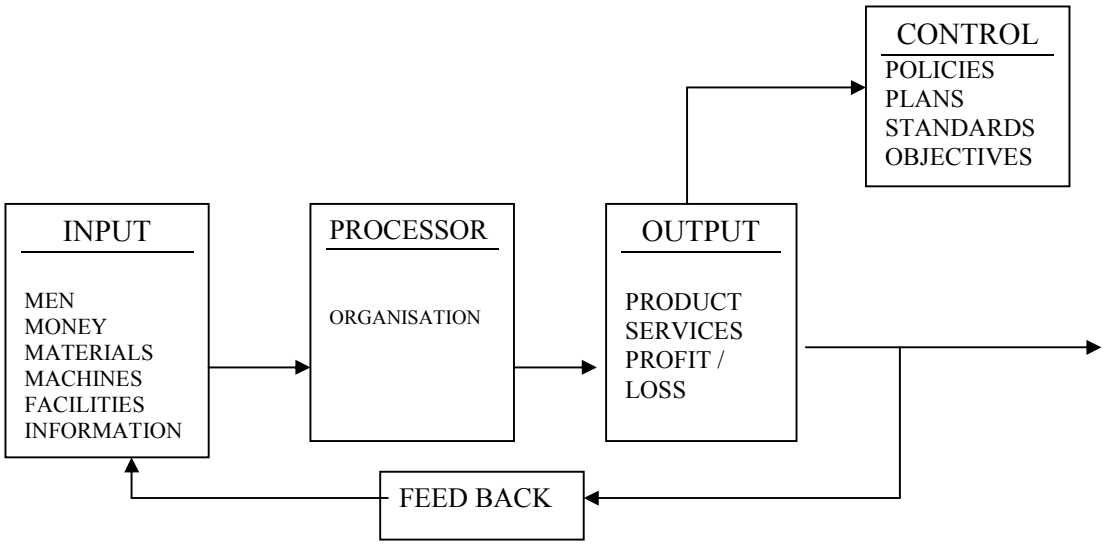
a. Input.
b. Processor.
c. Output.

General Model of a System

A system can be better understood with a general model. A general model of a physical system is made up of system elements like input, processor and output with system concepts like control and feed back to keep the system in equilibrium.



An information system is a subsystem of any business system.
"An information system is an arrangement of components that interact to support the operations, management and decision making information needs of an organization."



System Elements:

Input, processor and output are elements common to all systems. They are the elements by which all systems are described.

INPUT:

Input is defined as the energizing or start-up components on which the system operates. The inputs may be raw materials, physical resource, human energy, knowledge or information. Input largely determines the nature of the output. This is truer in information system. Unless the input data are accurate, output information cannot be expected to be accurate. It may be seen that in most cases, output of one system becomes input for the other e.g. the output of information and decision systems – the decisions – becomes the input to planning and control system.

PROCESS:

Process is defined as the activity that makes possible the transformation of input to output. Men, machine, functions, operations, organizations and combinations of these may act as processors. E.g. when data are processed through computer, processing involves a set of logical steps. These steps are required to be instructed to the computer and this is done by a series of 'instructions' called 'programs'.

OUTPUT:

Output is defined as the result of an operation. It is the purpose or objective for which the system is designed. Though output largely depends upon the input, its nature, utility and format may be vastly different from those of input.

SYSTEM	INPUT	PROCESSOR	OUTPUT	FEEDBACK
University	Students	Various departments	Changed students	Alumni opinions
Management information system (computer based)	Information	People, computer	Decision	Reports about its effectiveness

TYPES OF SYSTEMS

1. CONCEPTUAL AND PHYSICAL SYSTEMS:

System can be abstract or physical. An abstract or conceptual system is an orderly arrangement of independent ideas. Conceptual systems are concerned with theoretical structure, which may or may not have any counterpart in the real world. Economic theory, Philosophy, Non – Euclidean Geometry, Abstract Algebra and General Theory of Relativity are examples of conceptual systems. Physical or Empirical systems are generally concrete operational systems made up of people, materials, machines energy and other physical things.

2. DETERMINISTIC AND PROBABILISTIC SYSTEMS :

Systems can also be classified as deterministic or probabilistic. A deterministic system operates in a predictable manner. If one knows the state of the system at a given point of time then it is a deterministic system if one can predict the next state without error. Similarly, in an inventory system, average demand, lead time etc. are probabilistic.

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. A closed system is a system which is self-contained. It does not exchange material, information or energy with the environment.

4. Natural and Artificial system :

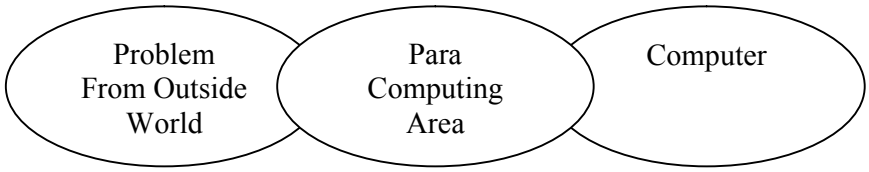
Solar system, Water system and human being as a system are examples of natural systems. A business organization, computer system, air conditioning system, social system, economic system, and Management information systems are examples of artificial systems.

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. Information system is a man- machine, relatively closed and determined system. Thus system integrated is the combination of related subsystems to form a larger subsystem or total system embracing the whole of business operations for the purpose of improving administrative efficiency.

What is System analysis?

In our day–to-day life there are many problems which can be solved with the help of computers. Such problems may be related to transportation system, communication system, educational system or business system. The systems analysis in broad outline decides how these problems in the outside world can be related to a computer system. So, systems analysis in Management Information Systems may be considered as a link between the actual problem and the computer. The procedures for computerizing outside problem are made more complex by a large area which can be called as “PARACOMPUTING”. The major part of para-computing is system analysis. In addition to systems analysis, para-computing also includes data collection and data preparation.



Thus, systems analysis is concerned with:

1. Investigating
2. Analyzing
3. Implementing
4. Evaluating information system in organizations.

SYSTEM ANALYST

Who is system analyst?

Individuals who perform the systems investigation as distinct from those merely involved in the detailed computer programming are called “System Analysts”. The programmer works within the framework provided by the System Analyst. If the framework or the outline is poorly designed, then the result is bound to be much off the mark. A systems analyst is like an architect and his work assumes greater importance because he has to design a system for the future.

Thus a system analyst designs information systems which meet organizational objective, promote integrated of activities, facilitate control; and which are flexible and robust. So, a system analyst's job consists of:

1. Gathering facts about existing information system.
2. Analyzing the basic methods and procedures of current information system.
3. Determining information needs.
4. Modifying, redesigning and integrating the existing procedures in the new system specifications to provide the needed information.

SYSTEM ANALYST'S RELATION TO THE COMPANY:

In a business organization, the systems analyst is the interface between the company and the computer system. He has to interact with the top management, understand policies and procedures. Many times his important task is to convert manual systems into computer systems. He has to work with other departments to gather information. His work within the computer department involves:

1. Choice of programming language
2. Keeping within the schedule and budget
3. Documentation of policies and procedures

KNOWLEDGE AND QUALITIES EXPECTED OF A SYSTEM ANALYST:

1. Business Method :
That is, he should have a fairly good understanding of the organization structure, management and administration methods, system techniques, production planning and control, inventory control, accounting procedures, operation research and simulation techniques.

2. Computing :
This includes the knowledge of data processing, programming languages and computer operations. He should himself be conversant with the information regarding various computer systems available in the market, their cost, benefits, versatility etc. He should have a working knowledge of the equilibrium used in the system.

a. A broad and flexible outlook
b. An orderly mind
c. Disciplined approach and logical neatness
d. Ability to express thoughts, ideas and proposals clearly both orally and in writing.

Main Objective of a System Analyst:

The main objective of a systems analyst is to provide right type of information, in right quantity, in right cost to management or for end user.

ROLE OF A SYSTEM ANALYST :

System Analysis is a difficult task and it requires a multifunctional personality. At different times, he will play some or all of the following roles:

1. System Analyst – an agent of change :

A System analyst works towards the future. Future is uncertain and different. Change is the only thing which is permanent and the system analyst has to prepare a vehicle to work in that changing environment. The greatest hurdle for him is that people resist change. He has to secure user acceptance through user participation in the design and implementation of the system. Hence, he is the creator of new environment.

2. System Analyst – a motivator:

Acceptance cannot be forced down the throats of system users. A good motivator has to be a good psychologist.

3. System Analyst – an organizer:

A system is the systems analyst's conceptual child. Hence he has to be clear about all activities of the systems. The sequences of activities, their purpose and their consequences must be clear to him .He is responsible for execution of all activities and events and hence that of the system .The role of the organizer includes that of 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 the blue print, modifies, improves , and provides aesthetic values to his product.

5. System Analyst – an intelligent salesperson :

A good Systems Analyst is one who can sell a refrigerator to An Eskimo. System selling is harder than that because the systems 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.

Introduction to System Design

- Process of defining and developing systems to satisfy specified requirements of the user.
- Process to define the architecture, modules, interfaces and data for a system to satisfy specified requirements.
- Designing a system is a application of systems that shows theory approach to product development approach.
- Sub-tasks are:
    - User Interface Design
    - Data Design
    - Process Design

Distinction between System Analysis and System Design

System Analysis	System Design
System analysis is the examination of the problem.	System design is the creator of the information system which is the solution to the problem.
It is concerned with identifying all the constraints and influences.	It is concerned with the co ordination of the activities, job procedures and equipment utilization in order to achieve system goals.
It deals with data collection and a detailed evaluation of present system.	It deals with general design specifications, detailed design specifications, output, input, files and procedures. It also deals with program construction, testing and user acceptance.
It portrays logical model of the system through Data Flow Diagram and data dictionaries.	It provides technical specifications and reports with which the problem can be tackled.

FEEDBACK – CONTROL

Feedback is device for the control and modification of input after analyzing the output with the objective of improving the system performances. Feedback helps to keep the system in equilibrium. In the economic system, purchasing serves as feedback because purchasing brings back money into the economic system and thereby maintains the equilibrium. Thus feedback is the basis for self-regulating control systems. The feedback is of two types:

- Positive feedback
- Negative feedback

A negative feedback control normally involves four elements:

1. A characteristic or condition to be controlled. The characteristics of control must be measurable from some output.
2. A sensor for measuring the characteristics.
3. A control unit which compares the measurements with a standard for that characteristic.
4. An activating unit which generates a corrective input signal to the process.