**UNIT I**

What is a System?

The word System is derived from Greek word Systema, which means an organized relationship between any set of components to achieve some common cause or objective.

*A system is “an orderly grouping of interdependent components linked together according to a plan to achieve a specific goal.”*

Constraints of a System

A system must have three basic constraints −

* A system must have some **structure and behavior** which is designed to achieve a predefined objective.
* **Interconnectivity** and **interdependence** must exist among the system components.
* The **objectives of the organization** have a **higher priority** than the objectives of its subsystems.

Systems Analysis

* It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components.
* System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose.
* Analysis specifies **what the system should do**.

## Systems Design

It is a process of planning a new business system or replacing an existing system by defining its components or modules to satisfy the specific requirements. Before planning, you need to understand the old system thoroughly and determine how computers can best be used in order to operate efficiently.

System Design focuses on **how to accomplish the objective of the system**.

**Need For System Approach**

A systems approach is a holistic and interdisciplinary way of understanding and solving complex problems. It views the world as a collection of interconnected and interdependent elements or people, and emphasises the relationships and interactions between them.

A systems approach aims to determine the system design and implementation that delivers the best service. It has the potential to drive greater efficiency and a better understanding of threats and opportunities present when shaping the delivery of health and careservices. A systems approach builds on the principles of systems thinking, systems engineering, design thinking and social science to bring together four key and complementary perspectives:

* People — understanding of interactions among people, at the personal, group and organisational levels, and other elements of a system in order to improve overall system performance;
* Systems — addressing complex and uncertain real world problems, involving highly interconnected technical and social elements that typically produce emergent properties and behaviour;
* Design — focusing on improvement by identifying the right problem to solve, creating a range of possible solutions and refining the best of these to deliver appropriate outcomes;
* Risk — managing risk, based on the timely identification of threats and opportunities in the system, assessment of their associated risks and management of necessary change.

**FACTORING INTO SUBSYSTEMS**: A complex system is difficult to comprehenced when considered as a whole. Therefore the system is decomposed or factored into subsystems. A subsystem is a part of a larger system. Each system is composed of subsystems, which in turn are made up of subsystems, each subsystem being delineated by its baunderies. The interconnections and interactions between the subsystems are termed as interfaces. Interfaces occurs at the boundary and take the form of inputs and outputs. The boundaries and interfaces are defined, so thar the sum of the subsystems constitutes the entire system. This process of decomposition is continued with subsystems divided into smaller subsystems until the smallest subsystem are of manageable size. The subsystems resulting from this process generally form hierarchical structures.



**Black Box System:**

The transformation process in certain sub-system, especially at the lowest level may not be defined. However, the inputs and outputs are known. Such a sub-system is called a black box system.

OUTPUT



INPUT

**INTRODUCTION TO BASIC ELEMENTS OF SYSTEM**

Following are considered as the elements of a system in terms of Information systems: –

• Outputs and Inputs

• Processor

• Control

• Environment

• Feedback

• Boundaries and interface

1. **Outputs and Inputs**

* The main aim of a system is to produce an output which is useful for its user.
* Inputs are the information that enters into the system for processing.
* Output is the outcome of processing.

A major objective of a system is to produce an output that has value to its user. Whatever

the nature of the output (goods, services, or information), it must be in line with the

expectations of the intended user. Inputs are the elements (material, human resources, and

information) that enter the system for processing. Output is the outcome of processing. A

system feeds on input to produce output in much the same way that a business brings in

human, financial, and material resources to produce goods and services

1. **Processor**

* The processor is the element of a system that involves the actual transformation of input into output.
* It is the operational component of a system. Processors may modify the input either totally or partially, depending on the output specification.
* As the output specifications change, so does the processing. In some cases, input is also modified to enable the processor for handling the transformation.

The processor is the element of a system that involves the actual transformation of input

into output. It is the operational component of a system. Processors may modify the input

totally or partially, depending on the specifications of the output. This means that as the

output specifications change so does the processing. In some cases, input is also modified

to enable the processor to handle the transformation.

1. **Control**

* The control element guides the system.
* It is the decision–making subsystem that controls the pattern of activities governing input, processing, and output.
* The behavior of a computer System is controlled by the Operating System and software. In order to keep system in balance, what and how much input is needed is determined by Output Specifications.

The control element guides the system. It is the decision – making subsystem that

controls the pattern of activities governing input, processing, and output. In an

organizational context, management as a decision – making body controls the inflow,

handling and outflow of activities that affect the welfare of the business. In a computer

system, the operating system and accompanying software influence the behavior of the

system. Management support is required for securing control and supporting the objective of the proposed change.

1. **Environment**

* The environment is the “supersystem” within which an organization operates.
* It is the source of external elements that strike on the system.
* It determines how a system must function. For example, vendors and competitors of organization’s environment, may provide constraints that affect the actual performance of the business.

The environment is the “suprasystem” within which an organization operates. It is the

source of external elements that impinge on the system. In fact, it often determines how a

system must function. For example, the organization’s environment, consisting of

vendors, competitors, and others, may provide constraints and, consequently, influence

the actual performance of the business.

1. **Feedback**

* Feedback provides the control in a dynamic system.
* Positive feedback is routine in nature that encourages the performance of the system.
* Negative feedback is informational in nature that provides the controller with information for action.

Feedback may be positive or negative, routing or informational. Positive feedback reinforces the performance of the system. Negative feedback generally provides the controller with

information for action. In systems analysis, feedback is important in different ways.

During analysis, the user may be told that the problems in a given application verify the

initial concerns and justify the need for change. Another form of feedback comes after

the system is implemented. The user informs the analyst about the performance of the

new installation. This feedback often results in enhancements to meet the user’s

requirements.

1. **Boundaries and interface**

* A system should be defined by its boundaries. Boundaries are the limits that identify its components, processes, and interrelationship when it interfaces with another system.
* Each system has boundaries that determine its sphere of influence and control.
* The knowledge of the boundaries of a given system is crucial in determining the nature of its interface with other systems for successful design.

A system should be defined by its boundaries – the limits that identify its components,

processes and interrelationship when it interfaces with another system. For example, a

teller system in a commercial bank is restricted to the deposits, withdrawals and related

activities of customers checking and savings accounts. It may exclude mortgage

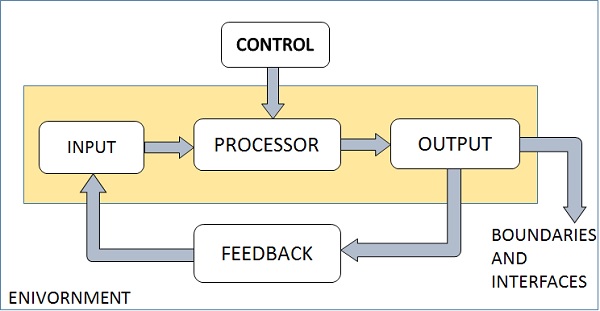
foreclosures, trust activities, and the like.

Each system has boundaries that determine its sphere of influence and control. For

example, in an integrated banking – wide computer system design, a customer who has a

mortgage and a checking account with the same bank may write a check through the

“teller system” to pay the premium that is later processed by the “mortgage loan system.”



**DIFFERENT TYPES AND BEHAVIOR OF THE SYSTEM**

1. **Physical or Abstract System**

* Physical systems are tangible entities. We can touch and feel them.
* Physical System may be static or dynamic in nature. For example, desks and chairs are the physical parts of computer center which are static. A programmed computer is a dynamic system in which programs, data, and applications can change according to the user's needs.
* Abstract systems are non-physical entities or conceptual that may be formulas, representation or model of a real system.

**2.Open vs Closed System**

* An open system must interact with its environment. It receives inputs from and delivers outputs to the outside of the system. For example, an information system which must adapt to the changing environmental conditions.
* A closed system does not interact with its environment. It is isolated from environmental influences. A completely closed system is rare in reality.

**3.Adaptive and Non Adaptive System**

* Adaptive System responds to the change in the environment in a way to improve their performance and to survive. For example, human beings, animals.
* Non Adaptive System is the system which does not respond to the environment. For example, machines.

**4.Permanent or Temporary System**

* Permanent System persists for long time. For example, business policies.
* Temporary System is made for specified time and after that they are demolished. For example, A DJ system is set up for a program and it is dissembled after the program.

**5.Natural and Manufactured System**

* Natural systems are created by the nature. For example, Solar system, seasonal system.
* Manufactured System is the man-made system. For example, Rockets, dams, trains.

**6.Social, Human-Machine, Machine System**

* Social System is made up of people. For example, social clubs, societies.
* In Human-Machine System, both human and machines are involved to perform a particular task. For example, Computer programming.
* Machine System is where human interference is neglected. All the tasks are performed by the machine. For example, an autonomous robot.

**7.Man–Made Information Systems**

* It is an interconnected set of information resources to manage data for particular organization, under Direct Management Control (DMC).
* This system includes hardware, software, communication, data, and application for producing information according to the need of an organization.

Man-made information systems are divided into three types −

* **Formal Information System** − It is based on the flow of information in the form of memos, instructions, etc., from top level to lower levels of management.
* **Informal Information System** − This is employee based system which solves the day to day work related problems.
* **Computer Based System** − This system is directly dependent on the computer for managing business applications. For example, automatic library system, railway reservation system, banking system, etc.

Systems Models

**System analysis** is to examine a business problem, identify its objectives and requirements, and then design the most optimal solution to fulfill those needs.

**Schematic Models**

* A schematic model is a 2-D chart that shows system elements and their linkages.
* Different arrows are used to show information flow, material flow, and information feedback.

**Flow System Models**

* A flow system model shows the orderly flow of the material, energy, and information that hold the system together.
* Program Evaluation and Review Technique (PERT), for example, is used to abstract a real world system in model form.

**Static System Models**

* They represent one pair of relationships such as *activity–time* or *cost–quantity*.
* The Gantt chart, for example, gives a static picture of an activity-time relationship.

**Dynamic System Models**

* Business organizations are dynamic systems. A dynamic model approximates the type of organization or application that analysts deal with.
* It shows an ongoing, constantly changing status of the system. It consists of −
  + Inputs that enter the system
  + The processor through which transformation takes place
  + The program(s) required for processing
  + The output(s) that result from process