Information System

Module Code: INFS-111

Programs: BCSS/BBIT

A System

- A **system** is defined as a set of interrelated components, with a clearly defined boundary, working together to achieve a common set of objectives by accepting inputs and producing outputs in an organized transformation process .
- Many examples of **systems** can be found in the physical and biological sciences, in modern technology, and in human society. Thus, we can talk of the physical system of the sun and its planets, the biological system of the human body, the technological system of an oil refinery, and the socioeconomic system of a business organization.

Elements of the system

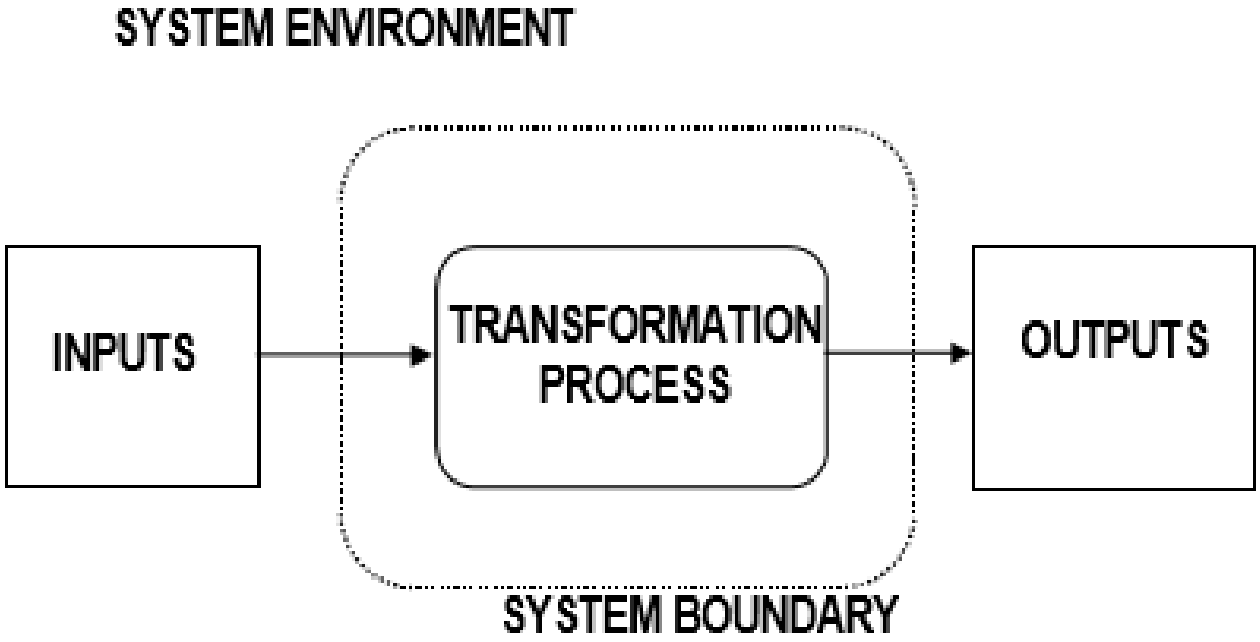
1. Environment and Boundary
2. Inputs, Transformation Process and Outputs
3. Components and Subsystems
4. Objectives, Control and Feedback Loops

Environment and Boundary

- A Boundary needs to exist in any system.
- When we look at the **boundary** we mean: what is inside the boundary belongs to the system, everything outside the boundary is not part of the system.
- Though in most cases, a system cant function as an entity, there is a need to interact with other systems or their components
- The part of the outside world in which the system is able to interact with is called the system's **environment**

Inputs, Transformation Process and Outputs

- **Input** -involves capturing and assembling elements that enter the system to be processed. For example, raw materials, energy, data, and human effort must be secured and organized for processing.
- **Processing** -involves transformation processes that convert input into output. Examples are manufacturing processes, the human breathing process, or mathematical calculations.
- **Output** - involves transferring elements that have been produced by a transformation process to their ultimate destination. For example, finished products, human services, and management information must be transmitted to their human users.


SYSTEM ENVIRONMENT
INPUTS
TRANSFORMATION PROCESS
OUTPUTS
SYSTEM BOUNDARY

Components and Subsystems

- A system consist of various **components ,** which makes up a system.
- **Components** are usually views as smaller systems on their own. These are referred to as **sub-systems.**
- An example of a **sub-system** electrical sub-system and an air condition of a motor car

Components and Subsystems

- In this case we can say that the components of an Information system are:

1. Hardware
2. Software
3. People
4. Data
5. Network

Granularity is defines as level of detail with which you study a given system

The view of the system can either be **Black Box, white box or grey box.**

Objectives, Control and Feedback Loops

- **Control** is the mechanism whereby special **control signals** or, when coming from outside the system, **control inputs**, modify the processes and activities which occur within the system.
- The **controller** is the component or (sub-)system which exercises the control and can be part of or outside the system under consideration.
- If there is any deviation within the system, then it should be able to adjust some inputs controls to modify systems outputs

Objectives, Control and Feedback Loops

- **feedback loop-** the 'round trip' of using output signals and using them to modify input signals.
- The system feedback can be either **positive** or **negative**.
- **Negative feedback loop** is when system behaviour needs to be altered (reversed) in order for its output to move closer to the desired state.
- **cybernetics**-The study of how systems can be controlled, with a particular focus on automatic or self controlling systems

Systems Concepts

- Open vs Closed Systems
- Dynamic vs Static Systems
- Continuous vs Discrete Systems
- Structure and Hierarchy
- Holism and Emergent Properties
- Entropy

Open vs Closed Systems

- **Open System** is any system that is able to interact with its environment.
- **Closed System** An isolated system that has no interaction with its external environment

Dynamic vs Static Systems

- A **dynamic system** is a system that has at least one (and usually many) activity or process.
- **Static System** is a system that has no activity. These are viewed to be very few in number.

Continuous vs Discrete Systems

- A **continuous system** is a system where inputs (and outputs) can be varied by extremely small amounts or quantities.
- **Discrete systems** are systems where the inputs or outputs can take on only certain discrete or distinct values.

Structure and Hierarchy

- The interactions between the various sub-systems and components of a system display some pattern or regularity. In this sense the observer can identify certain relationships, which contribute to the overall behaviour of the system. The entire set of relationships is referred to as the **structure** of the system.
- **System Hierarchy** Is the nesting of systems within systems within systems

Holism and Emergent Properties

- The perspective from which claims that many aspects of a system can be understood only in terms of its entirety, and not necessarily be reduced to the characteristics of its components, is called **holism** (the opposite of reductionism).
- The holistic systems view implies that a system has certain properties, qualities or attributes which cannot be reduced to or understood from its components alone. These properties are called the **emergent properties** of a system.

Entropy

- An important measure of a system is the amount of order (in the case of matter or information) or potential energy it contains. The measure for disorder or energy degradation is **entropy**: the higher the level of disorder, the higher the entropy level.
- All systems change over time and, unless a system can draw on resources from the environment, it will tend to become more disorderly or lose energy ("run down") i.e. entropy increases.

Entropy

- This is one of systems fundamental laws; it is a generalisation of the second law of **thermodynamics**, which states that the energy in the universe degrades irreversibly as time passes.