SYSTEMS ANALYSIS AND DESIGN
CSC 311

CONCEPT OF A SYSTEM

The term "system" originates from the Greek word “systema,” which refers to an organized set of interacting functional units. Our world is filled with various types of systems, including telephone systems, accounting systems, car systems, railway systems, computer systems, and biological systems like central nervous system. Additionally, there are organizational systems such as management information systems (MIS).

Of all these systems, the most relevant to our study is the management information system, which focuses on the structured flow of information within an organization. This system aids in decision-making and further processing of data to ensure timely and effective management actions.

DEFINITION OF A SYSTEM

A system can be defined as a collection of interconnected components, organized with a common goal to achieve a specific objective.

According to Graham Curtis, a system is composed of interrelated parts that, when combined, form a whole with two key characteristics:

- The collection has a defined purpose.
- A change in one part will affect or result from changes in other parts (Graham, C., 1998).

These definitions are comprehensive, as they highlight the essential elements of systems: parts, relationships, and objectives. Importantly, a system is not a single entity but consists of various subsystems that interact through inputs and outputs. Each subsystem is, in itself, a system with its own objectives, inputs, and outputs.

OBJECTIVES OF A SYSTEM

All systems have defined objectives, and to recognize a particular system, its objectives must be clearly identified. While the objectives of systems may differ from one organization to another based on the nature of their operations, the primary goal of any organization—whether it is profit-driven or nonprofit—is to meet the needs of its clients or target markets.

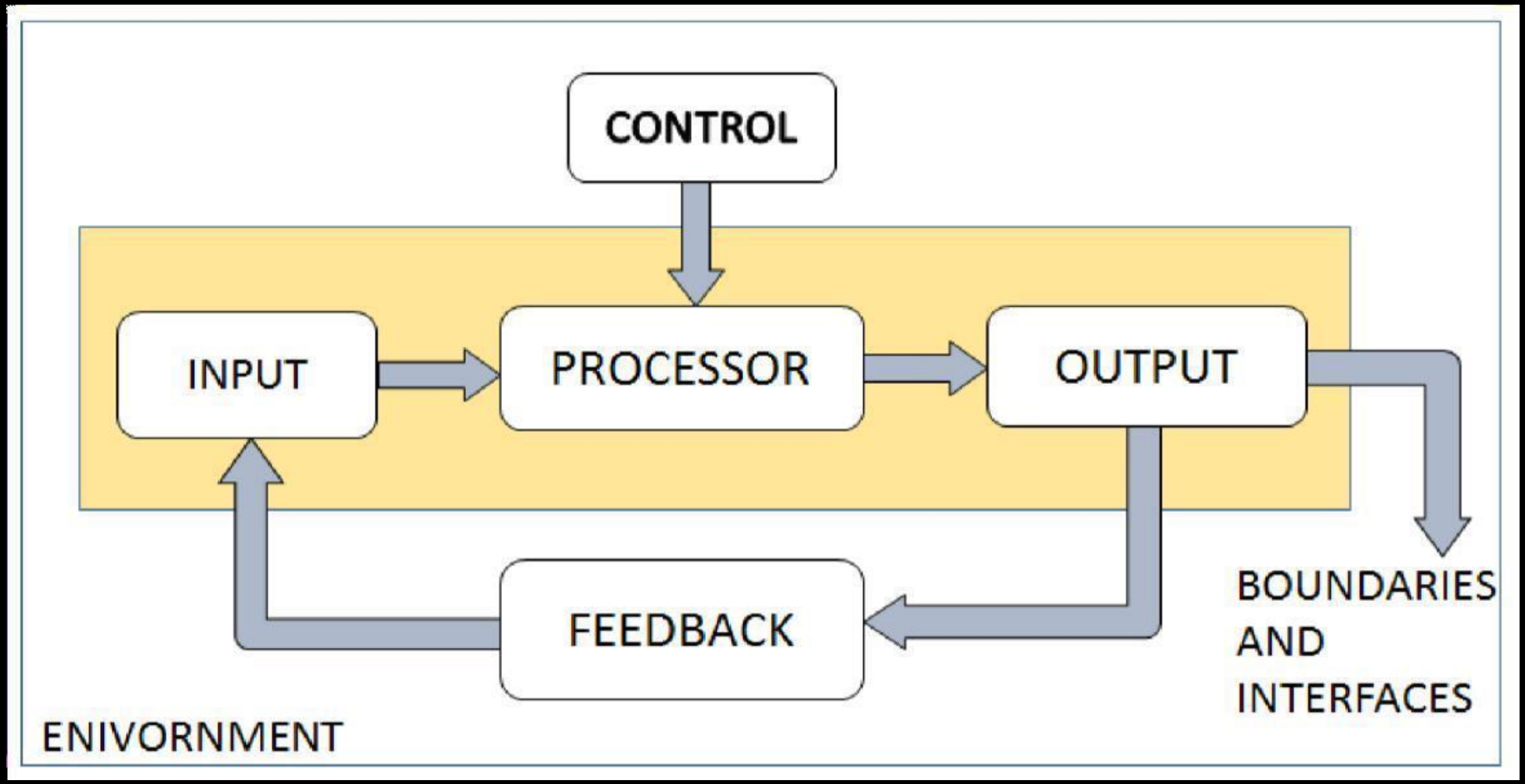
Other common objectives of systems within organizations include:

- Increasing productivity
- Maximizing profits in the marketplace
- Ensuring that operational procedures are properly implemented
- Competing effectively with other players in the industry

CHARACTERISTICS OF A SYSTEM

1. **Holism**: A system is considered a whole, with its parts working together. The system as a whole is greater than the sum of its individual components.
2. **Hierarchy**: Systems are often structured in a hierarchical manner, meaning they are composed of subsystems, which are further made up of smaller parts.
3. **Purpose or Objective**: Every system has a defined purpose or objective, which it aims to achieve through the interaction of its parts.
4. **Interdependence**: The various parts or components of a system are interconnected and interdependent. A change in one part will typically affect other parts, demonstrating the system's integrated nature.
5. **Dynamic Nature**: Systems are dynamic and can evolve or adapt over time in response to internal and external changes.

ELEMENTS OF A SYSTEM



- **Inputs**: These are the resources (such as data, energy, materials, or information) that enter the system to be processed and transformed into outputs.
- **Processes**: The activities or operations that occur within the system to convert inputs into outputs.
- **Outputs**: The results or outcomes produced by the system, which could be in the form of products, services or information.
- **Feedback**: Information about the system’s performance or output, which is used to make adjustments or improvements. Feedback helps maintain the system's effectiveness and adapt to changes.
- **Control**: The mechanisms or procedures that regulate and monitor the system to ensure it meets its objectives. Controls help in guiding the system’s behavior toward its goals.

SYSTEM ENVIRONMENT AND BOUNDARY

The term **system environment** refers to whatever lies outside the boundaries of a system or those elements that are not in the system but can affect the system.

Some of the influences in the environment that may affect the organization and its output are weather, location, government policies, social and cultural factors, customers, finance and Marketing.

The **system boundaries** on the other hand are the features used in defining the extent of a system. The boundaries of a system vary from one organization to another and can be determined by the management of the organization. For example, in an organization the invoice may be within the boundary of the accounting department.

CLASSIFICATIONS OF SYSTEMS

- **Closed Systems:** These do not interact with the external environment, meaning they operate in isolation with no exchange of materials, energy, or information. Examples include certain controlled scientific experiments, although in practice, truly closed systems are rare.
- **Open Systems**: These systems interact with their external environment by exchanging energy, materials, or information. Examples include biological organisms, social organizations, and economies.
- **Formal Systems:** A formal system is well-structured, organized, and defined by official rules, procedures, and documentation. It operates according to pre-established policies and standards that are recognized and enforced within an organization or institution. Example is an Educational systems, with formal curricula and grading policies.

- **Informal Systems:** An informal system operates without strict adherence to official rules or structures. It evolves organically, often based on social interactions, personal relationships, or unwritten norms.

For example, Cultural norms and practices that are followed in a workplace but are not documented.

- **Physical Systems**: These are tangible, real-world systems that consist of physical elements. Examples include machinery, human bodies, buildings, and vehicles.
- **Abstract Systems**: These consist of concepts, theories, models, or relationships. Examples include mathematical models, organizational structures, or software algorithms.
- **Automated Systems:** These are systems that do not require human intervention for its operation, the whole process is automatic.

Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services.

In the scope of industrialization, automation is a step beyond mechanization. Whereas **mechanization** provides human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well.

Advantages of Automated Systems

- 1. It replaces human operators in tasks that involve hard, physical or monotonous work.
- 2. It replaces humans in tasks done in dangerous environments i.e. fire, space, volcanoes, nuclear facilities or underwater .

- 3. It perform tasks that are beyond human capabilities in terms of size, weight and speed.
- 4. Economy improvement: Automation may improve the economy of enterprises, society or most of humanity. For example, when an enterprise invests in automation, technology recovers its investment.

Disadvantages of Automated Systems

1. Unemployment rate increases due to machines replacing humans.

2. Technical Limitation: Current technology is unable to automate all the desired tasks.

3. Security Threats/Vulnerability: An automated system may have limited level of intelligence; hence it is most likely susceptible to commit error.

4. High Initial Costs: The research and development cost of automating a process may exceed the cost saved by the automation itself.

- **Manual Systems:** This requires human intervention. It is a system involving data processing which does not make use of stored-program computing equipment; by this somewhat arbitrary definition, systems using other types of tabulating equipment, such as the card-programmed calculator, are considered to be manual.
- **Deterministic Systems**: These operate in a predictable manner, where the outcome is certain if the inputs are known. An example is a machine that performs the same task under the same conditions.
- **Probabilistic Systems**: These systems involve elements of randomness and uncertainty, where the outcome is not guaranteed but can be expressed in terms of probability. Examples include weather forecasting systems, business and economic systems.

- **Natural Systems**: Systems that occur in nature without human intervention. Examples include the ecosystem, solar systems, and the human body.
- **Man-Made Systems**: These systems are created by humans for a specific purpose, like machines, computers, and transportation networks.
- **Dynamic Systems**: These systems evolve over time and change based on inputs, interactions, or feedback. Examples include ecosystems, economies, and computer simulations.
- **Static Systems**: These systems remain unchanged over time once they are set up. Examples include structures like bridges or buildings.

- **Simple Systems**: These consist of a few interconnected components and have straightforward functionality. An example is a lever mechanism.
- **Complex Systems**: These contain many interconnected components, often interacting in unpredictable ways. Examples include a city's transportation network or the human brain.

SYSTEM PLANNING, CONRTOL AND COORDINATION

SYSTEM PLANNING

System planning involves allocating resources for a particular task and setting up performance standard which acts as a laid down rule for a future occurrence. It can also be described as a basic management function involving formulation of one or more detailed plans to achieve optimum balance of needs or demands with the available resources. The planning process involves the following:

- Identifying the goals or objectives to be achieved
- Formulating strategies to achieve them
- Arranging or creating the means required, and
- Implementing, directing and monitoring all steps in their right sequence

An example of system planning is the budget plan of an organization.

SYSTEM CONTROL

Control is a monitoring process undertaken to ensure that operations proceed according to plan, and is exercised in organizational systems by feedback loops. In manufacturing, control refers to mechanism that regulates the operations of an apparatus, machine, or system.

Generally, control is carried out using information. Feedback loops gather information on past performance from the output side of a system, and uses it to govern future performance by adjusting the input side of the system.

SYSTEM COORDINATION

This can be described as the synchronization and integration of activities, responsibilities, command and control structures to ensure that the resources of an organization are used most efficiently in pursuit of the specified objectives.