

E-notes Software Engineering

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Syllabus

Chapter 1 :Introduction to System Concepts

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References :

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Chapter 1

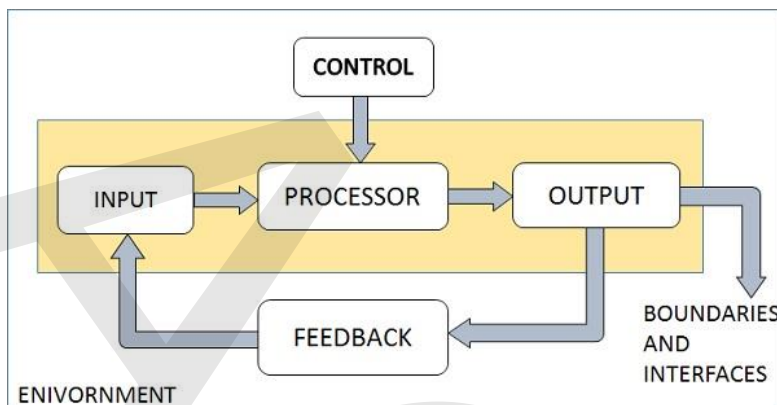
Introduction to System Concepts

Multiple business and engineering domains have definitions of a system.

System- An integrated set of interoperable elements, each with explicitly specified and bounded capabilities, working synergistically to perform value-added processing to enable a User to satisfy mission-oriented operational needs in a prescribed operating environment with a specified outcome and probability of success.

Elements of a System

The following diagram shows the elements of a system –



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.

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.

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 behaviour 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.

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.

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.

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.

Types of Systems

The systems can be divided into the following types –

Physical or Abstract Systems

- 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 centre 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.

Open or Closed Systems

- 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.

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.

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.

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.

Deterministic or Probabilistic System

- Deterministic system operates in a predictable manner and the interaction between system components is known with certainty. For example, two molecules of hydrogen and one molecule of oxygen makes water.
- Probabilistic System shows uncertain behaviour. The exact output is not known. For example, Weather forecasting, mail delivery.

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.

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.

Software Characteristics

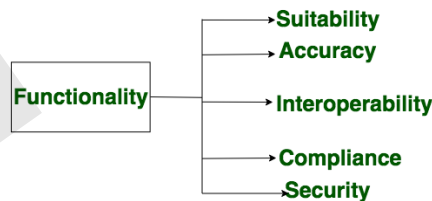
Software Characteristics are classified into six major components:

These components are described below:

- **Functionality:**

It refers to the degree of performance of the software against its intended purpose.

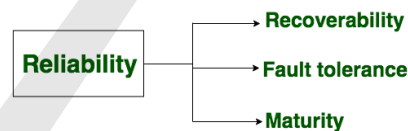
Required functions are:



- **Reliability:**

A set of attribute that bear on capability of software to maintain its level of performance under the given condition for a stated period of time.

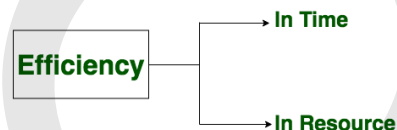
Required functions are:



- **Efficiency:**

It refers to the ability of the software to use system resources in the most effective and efficient manner. The software should make effective use of storage space and executive command as per desired timing requirement.

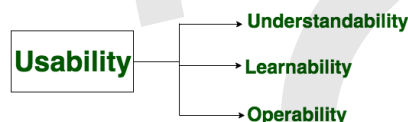
Required functions are:



- **Usability:**

It refers to the extent to which the software can be used with ease.the amount of effort or time required to learn how to use the software.

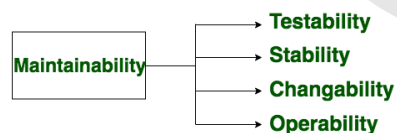
Required functions are:



- **Maintainability:**

It refers to the ease with which the modifications can be made in a software system to extend its functionality, improve its performance, or correct errors.

Required functions are:



- **Portability:**

A set of attribute that bear on the ability of software to be transferred from one environment to another, without or minimum changes.

Required functions are:

