System Analysis and Design

Dr. Vijendra Singh Marwah

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Published by:

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PUBLICATIONS
(Publishers of Educational Books)
Sales Office : 1507, 1st Floor,
Nai Sarak, Delhi-110 006
E-mail: info@neerajbooks.com
Website: www.neerajbooks.com

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SYSTEM ANALYSIS AND DESIGN

Introduction to SAD

1

INTRODUCTION

This chapter introduces the focus on fundamental of systems and various approaches for development of information systems. The study of "SYSTEMS" is not a new or a recent endeavour. People freely talk of different types of systems in their day-to-day life. However, we shall only concern ourselves with those systems which are of direct or immediate concern to a business in the processing of information to generate useful and meaningful information or results for management. In other words, we can say system analysts will refer to the analysis of business systems.

Systems today are very helpful in running the business efficiently. But a system can work in a effective way only if the users such as accountants, business managers and other responsible individuals within the company make it function in a proper way. Many times, managers are told that they only need to know how to retrieve required information, then making them ignorant of the operations of the systems as a whole. In accepting such advice, these managers are, in essence, relinquishing a substantial part of the control of the organisation to the system designers. It is therefore, necessary that these potential system analyst should clearly understand many other things also such as what a system is, what are its objectives, what kinds of systems there are, what goes with the creation and maintenance, what are their costs and benefits and how to analyze and monitor systems.

In general, a system is based on input–process–output (IPO model). Computerized systems can be employed to replace manual work for accuracy and speed of processing.

System analysis and design refers to the process of examining a business situation with the intent of improving through better procedures and methods. System developments can generally be thought of as having two major components; system analysis and system design. System design is the process of planning a new system or replace or complement an existing system and determine how computers can best be used to make its operation more effective. System analysis, then, is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvement to the system. In brief, we

can say that analysis specifices what the system should do. Design states how to accomplish the objective.

To develop a system, a standard methodology must be considered. There are different approaches, which are available for the development of the system. Selecting the best approach is the responsibility of the system analyst and the selection is based on the requirements of the end user, problem definition, and the infrastructure provided.

This chapter discusses the concept related to systems, an elaborate discussion on the types of system that are relevant to system analysis and illustrates the relationship between the knowledge of system concepts and system analysis.

Fundamental of Systems

The word "SYSTEM" covers a very broad spectrum of concepts. This is derived form the Greek word systems, which means an organized relationship among the functioning units or components in our daily life; we come into contact with the transportation systems, the communication systems, the accounting systems, the production systems. Similarly, the business systems are the means by which business organisations achieve their predetermined goals. A business system combines policies, personnel, equipment and computer facilities to coordinate the activities of a business organisation. Essentially, a business system represents an organized way of achieving the predetermined objective of an organisation.

A system may be defined as orderly grouping of interdependent components linked together according to a plan to achieve a specific goal. Each component is a part of total system and it has to do its own share of work for the system to achieve the desired goal. The word component may refer to physical parts (engine, wheels of car), managerial steps (planning, organizing, controlling) as a subsystem in a multi-level structure. The component may be simple, complex, basic or advanced. They may be a single computer with a keyboard, memory, and printer as a series of intelligent terminals linked to a mainframe. In either case, each component is part of the total system that has to do its own share of work for the system to achieve the desired goal.

Systems study may be defined as "*a study of the operations of a set of connected elements and of the interconnections between their elements*". It shows clearly that one cannot ignore any part or element of a system without first finding out the effect that element has on the operation of the system as a whole. We can understand this with the help of system analysis.

There is a difference between the "*system approach*" and "*system analysis*" also. The system approach shows a set of procedure for solving a particular problem. It applies scientific methods to observe, clarify, identify, and solve a problem with special care being taken to understand the inter-relatedness between elements and their system characteristics. However system analysis is a management technique which helps us in designing a new system or improving an existing system.

The study of system concepts then, has three basic implementations:

(1) A system must be designed to achieve a predetermined objective.

(2) Interrelationships and interdependence must exist among the components.

(3) The objective of the organisation as a whole have a higher priority than the objectives of its subsystems. For example, computerizing personnel application must conform to the organisations policy on privacy, confidentiality, and security as well as making slected data (*e.g.*, payroll) available to the accounting decision on request.

An Information System is an arrangement of people, data, processes, information presentation and information technology that interact to support and improve day-to-day operations in a business as well as support the problems-solving and decision-making needs of management and users. And an Information Technology is a contemporary term that describes the combination of computer technology (hardware and software) with telecommunications technology (data, image, and voile networks).

Many organisations consider information systems and information technology to be essential to their ability to compete or gain a competitive advantage.

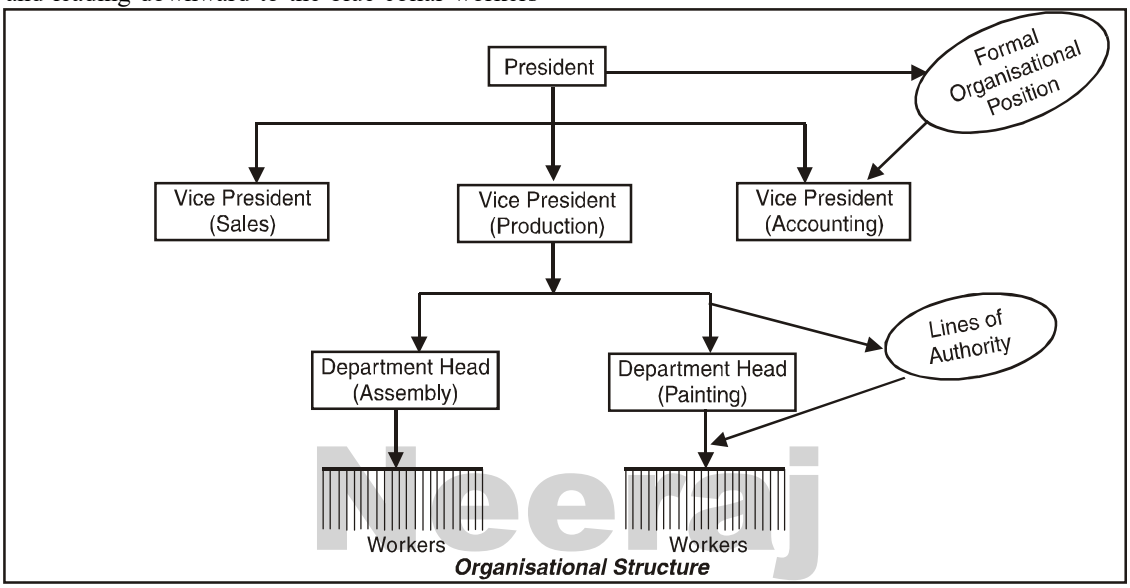
Characteristics of a System

Our definition of system suggests some characteristics that are present in all systems. These are:

(1) Organisation
(2) Interaction
(3) Interdependence
(4) Integration
(5) Central Objective.

Organisation

Organisation implies structure and order. It is the arrangement of components that helps to achieve objectives. In a business system, for example, the hierarchical relationships starting with the President on top and leading downward to the blue-collar workers represents the organisation structure. Figure below shows the hierarchy relationship of organisation structure. Such relationship defines the authority structure, specifies the formal flow of communication and formalises the chain of command.



Organisational Structure

Interaction

Interaction refers to the manner in which each component functions with other components of the system. In an organisation, for example, purchasing must interact with production, advertising with sales, and payroll with personnel. In a computer system, the central processing unit must interact with input device to solve a problem.

Interdependence

Interdependence means that parts of the organisation or computer system depend on one-another. They are coordinated and linked together according to a plan. One subsystem depends on the input of another subsystem for proper functioning, that is, the output of one subsystem for proper functioning; that is, the output of one subsystem is the required input for another subsystem. This interdependence is crucial in system work because no subsystem can function in isolation because it is dependent on the data (inputs) it receives from other subsystems to perform its required tasks.

Integration

Integration refers to the holism of systems. It is concerned with how a system is tied together. It is more than sharing a physical part or location. It means that parts of the system work together within the system even though each part performs a unique function. Successful integration will typically produce a synergistic effect and greater total impact than if each component works separately.

Central Objective

The last characteristic of a system is its central objective. Objectives may be real or stated. Although a stated objective may be the real objective, it is not uncommon for an organisation to state one objective and operate to advice another. The important point is that user must know the central objective of a computer application early in the analysis for a successful design and conversion.

Elements of a System

In a dynamic environment, to contract a system may be it is business firm or business application or computer system, the following key elements must be considered:

(1) Outputs and Inputs
(2) Processor(s)
(3) Control
(4) Feedback

(5) Environment
(6) Boundaries and interface.

(1) Outputs and Inputs: A major objective of a system is to produce an output that has value to its user. Whatever the nature of output (goods, services or information), it must be in line with the expectations of the intended user. Inputs are the elements (material, human resources, 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.

(2) Processor(s): 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. Processor may modify the input totally or partially, depending on the specification 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.

(3) Control: The control element guides the system. It is the decision-making subsystem that controls the patterns of activities governing input, processing and output. In a computer system, the operating system and accompanying software influence the behaviour of system. In system analysis, knowing the attitudes of the individual who controls the area for which a computer is being considered can make a difference between the success and failure of the installation.

(4) Feedback: Control in a dynamic system is achieved by feedback. Feedback measures output against a standard in some form of cybernetic procedure that includes communication and control. Feedback may be positive or negative, routine or informational. Positive feedback reinforces the performance of the system. It is routine in nature. Negative feedback generally provides the controller with information for action.

(5) Environment: The environment is the "suprasystem" within which an organisation operates. It is the source of external elements that impinge on the system. In fact, it often determines how a system must function.

(6) Boundaries and Interface: Boundaries are the limits that identify its components, processes and interrelationships when it interfaces with another system. Each system has boundaries that determine its spheres of influence and control. In systems analysis knowledge of the boundaries of a given system is crucial in determining the nature of its interface with other system for successful design.

Types of System Classification of Systems

There are many ways to classify a system. Common classifications are:

(1) Open or Closed information systems
(2) Physical or Abstract information systems
(3) 'Man-made' Information systems.

(1) Open or Closed: Open or closed systems is one of the classification which is based on their degree of independence. An open system has many interfaces with its environment. It permits interaction across its boundary means it receives inputs from and delivers output to the outside. An information system, must adapt to the changing demands of the user. A closed system is isolated from environmental influences. It is a very much rare to have completely closed system. In systems analysis, applications, organisations and computers are invariably open, dynamic systems influenced by their environment.

Characteristics of open systems are:

(i) **Input form Outside:** Open systems are self-adjusting and self-regulating. When functioning properly, an open system reaches a steady state. For example, in a general store, a steady state exist when goods are purchased and sold without being either out of stock or overstocked.

(ii) **Entropy:** All dynamic systems tend to run down overtime, resulting entropy. Entropy means loss of energy. In an open system entropy is resisted by seeking new inputs or modifying the process to return to steady state.

(iii) **Process, Output and Cycle:** Open systems produce useful output and operate in cycles, following a continuous flow path.

(iv) **Differentiation:** Open systems have a tendency towards an increasing specialization of functions and a greater differentiation of their components. This characteristic offers a compelling reason for the increasing value of the concept of systems in the systems analyst's thinking

(v) **Equifinality:** Equifinality means that goals are achieved through differing courses of action and a variety of paths.

Understanding system characteristics help analysts to identify their role and relate their activities