BCA SEM-5 **PAPER- BCAB3102T**

SYSTEM ANALYSIS & DESIGN

UNIT No.1

Center for Distance and Online Education, PunjabiUniversity,Patiala

Lesson No:

(Syllabus)

BCAB3102T: System Analysis and Design

Max Marks: 75 **Maximum Time: 3 Hrs**
Min Pass Marks: 35%

(A) INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective section of the syllabus carrying 15 marks for each question. Section C will consist of 5-10 short answer type questions carrying a total of 15 marks, which will cover the entire syllabus uniformly. Candidates are required ***to attempt five questions in all by selecting at least two questions each from the section A and B. Section C is compulsory.***

(B) INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all by selecting at least two questions each from the section A and B. Section C is compulsory.

SECTION-A

Systems concepts: Definition and characteristics of a system, Elements of a system, Types of systems. **The system development life cycle:** Introduction to various phases.

The role of the Systems Analyst: Qualifications of a systems analyst, various roles of the systems analyst.

Systems analysis: Initial investigation, needs identification, determining the user's information requirements, Information-gathering tools.

SECTION B

Structured analysis tools: Data flow diagram, Data dictionary, Decision tree, Structured English, Decision tables. **Feasibility study:** Feasibility considerations, Steps in Feasibility analysis.

Systems Design: The process and stages of systems design, Input/output and forms design, Database design.

Implementation and software maintenance: Conversion, Post-implementation review. Software maintenance: maintenance or enhancement, Primary activities of a maintenance procedure.

Hardware and software selection: Procedure and major phases in selection.

Text Book:

1. E. M. Awad: Systems Analysis and Design, Galgotia Publications (P) Ltd.

Reference Books:

1. Systems Analysis and Design: Techniques, Methodologies, Approaches, And Architectures1st Edition **Author**: Hardgrave Bill C. , Siau Keng , Chiang Roger H. L. **Publisher**: M.E. Sharpe

LESSON No. 1.1 **AUTHOR: Dr. VISHAL SINGH**

System Concepts

Objectives

1.0 Definition of a System

2.0 Characteristics of a System

1. Organization
2. Interaction
3. Interdependence
4. Integration
5. Central Objective

3.0 Elements of a System

1. Output and Inputs
2. Processor(s)
3. Control
4. Feedback
5. Environment
6. Boundaries and Interface

4.0 Types of Systems

1. Physical or abstract systems
2. Open or closed systems
3. Deterministic or probabilistic systems
4. Man-made information systems

5.0 Overview of System Analysis

6.0 What System Analysis is NOT

7.0 Project Selection

8.0 Feasibility Study

9.0 Assessing Project Feasibility

1. Economic Feasibility
2. Technical Feasibility
3. Operational Feasibility
4. Schedule Feasibility

10.0 Tools for Analysis and Design of Business System

11.0 Summary

12.0 Self Check Exercise

13. Suggested Readings

Objectives:

In this lesson we will study about the System, its elements, characteristics and types. We will also discuss about system analysis and its importance.

1.0 Definition of a System

The term system is derived from the Greek word systema, which means an organized relationship among functioning units or components. A system exists because it is designed to achieve one or more objectives. We come into daily contact with the transportation system, the telephone system etc. Similarly we talk of the business system and of the organization as a system consisting of interrelated departments such as production, sales, personnel and an information system.

There are more than a hundred definitions of the word system but most seem to have a common thread that suggests that a system is an orderly grouping of interdependent components linked together according to a plan to achieve a specific objective. The word component may refer to physical parts or a subsystem in a multilevel structure. The components may be simple or complex, basic or advanced. They may be a single computer with a keyboard, memory and printer or a series of intelligent terminals linked to a mainframe. In either case each component is part of the total system and has to do its share to work for the system to achieve the intended goal. This orientation requires an orderly grouping of the components for design for a successful system.

The study of systems concept has three basic implications:

1. A system must be designed to achieve a predetermined objective.
2. Interrelationship and interdependence must exist among the components.
3. The objectives of the organization as a whole have higher priority than the objectives of its subsystems.

2.0 Characteristics of a System

Our definition of a system suggests some characteristics that are present in all systems: organization, interaction, interdependence, interaction and a central objective.

1. Organization

Organization implies structure and order. It is the arrangement of components that helps to achieve objectives. In the design of a business system, for example, the hierarchical relationship starting with president on top and leading downward to the workers represents the organization structure. Such an arrangement portrays a system-subsystem relationship, defines the authority structure, specifies the formal flow of communication and formalizes the chain of command (see figure1.1). Likewise a computer system is designed around an input device, a central processing unit, and output device and one or more storage units. When they are linked together, they work as a whole for producing information.

2. Interaction

Interaction refers to the manner in which each component functions with other components of the system. In an organization, 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. In turn, the main memory holds programs and data that the arithmetic unit uses for computation. The interrelationship between these components enables the computer to perform.

3. Interdependence

Interdependence means that parts of the organization 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 i.e. the output of one subsystem is the required as input for another subsystem. This interdependence is crucial in systems work.

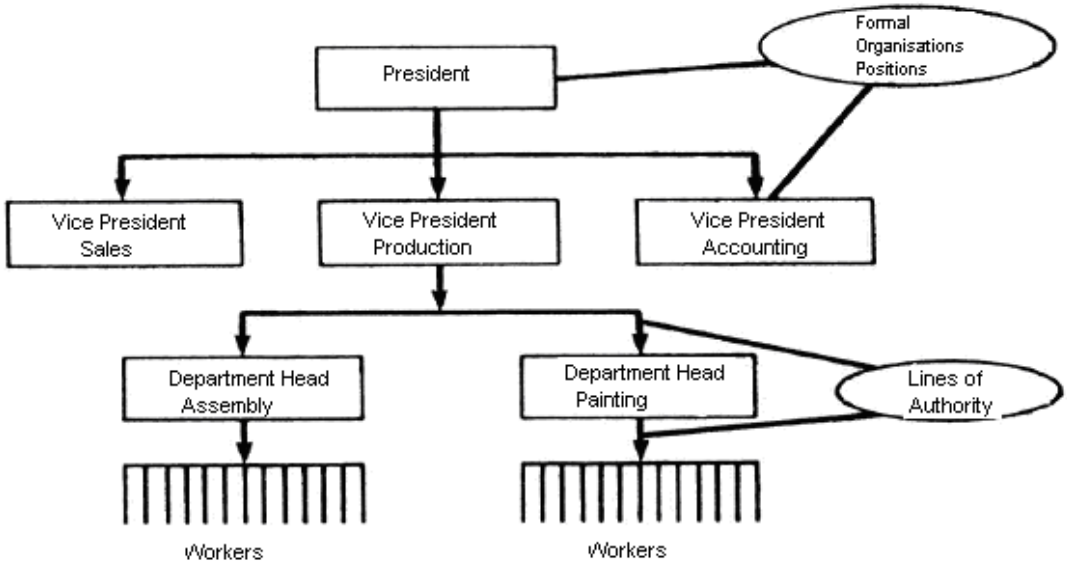

Figure 1.1: Organization Structure

To illustrate these system characteristics figure 1-2 shows three levels of subsystems. Each of the top inner circles represents a major subsystem of a production firm. The personnel subsystem in turn may be viewed as a system that consists of subsystems such as benefits, health and safety and employment.

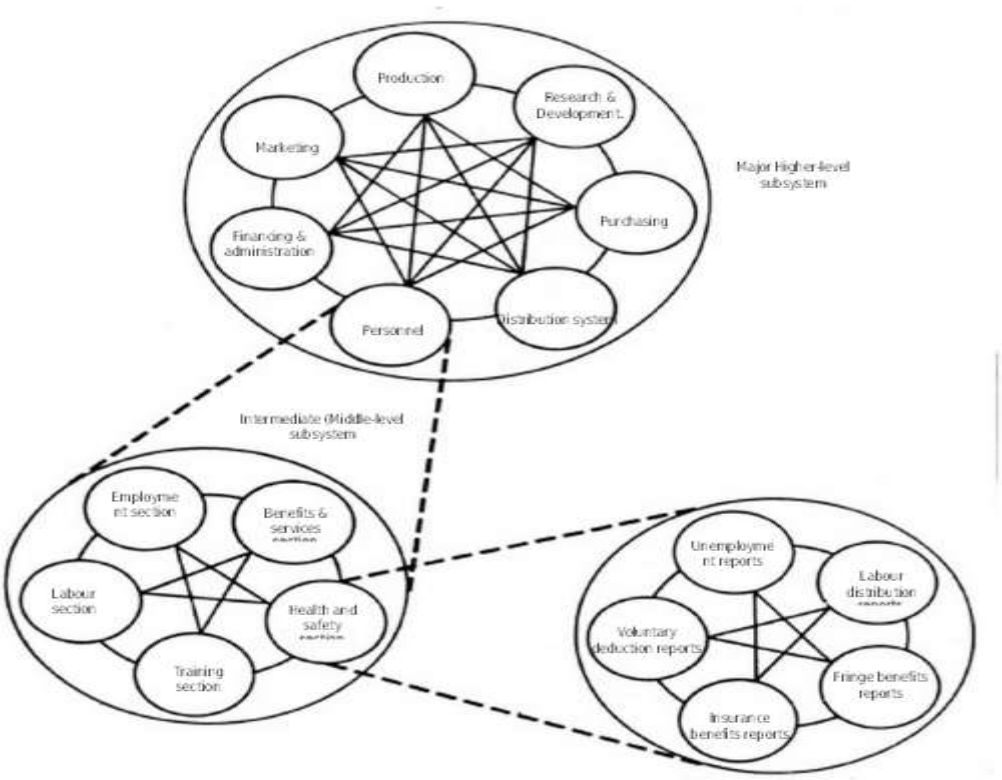

Fig. 1.2

Above 1.2 figure is an integrated information system designed to serve the needs of authorized users for quick access and retrieval through remote terminals. The interdependence between the personnel subsystem and the organization's users is obvious.

In summary, no subsystem can function in isolation because it is dependent on the data it receives from other sub systems to perform its required tasks. Interdependence is further illustrated by activities and support of systems analysts, programmers and the operations staff in a computer center. A decision to computerize an application is initiated by the user, analyzed and designed by the analyst, programmed and tested by the programmer and run by the computer operator. As shown in figure 1.3, none of these persons can perform properly without the required input from others in the computer based subsystem.

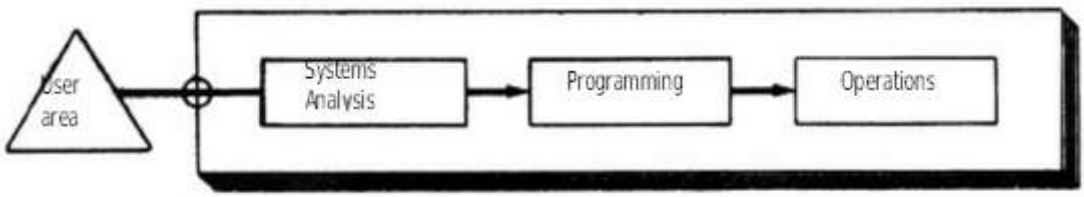

Fig. 1.3

4. Integration

Integration refers to the holism of systems. Synthesis follows analysis to achieve the central objective of the organization. Integration 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 produce a synergistic effect of greater total impact than if each component works separately.

5. 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 organization to state one objective and operates to achieve another. The important point is that users must know the central objective of a computer application early in the analysis for a successful design and conversion.

3.0 Elements of a System

1. Output 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 the output, it must be within the line with the explanations of the intended user. Inputs are the elements 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. It is important to point out here that determining the output is a first step in specifying the nature, amount and regularity of the input needed to operate a system. For example in systems analysis, the first concern is to determine the user's requirements of a proposed commuter system –that is specification of the output that the computer is expected to provide for meeting user requirements. Input and processing design follow.

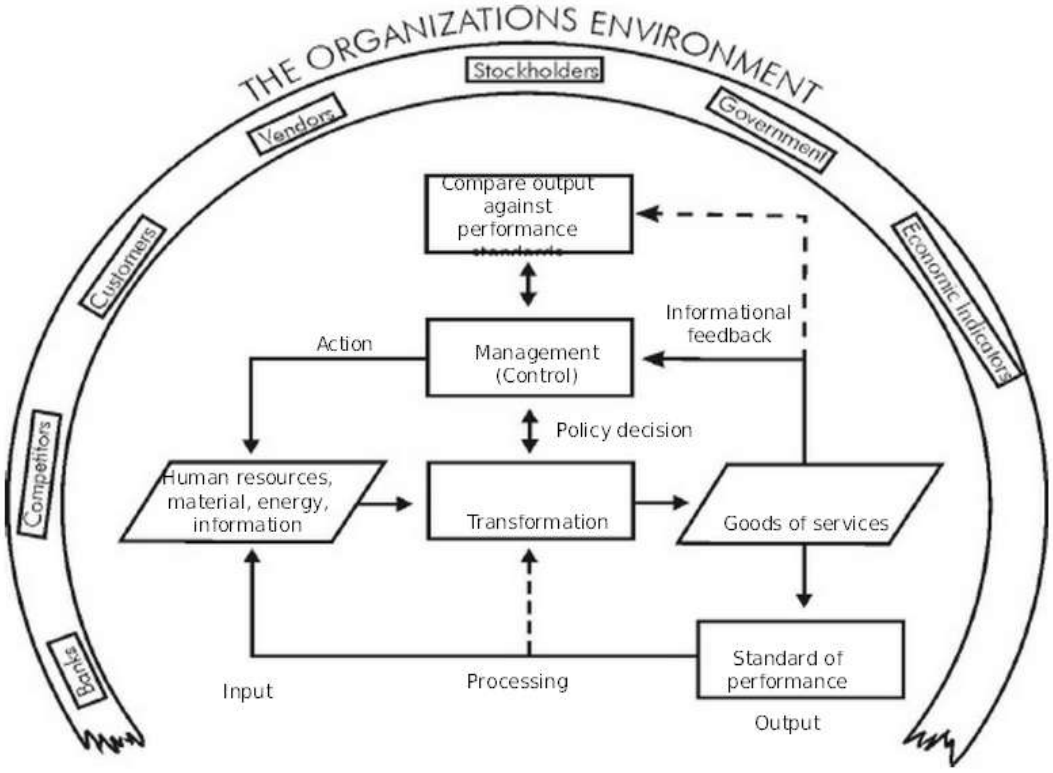

Figure 1.4: Inputs and Outputs in a Business Operation

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 the system. Processor may modify the input totally or personally, 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.

3. Control

The control element guides the system. It is the decision – making sub-system 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 affects the welfare of the business. Output specification determines what and how much input is needed to keep the system I balance.

In system analysis, knowing the attitudes of the individuals who control the area for which a computer is being considered can make a difference between the success and the failure of the installation. Management support is required for securing control and supporting the objective of the proposed change.

4. Feedback

Control in a dynamic system is achieved by feedback. Feedback measures output against standard in some form. After the output is compared against performance standards, changes can result in the input or processing and consequently, the output.

Feedback may be positive or negative, routine or informational. Positive feedback reinforces the performance and provides the controller with information for action. In system analysis, feedback is important in different ways. During analysis, the user may specify that the problems in a given application, 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.

5. Environment

The environment is the "suprasystem" within which an organization operates. It is the source of external elements that unhinge on the system. In fact, it often determines how a system must function. The organization's environment, consisting of vendors, competitions and others, may provide constraints and consequently influence the actual performance of the business.

6. Boundaries and Interface

A system should be defined by its boundaries – the limits that identify its components, processes and interrelationships and 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. Although in an integrated banking 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". Recently system design has been successful in allowing the automatic transfer of funds from the bank account to pay bills and other obligations to creditors, regardless of distance or location. This means that in systems analysis, knowledge of the boundaries of given system is crucial in determining the nature of its interface with other system for successful design.

4.0 Types of Systems

Systems have been classified in different ways. Common classifications are:

1. Physical or abstract systems
2. Open or closed systems
3. Deterministic or probabilistic systems
4. Man-made information systems

1. Physical or Abstract Systems: Physical systems are tangible entities that maybe static or dynamic in operation. Abstract systems are conceptual or non-physical entities which may be as straightforward as formulas of relationships among sets of variables or models - the abstract conceptualization of physical situations.

2. Open or Closed Systems: An open system continually interacts with its environments. It receives inputs from and delivers output to the outside. An information system belongs to this category, since it must adapt to the changing demands of the user. In contrast, a closed system is isolated from environmental influences. In reality, completely closed systems are rare.

3. Deterministic or Probabilistic Systems: A deterministic system is one in which the occurrence of all events is perfectly predictable. If we get the description of the system state at a particular time, the next state can be easily predicted. An example of such a system is a numerically controlled machine tool .Probabilistic system is one in which the occurrence of events cannot be perfectly predicted. An example of such a system is a warehouse and its contents.

4. Man-made Information Systems: It is generally believed that information reduces uncertainty about a state or event. For example, information that the wind is calm reduces the uncertainty that a trip by boat will be enjoyable. An information system is the basis for interaction between the user and the analyst. It determines the nature of relationship among decision makers. Infact, it may be viewed as a decision centre for personnel at all levels. From this basis, an information system may be defined as a set of devices, procedures and operating systems designed around user-based criteria to produce information and communicate it to the user for planning, control and performance. Many practitioners fail to recognize that a business has several information systems; each is designed for a specific purpose. The major information systems are:

- Formal information systems
- Informal information systems
- Computer based information system

A Formal information system is based on the organization represented by the organization chart. The chart is a map of positions and their authority relationships, indicated by boxes and connected by straight lines. It is concerned with the pattern of authority, communication and work flow.

An Informal information system is an employee-based system designed to meet personnel and vocational needs and to help in the solution of work-related problems. It also funnels information upward through indirect channels. In this way, it is considered to be a useful system because it works within the framework of the business and its stated policies. Third category of information system depends mainly on the computer for handling business applications. Systems analysts develop several different types of information systems to meet a variety of business needs. There is a class of systems known collectively as Computer Based Information Systems. As we have different types of

transportation systems such as highway systems, railway systems and airline systems, computer based information systems are of too many types. They are classified as:

- Transaction Processing Systems (TPS)
- Management Information Systems (MIS)
- Decision Support Systems (DSS)
- Office Automation Systems (OAS)

Figure 1.5 shows the organisation chart of computer based information system

(CBIS) and figure 1.6 shows the hierarchical view of CBIS

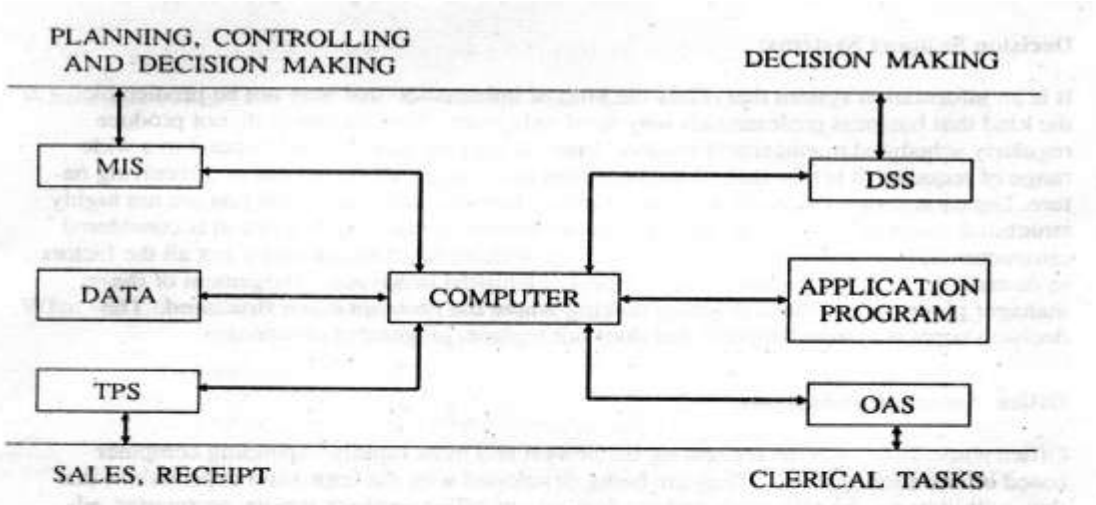

Fig 1.5 Organization chart of computer based Information System

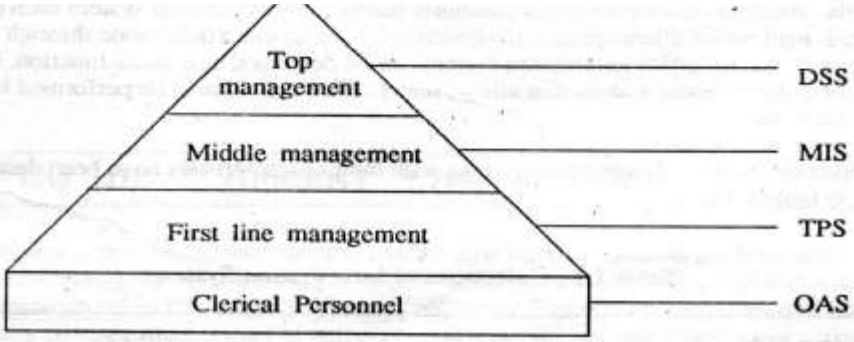

Figure 1.6: Hierarchical View of CBIS

Transaction Processing Systems

The most fundamental computer based system in an organisation pertains to the processing of business transactions. A transaction processing system can be defined as a computer based system that captures, classifies, stores, maintains, updates and retrieves

transaction data for record keeping and for input to other types of CBIS. Transaction Processing Systems are aimed at improving the routine business activities on which all organizations depend. A transaction is any event or activity that affects the whole organisation. Placing orders, billing customers, hiring of employees and depositing cheques are some of the common transactions. The types of transactions that occur vary from organisation to organisation.

But this is true that all organisations process transactions act as a major part of their daily business activities. The most successful organisations perform this work of transaction processing in a very systematic way. Transaction processing systems provide speed and accuracy and can be programmed to follow routines without any variance.

Management Information System

Data processing by computers has been extremely effective because of several reasons. The main reason being that huge amount of data relating to accounts and other transactions can be processed very quickly. Earlier most of the computer applications were concerned with record keeping and the automation of routine clerical processes. However, in recent years, increasing attention has been focused on computer applications providing information for policy making, management planning and control purposes. MIS are more concerned with management function. MIS can be described as information system that can provide all levels of management with information essential to the running of smooth business. This information must be relevant, timely, accurate, complete and concise and economically feasible.

Decision Support Systems

It is an information system that offers the kind of information that may not be predictable, the kind that business professionals may need only once. These systems do not produce regularly scheduled management reports. Instead, they are designed to respond to a wide range of requests. It is true that all the decisions in an organisation are not of a recurring nature. Decision support systems assist managers who must make decisions that are not highly structured, often called unstructured or semi-structured decisions. A decision is considered unstructured if there are no clear procedures for making the decision and if not all the factors to be considered in the decision can be readily identified in advance. Judgment of the manager plays a vital role in decision making where the problem is not structured. The decision support system supports, but does not replace, judgment of manager.

Office Automation Systems

Office automation systems are among the newest and most rapidly expanding computer based information systems. They are being developed with the hopes and expectations that they will increase the efficiency and productivity of office workers-typists, secretaries, administrative assistants, staff professionals, managers and the like. Many

organisations have taken the First step toward automating their offices. Often this step involves the use of word processing equipment to facilitate the typing, storing, revising and printing of textual materials. Another development is a computer based communications system such as electronic mail which allows people to communicate in an electronic mode through computer terminals. An office automation system can be described as a multi-function, integrated computer based system that allows many office activities to be performed in an electronic mode.

Categories of different information systems with their characteristics have been described briefly in table 1.1

Table 1.1 Categories of Information Systems

Category of Information System	**Characteristics**
Transaction Processing System	Substitutes computer-based processing for manual processes. Includes record-keeping applications.
Management Information System	Provides input to be used in the managerial decision process. Deals with supporting well structured decision situations. Typical information requirements can be anticipated
Decision Support System	Provides information to managers who make Judgments about particular situations. Supports decision makers in situations that are not well structured
Office Automation System	It is a multi-function, integrated computer based system that allows many office activities to be performed in an electronic mode.

5.0 Overview of System Analysis

In business, systems analysis and design refers to the process of examining a business situation with the intent of improving it through better procedures and methods. Systems development can generally be thought of as having two major components: systems analysis and systems design. Systems design is the process of planning a new business system or one to replace or complement an existing system. But before this planning can be done, we must thoroughly understand the old system and determine how computers can best be used (if at all) to make its operation more effective. Systems analysis, then, is the process of

gathering and interpreting facts, diagnosing problems, and using the information to recommend improvements to the system. This is the job of the systems analyst.

Consider, for example, the stockroom operations of a clothing store. To better control its inventory and gain access to more up-to-date information about stock levels and reordering, the store asks you, a systems analyst, to "computerize" its stockroom operations. Before you can design a system to capture data, update files, and produce reports, you need to know more about how the store currently operates: what forms are being used to store information manually, such as requisitions, purchase orders, and invoices, and what reports, if any, are being produced and how they are being used.

To proceed, you then seek out information about lists of reorder notices, outstanding purchase orders, records of stock on hand, and other reports. You also need to find out where this information originates, whether in the purchasing department, stockroom, or accounting department. In other words, you must understand how the existing system works and, more specifically, what the flow of information through the system looks like.

You also must know why the store wants to change its current operations. Does the business have problems tracking orders, merchandise, or money? Does it seem to fall behind in handling inventory records? Does it need a more efficient system before it can expand operations?

Only after you have collected these facts can you begin to determine how and where a computer information system can benefit all the users of the system. This accumulation of information, called a systems study, must precede all other analysis activities.

Systems analysts do more than solve current problems. They are frequently called upon to help handle the planned expansion of a business. In the case of the clothing store, the systems study is future-oriented, since no system currently exists. Analysts assess as carefully as possible what the future needs of the business will be and what changes should be considered to meet these needs. In this instance and in most others, analysts may recommend alternatives for improving the situation. Usually more than one strategy is possible.

Working with managers and employees in the organization, systems analysts recommend which alternative to adopt, based on such concerns as the suitability of the solution to the particular organization and setting, as well as the employee support the solution is likely to have. Sometimes the time required to develop one alternative, compared with others, is the most critical issue. Costs and benefits are also important determinants. In the end, management, which will pay for and use the result, actually decides which alternative to accept.

Once this decision is made, a plan is developed to implement the recommendation. The plan includes all systems design features, such as new data capture needs, file specifications, operating procedures, and equipment and personnel needs. The systems

design is like the blueprint for a building: it specifies all the features that are to be in the finished product.

Designs for the stockroom will provide ways to capture data about orders and sales to customers and specify the way the data will be stored, whether on paper forms or on a computer-readable medium, such as magnetic tape or disk. The designs will also designate work to be performed by people and by computers. Designs vary in their division of human and computer tasks.

The stockroom personnel will also need information about the business. Each design describes output to be produced by the system, such as inventory reports, sales analyses, purchasing summaries, and invoices. The systems analysts will actually decide which outputs to use, as well as how to produce them.

Analysis specifies what the system should do. Design states how to accomplish the objective.

Notice that each of the processes mentioned involves people. Managers and employees have good ideas about what works and what does not, about what flows smoothly and what causes problems, about where change is needed and where it is not, and especially about where change will be accepted and where it will not. Despite technology, people are still the keys that make the organizations work. Thus, communicating and dealing with people are very important parts of the systems analyst's job.

6.0 What Systems Analysis Is NOT

You have an idea of what systems analysis is—studying business systems to learn current methods and assess effectiveness. It is also helpful to know what systems analysis is NOT:

It is NOT:

Studying a business to see which existing processes should be handled by computer and which should be done by non-computerized methods. The emphasis is on understanding the details of a situation and deciding whether improvement is desired or feasible. The selection of computer and non-computer methods is secondary.

It is NOT:

Determining what changes should be made. The intent of the systems investigation is to study a business process and evaluate it. Sometimes, not only is change not needed, it is not possible. Change should be a result, not intent.

It is NOT:

Determining how best to solve an information systems problem, Regardless of the organization, the analyst works on business problems. It would be a mistake to

distinguish between business and systems problems, since there are no systems problems that are not first business problems. Any suggestion should be considered first in light of whether it will improve or harm the business. Technically attractive ideas should not be pursued unless they will improve the business system.

7.0 Project Selection

Many more requests for systems development are generated than most firms can pursue. Someone must decide which requests to pursue and which to reject (or perhaps solve by other means). The decision to accept or reject a request can be made in a number of different ways and by various members of the organization. The systems analysts are not the final arbiters.

One of the more common methods of reviewing and selecting projects for development is by committee.

Steering Committee Method

In many organizations, steering committees (also called operating committees, operating councils, or project selection boards) supervise the review of project proposals. The steering committee typically consists of key managers from various departments of the organization, as well as members of the information systems group. However, the committee is not dominated by systems specialists. A typical seven to ten person committee would consist of the following membership:

1. Upper-management members:
   Executive vice president

   Vice president for manufacturing

2. Departmental management:
   Manager of retail marketing

   Credit manager

3. Technical managers:
   Manager of research and development

   Quality control coordinator

4. Information systems group:
   Data processing manager

   Senior systems analyst

The committee receives proposals and evaluates them. The major responsibility of the committee is to make a decision, which often more information than the proposal provides. Therefore, a preliminary investigation is often requested to gather those details.

The steering-committee method brings high respectability and visibility to the review of project proposals. The committee consists of managers with the responsibility and the authority to decide which projects are in the best interstests of the entire firm. Because several levels of management are included on the committee, members can have informed discussions on matters relating to day-to-day operations (treating patients, ordering materials, or hiring staff members) and long-range plans (new facilities, new programs) that may have a bearing on the project request. The managers provide practical information and insight about operations and long-term development. System specialists on the committee provide technical and developmental information that is useful in reaching decisions about project management.

The steering committee approach is often favored because systems projects are business investments. Management, not systems analysis or designers, selects projects for development. Decisions are the basis of the cost of the project, its benefit to the organization, and the feasibility of accomplishing the development within the limits of information systems technology in the organization.

Information Systems Committee Method

In some organizations, the responsibility for reviewing project request is assigned to a committee of managers and analysts in the information systems department. Under this method, all requests for service and development are submitted directly to a review committee within the information systems department. The information systems committee approves or disapproves projects and sets priorities, indicating which projects are most important and should receive immediate attention.

This method can be used when many requests are for routine services or maintenance on existing applications. For these projects, information systems staff members can offer good insight into project requirements. In addition, by working with other projects (and by coordinating their efforts with the organization's business planning committee) systems developers can have access to information about where the firm is moving overall—an important consideration for effective project selection.

Sometimes, such as when major equipment decisions must be made or when long-term development commitments are needed to undertake a project, the decision authority is shared with senior executives who determine whether a project should proceed. However, sharing project decision authority may confuse users who want to know how the committee will make the decision about a request. In addition, if top managers and systems-committee members disagree about the merit or priority of a request, the potential for conflict can disrupt the handling of future project proposals. In still other cases, users may attempt to submit a request directly to senior executives after it has been disapproved by the information systems committee. If upper management approves the request, the authority of the information systems committee is undermined.

User-Group Committee Method

In some organizations, the responsibility for project decisions is delegated to the users themselves. Individual departments or divisions hire their own analysts and designers, who handle project selection and carry out development. In effect, departments form their own selection committees—a user-group committee—controlling what is developed and when it is implemented.

Although the practice of having user committees both choose and develop systems does take some of the burden from the systems development group, it can have disadvantages for the users. For example, a number of small departments working independently toward the same goal could unknowingly waste resources and miss the opportunity to coordinate planning of a shared and integrated information system that could benefit the entire firm. A company's computer facilities can be unduly strained if the systems development team is not made aware of the future demands on the facilities that are being planned throughout the firm. Some user groups may find themselves with defective or poorly designed systems that require additional time and effort to undo any damage caused by the misinformation that such systems could generate. Although user groups may find the decisions of steering committees and information system committees disappointing at times, the success rate for users who take on the development job is not very encouraging.

Membership often rotates under each of these committee formats, with individuals serving for, say, six- or twelve-month periods. Membership changes are staggered to avoid changing the entire membership at one time. The chairperson of each committee should have experience in serving as a committee member and in reviewing systems proposals and making decisions about project requests.

Other Methods

Other approaches are also tried from time to time, although usually with much less success than the methods already discussed. Some organizations have management planning committees that propose new projects, which are in turn evaluated by the systems department staff members. This method suffers from lack of user involvement, as well as limited insight into technology.

In still other cases, department managers are able to bypass the organization's information systems departments to contract with independent systems companies, which handle all analysis and design work for projects. A disadvantage of this approach is the possibility that a department can sponsor the development of a system while the information systems group or upper management is completely unaware that a project is in the making.

There is simply too much complexity in any dynamic business, large or small, for one person to stay on top of it all. Ideas and observations must be pooled from any source that has something of value to offer. This is true whether decisions are being made about

new products to pursue and market, construction of a new manufacturing facility, or development of information systems.

The steering committee incorporates viewpoints of managers and employees throughout the firm. This approach recognizes that information systems are a resource, one intended to serve and benefit all members of the organization. This is the reason the steering committee form of project selection is the most widely used method for managing information systems.

8.0 Feasibility Study

All projects are feasible if unlimited resources and infinite time is given (Pressman, 1992). A feasibility study could be used to test a new working system, which could be used because:

- The current system may no longer suit its purpose,
- Technological advancement may have rendered the current system redundant,
- The business is expanding, allowing it to cope with extra work load,
- Customers are complaining about the speed and quality of work the business provides,
- Competitors are winning greater market shares due to an effective integration of a computerized system.

Although few businesses would not benefit from a computerized system at all, the process of carrying out this feasibility study makes the purchaser/client think carefully about how it is going to be used.

Feasibility viewpoints

A system's feasibility is typically considered from economic, ecological, technical, schedule and organizational viewpoints. You will be able to know various feasible aspects which are as follows:

Economic Feasibility

This involves questions such as whether the firm can afford to build the system, whether its benefits should substantially exceed its costs, and whether the project has higher priority than other projects that might use the same resources.

Technical Feasibility

This involves questions such as whether the technology needed for the system exists, how difficult it will be to build, and whether the firm has enough experience using that technology.

Schedule Feasibility

This involves questions such as how much time is available to build the new system, when it can be built (i.e. during holidays), interference with normal business operation, etc.

Organizational Feasibility

This involves questions such as whether the system has enough support to be implemented successfully, whether it brings an excessive amount of change, and whether the organization is changing too rapidly to absorb it.

Ecological Feasibility

This involves questions pertaining (if applicable) to the scope of presumed ecological impact of a project on its environment.

9.0 Assessing Project Feasibility

All projects are feasible if unlimited resources and infinite time is given (Pressman, 1992). But most of the projects are developed within tight budgetary and time constraints. A feasibility study is a preliminary study undertaken before the real work of a project starts to ascertain the likelihood of the project's success. This means project feasibility assessment is to be must activity for all information systems projects and is potentially a large undertaking. There are some factors on which feasibility is assessed. Some of these factors will be more important than others for some of the projects and relatively less important for other projects. Most feasible factors are given below:

- Economic
- Technical
- Operational
- Schedule

1. Economic Feasibility

Economic feasibility is refereed as cost - benefit analysis. The purpose this type assessment is to identify financial benefits and costs associated with the development project. It is difficult or impossible to precisely define all benefits and cost of the project just while project is initiated and planned. Yet, it is important that you spend some time identifying these items which can influence your budget.

Benefits Analysis and Procedure to Determine Project Benefits

Many benefits can be provided by an information system to an organization. The benefits can be viewed as both tangible and intangible. Tangible benefits are the benefits which can be measured with certainty in terms of currency. Tangible benefits can be from the following factors:

- Cost reduction
- Error reduction and avoidance
- Flexibility is increased
- Speed of the activity is increased
- Management planning and control is improved
- Opening new markets and increasing sales opportunities

Intangible benefits refer to items that cannot be easily measured in currency with certainty. These type benefits may have direct organizational benefits such as improvement of employee morale, a better goodwill in the market, reduction in resource consumption or reduction in waste creation.

Tangible benefits are usually measured in terms of monthly or annual savings or of profits to the organization. For example, let us have the following scenario:

While processing the library membership applications, we discover that considerable data is being typed and filed at so many places in the library. An analysis reveals that the same data is typed seven times, requiring an average of 60 additional minutes of a clerical work per application. The office processes 1000 applications per year. That means total 60,000 minutes or 1000 hours of redundant work per year. If average salary of a clerk is Rs. 40 per hour, the cost of this problem and the benefit of solving the problem is Rs 40,000 per year.

Alternatively, tangible benefits may be measured in terms of unit cost savings or profit/For instance, an alternative inventory scheme may reduce inventory carrying cost by Rs 1500 per unit of inventory.

Intangible benefits are difficult to quantify; for example improved customer goodwill is listed as a possible intangible benefit. Can one quantify goodwill? The following analysis can be tried:

- What is the result of customer antagonism? The customer will submit fewer or no order.
- To what degree a customer reduce orders. Percent wise one can quantify it. For example, number of order received last month and number of order received this month. Difference between these two figures can be to have percent wise figure.
- Find out overall loss to business by adding all these figures. This analysis can be put to management.

Cost Analysis and Procedure to Determining Project Cost

Costs fall into two categories. In first category, it is the cost associated with developing the system. This can be estimated from the outset of a project and should be refined at the end of each phase. In the second category, there are costs associated with operating a system. This can be defined only after specific computer - based solutions have defined.

Many organizations have standard cost categories. In the absence of such categories, the following list should help: .

Personnel costs

The salaries of programmers, system analysts, data entry operators, consultants and all those who work on the project make up the personnel costs.

Computer usage

Computer time will be used for some or all of these activities - programming, testing, conversions, word processing, preparing and loading data files, and prototyping.

Training

The training given to computer personnel will have some costs.

Supply and equipment costs

Costs of Any new hardware and software

But our main concerns are the costs incurred due to the information system. Like benefits, an information system can have both tangible and intangible costs. Tangible costs are the costs which can be measured with certainty in terms of currency. Tangible costs may include the following items

- Hardware costs
- Labor costs
- Operational costs (such as employee training and site setup etc.)

Alternatively, intangible costs refer to items that cannot be easily measured in currency with certainty. Intangible costs may include the following items

- Customer goodwill
- Employee morale
- Operational efficiency

Besides tangible and intangible costs, one can distinguish information system related development costs as either one - time or recurring. Onetime costs refer to those associated with project initiation, development and start - up of the system. These include new hardware and software purchases, user training, site preparation and data conversion costs. Recurring costs are from the those costs resulting from the ongoing evolution and the use of the system like

- Application software maintenance
- Increased data storage expenses
- Increased data communications

- Supplies and other expenses
- New software and hardware leases

In the any system, cost of hardware and software (to be purchased), cost of user training, cost of site preparation is one time cost. The following worksheet shows onetime costs (with hypothetical numerical figures).

Table 1.2: Onetime Costs Worksheet

	Worksheet One – Time Costs (Library Management System)	Year 0
1	New Hardware	35000
2	Development Costs	95000
3	New (purchased) software, if any	20000
4	User training	10000
5	Site preparation	30000
6	Any other	0
	TOTAL one – time cost	1,90,000

There are some areas to which you have to spend time and again. Here is a worksheet showing recurring costs in a system (with hypothetical numerical figures).

Table 1.3 : Recurring Costs Worksheet

	Worksheet Recurring Costs (Library Management System)	Year 1 through 4
1	Maintenance of application software	35000
2	Incremental data storage	10000
3	Incremental communications (lines, messages..)	20000
4	New hardware or software leases	10000
5	Supplies	10000
6	Any Other	0
	TOTAL recurring cost	85,000

Note that in both worksheets, the headings may be different and more, depending upon the actual system.

2. TECHNICAL FEASIBILITY

The purpose of this type of assessment is to gain an understanding of the organization's ability to develop the proposed system. This analysis include an assessment of the development team's understanding of the possible target hardware, software, and operating environments to be used as well as complexity, size, and team's experience with

similar systems. Technical feasibility is a measure of the practicality of a specific technical solution and the availability of technical resources and expertise.

3. OPERATIONAL FEASIBILITY

Operational feasibility is a measure of how well the solution will work in the organization. It is also a measure of how people feel about system/project. Thus, it is important for you as an analyst to have a clear understanding of how an information system will fit into the current day - to - day operations of the organization.

4. SCHEDULE FEASIBILITY

This type of feasibility is a measure of how reasonable the project timetable is i.e. it relates to project duration and is referred to as assessing schedule feasibility. This is an important assessment which helps the analysts to gain an understanding of the likelihood that all potential timeframes and completion date schedules can be met and meeting these dates will be sufficient for dealing with the needs of the organization. Sometimes system is to make operational because of any of the following reasons:

- due to government imposed deadline
- by a particular point in the business cycle (beginning of the new season when new product is to launch)
- by the time a competitor is expected to introduce a similar system

Further detailed activities may only be feasible if resources are available when called for in the schedule.

10.0 Tools for Analysis and design of business system

The focus in the structured analysis is "what" part that is what the system is required to do. Here, how part is not answered mean how the requirements should be accomplished or how the application is to be implemented. To achieve structured analysis certain structured tools / methods are available. The goal to have structured methods is to reduce maintenance time and effort. These methods make it easier to go back to earlier phases of development life cycle. Following is the list of structured methods.

(a) Graphical Description

System can be described in narrative way, but for a larger system it is always a tedious job to describe, in words narration, the detail of system. So in structured analysis some symbols or icons are used to describe the system. Graphic model shows the details of the system but computer processes are not shown. With the selection of right symbol and correct notations one can easily understand the system.

(b) Data Flow Diagram

Data flow diagram shows the flow data through the system and it also shows the conversion of data when data passes through the processes. Different symbols are

used to show sources, destinations, data stores, processes and data flow lines. System description is developed by using a top down approach. An overview is exploded to more detailed view and while moving to next lower level more details are added to system description. Only data flow and its conversions are shown in the data flow diagrams. Physical details of computers, communications, people or departments are not mentioned in the DFDs.

(c) Data Dictionary

Elements present in the system are described in data dictionary, that is, the details of data flows, processes and data stores are recorded in the data dictionary. One can say that all the definitions are available in data dictionary.

d) System Prototype Method

In right environment, prototyping is very effective. User direct involvement is more in prototyping than other development strategies. Now the question arises - What is prototype?

Prototype is a live working model. It consists of set working programs called software. It is used to test the assumption and ideas made about the new system. Prototype is developed at faster pace. It is evolved using an iterative approach.

Following are reasons to adopt prototyping approach:

- When the requirements are not known to analysts and even to user.
- When high development cost is to be involved.
- When the risk is so high that if the evaluation of system is not correct then it may to a disaster.
- When a new technology is to be used or to be installed in the organization that is the organization is not having an experience in technology which is to be adopted.

System prototyping is an interactive process. It is accomplished by going through the-following steps:

1. Features needed in the system or user's known requirements are identified.
2. A working model is developed based on the list of available requirements.
3. Working model is evaluated by user as well as analyst. If no enhancements are required then development process is stopped otherwise enhanced requirements are noted down.
4. Go to step 2

4th generation languages, query and retrieval language, application generators, screen generators and report generators are few of the tools used in prototyping.

11.0 Summary

In this lesson we have discussed "system" which refers to a purposeful arrangement of interconnected components, processes, and resources that work together to achieve specific objectives. It involves the systematic study, modeling, and optimization of these elements to create efficient and effective solutions. A well-designed system addresses requirements, functions, and constraints while considering factors like scalability, usability, and maintainability, ensuring a holistic approach to solving complex problems. We have also discussed its elements and its various types such as Physical or abstract systems, Open or closed systems, Deterministic or probabilistic systems and Man-made information systems.

12.0 Self Check Exercise

1. Define System. What are the various elements of a system?
2. Explain the different types of systems.
3. Write a detailed note on feasibility study.

13.0 Suggested Readings

- Systems Analysis and Design by Elias M. Awad, Galgotia Publications Pvt. Ltd.
- Systems Analysis and Design by Alan Dennis, Barbara Haley Wixom, Roberta M. Roth, John Wiley & Sons.

LESSON No. 1.2 **AUTHOR: Dr. Neeraj Sharma**
Converted into SLM by: Dr. Vishal Singh

System Development Life Cycle

Objectives

The objective of this lesson is to familiarize students with the process of developing systems. A brief discussion of major activities undertaken under each phase of system development process will be made so as to give an idea to the students as to the spectrum of major challenges and tasks involved in system development process.

1.0 Introduction

The system approach is a way of looking at how the elements of an entity are coordinated and managed, and how they interact and achieve their goals. The form of any system will be the result of a particular system's goals, components and environment; but the principles of operation will be the same for any system. To understand system development, we need to recognize that a candidate system has a life cycle, much like a living system or a new product. Systems analysis and design are based on the system life cycle. The Systems Development Life Cycle (SDLC) has many

phases. The analyst must progress from one stage to another methodically, answering key questions and achieving results in each stage.

2.0 Systems Development Life Cycle

The methodology of developing system is popularly called System Development Life Cycle. Immaterial to the fact that the programmers, the users or an outside vendor develops the software, this general process can be summarized in terms of sequential stages or phases. A word of caution regarding life cycle activities: We isolate and sequence these activities for learning purposes, but in real life they overlap and highly interrelated, for example, when the analyst is evaluating an existing operation he/she is probably thinking about an alternative way that would improve the system or wondering whether a given piece of hardware would be a critical cost item to consider for a candidate system. Therefore, there can easily be overlap during any phase of the cycle. In fact, it may act as a basis for modifying earlier steps taken.

We now describe each of these steps.

2.1 Recognition of Need or Problem Identification

One must know what the problem is before it can be solved. The basis for a candidate system is recognition of a need for improving an information system or a procedure. For example, a supervisor may want to investigate the system flow in purchasing or a bank president has been getting complaints about the long lines in the drive - in. This need leads to a preliminary survey or an initial investigation to determine whether an alternative system can solve the problem. It entails looking into the duplication of effort bottlenecks, inefficient existing procedures, or whether parts of the existing system would be candidates for computerization. If the problem is serious enough, management may want to have an analyst look at it, such an assignment implies a commitment, especially if the analyst hired from the outside. In larger environments, where formal procedures are the norm, the analyst's first task is to prepare a statement specifying the scope and objective of the problem. He/she then reviews it with the user for accuracy at this stage, only a rough estimate of the development cost of the project may be reached. However, an accurate cost of the next phase – the feasibility study – can be produced.

2.2 Project Selection

The project has to be identified before it can be solved. The basis for an alternative system is the recognition of a need for improving an information system or a procedure. The idea for change originates in the environment or within the firm due to any of the following reasons:

- Speed of processing needed to be improved
- Increased workload
- To cut down on cost of processing

- Requirement of increased accuracy/reliability of output reports generated
- Security of processing

System Development Life Cycle Activities

Stage		**Key Question**	**Result**
1.	Recognition of need Preliminary survey/ Initial investigation	What is the problem or opportunity?	Statement of scope and Objectives Performance criteria
2.	Feasibility study Evaluation of existing System and procedures Analysis alternative Candidate system Cost estimates	What are the user's demonstrable needs? Is the problem worth solving? How can the problem be Redefined?	Technical/behavioral Feasibility Cost/benefit analysis System scope and objectives Statement of new scope and Objectives
3.	Analysis Detailed evaluation of Present system Data collection	What must be done to solve the problem? What are the facts?	Logical model of system e.g., data dictionary, data flow diagram Pertient data
4.	Design General design specifications Detailed design specifications Output Input Files Procedures	Does the user approve the System?	Implementation schedule Approval of system by user
5.	Program construction Testing Unit testing Combined module Testing User acceptance Testing	How well do individual programs/modules test out? How ready are programs for acceptance test?	Programs Security, audit, and operating Procedures Actual hardware use Formal system test
6.	Implementation	What is the actual	Training program

	User training File/System conversion	operation? Are user manuals ready? Are there delays in lading	User-friendly documentation
7.	Post-implementation Evaluation and Maintenance, Enhancements	Is the key system running? Should the system be modified?	User requirements met User standards met Satisfied user

Environment based ideas originate from customers, vendors, government sources etc. For example, new unemployment compensation regulations may make it necessary to change the reporting procedure, format, and content of various reports, as well as the file structures. Customer complaints about the delivery of orders may prompt an investigation of the delivery schedule, the experience of the truck drivers, or the volume of the orders to be delivered. Ideas for change may also come from within the organization's top management or from the users. When investigated, each of these ideas may lead to a problem definition which leads to the first step in the system life cycle process.

The objective of this phase is to answer the following questions:

1. What is the problem (or opportunity) perceived?
2. What are the goals to be achieved by the solution?
3. What are the benefits which will result from achieving the solution?

These details may be recorded in an informal note or in a formal document. This document would be called the Project Request Form. A request to receive assistance from an information system can be made for many reasons, but in each case someone, a manager, an employee, or a systems specialist, initiates the request. The project proposal submitted by the users to the project selection committee is a critical element while launching a systems study.

2.3 Initial Investigation

When a request to change, improve or enhance an existing system is made, the next systems activity, that is, the preliminary investigation, begins. Because there is a possibility for a stream of requests, standard procedures must be established to deal with them. The 'initial investigation' is one way to handle this. The objective is to determine whether the request is valid and feasible before a recommendation is made to either do nothing, or improve or modify the existing system or build a new one.

The purpose of the preliminary investigation is to evaluate the project requests. It is not a design study. It is collecting the information that permits the committee

members to evaluate the merits of the project request and to make an informal judgement about the feasibility of the proposed project.

The following activities should be accomplished during the preliminary investigation:

1. Clarify and understand the project request.

What is being done? What is required? Why? Is there an underlying reason different from the one the requester identifies? For example, the user justifies a request for developing of an account receivable system based on the requirement of faster processing. However, the preliminary investigation may reveal that the need for better control of cash handling outweighs the need for speed. Lost checks and not speed of processing are the real problems, but the requester has not described the specific need clearly.

2. Determine the size of the project.

For example, does a request for a course-registration project call for new development or for modification of the existing system? The investigation conducted for a solution will also gather the details useful in estimating the amount of time and number of people required to develop the project. Since many enhancements of existing system are costly, they are treated in the same way as a new project by the project selection committee.

3. Assess costs and benefits of alternative approaches

For example, what are the estimated costs for developing a patient information system, as requested by the hospital's chief of staff? What expenses will be incurred to train the medical and nursing personnel and install the system? Will the proposed system reduce the operating costs? Is it likely that the cost of error will decrease?

4. Determine the technical and operational feasibility of alternative approaches.

For example, does the necessary technology to link office word processing systems to the main computer exist or can it be acquired? How workable is the request to enable administrative assistants to retrieve sales information from the main system and insert it directly into type written reports prepared on a word processor?

5. Report the findings to the management, with recommendations outlining the acceptance or rejection of the proposal.

For example, a proposal for the installation of an order entry system should be modified to allow all salespersons to submit their orders through ordinary telephone

connections directly into the computer. The modifications will improve the usefulness of the system and increase the financial benefits of the organization.

2.4 Feasibility Study

Depending on the results of the initial investigation, the survey is expanded to a more detailed feasibility study. As we shall learn, a feasibility study is a test of a system proposal according to its workability impact on the organization, ability to meet user needs, and effective use of resources. It focuses on three major questions:

I. What are the user's demonstrable needs and how does a candidate system meet them?
II. What resources are available for given candidate systems? Is the problem worth solving?
III. What is the likely impact of the candidate system on the organization? How will it fit within the organization's master plan?

Each of these questions must be answered carefully. They revolve around investigation and evaluation of the problem, identification, and description of candidate systems, specification of performance and the cost of each system, and final selection of the best system.

The objective of a feasibility study is not to solve the problem but to acquire a sense of its scope. During the study, the problem definition is crystallized and aspects of the problem to be included in the system are determined. Consequently, costs and benefits are estimated with greater accuracy at this stage.

The result of the feasibility study is a formal proposal. This is simply a report - a formal document detailing the nature and scope of the proposed solution. The proposal summarizes what is known and what is going to be done. It consists of the following:

1. Statement of the Problem – a carefully worded statement of the problem that led to analysis.
2. Summary of Findings and Recommendations – a list of the major findings and recommendations of the study. It is ideal for the user who required quick access to the results of the analysis of the system under study. Conclusions are stated, followed by a list of the recommendations and a justification for them.
3. Details of Findings – An outline of the methods and procedures undertaken by the existing system, followed by coverage of objectives & procedures of the candidate system. Included are also discussions of output reports, file structures, and costs and benefits of the candidate system.
4. Recommendations and Conclusions – special recommendations regarding the candidate system, including the personal assignments costs, project schedules, and target dates.

In the feasibility study, we consider the following:

- Economic Feasibility,
- Technical Feasibility,
- Behavioural Feasibility

Let's briefly review each consideration and how it relates to the systems effort.

Economic Feasibility
Economic analysis is the most frequently used method for evaluating the effectiveness of a candidate system. More commonly known as cost/benefit analysis, the procedure is to determine the benefits and savings that are expected from a candidate system and compare them with costs. If benefits outweigh costs, then the decision is made to design and implement the system. Otherwise, further justification or alterations in the proposed system will have to be made if it is to have a chance of being approved. This is an ongoing effort that improves in accuracy at each phase of the system life cycle.

Technical Feasibility
Technical feasibility centers around the existing computer system (hardware, software etc.) and to what extent it can support the proposed addition. For example, if the current computer is operating at 80 per cent capacity – an arbitrary ceiling – then running another application could overload the system or require additional hardware. This involves financial considerations to accommodate technical enhancements. If the budget is a serious constraint, then the project is judged not feasible.

Behavioral Feasibility
People are inherently resistant to change, and computers have been known to facilitate change. An estimate should be made of how strong a reaction the user staff is likely to have towards the development of a computerized system. It is common knowledge that computer installations have something to do with turnover, transfers, retraining, and changes in employee job status. Therefore, it is understandable that the introduction of a candidate system requires special effort to educate, sell, and train the staff on new ways of conducting business.

After the proposal is viewed by management it becomes a formal agreement that paves the way for actual design and implementation. This is a crucial decision point in the life cycle. Many projects die here, whereas the more promising ones continue through implementation. Changes in the proposal are made in writing, depending on the complexity, size, and cost of the project. It is simply common sense to verify changes before committing the project to design.

2.5 Systems Analysis

This phase is a detailed appraisal of the existing system and includes finding out how the system works and what it does. It includes finding out in more detail what the system problems are and what users require of new or changed system.

In the systems analysis phase, the systems analyst or the systems development team determines what the new system should accomplish. This phase includes two steps: analyzing the existing system and determining the needs of the new system. A study of the existing system helps determine which activities currently being performed should be continued in the new system. This step can be simple if the current system is well documented but unfortunately, most systems are not well documented. Therefore, a major part of the analysis of the existing system is to document it. If the original system is computerized, the current hardware needs to be examined to see whether it is adequate to do the job. An unexpected but valuable benefit of the systems analysis phase is that it points out problems that have not been studied so far. This analysis may be the first time that the analyst or a group of people have sat down and talked about the actual process. The discussions can result in new insights, and problems that were not part of the preliminary investigation. The results of the analysis of the existing system are merged with the needs of the new system. Determining the new needs requires many of the systems analyst's tools, for example, interviews, observation, questionnaire, etc. Training, experience and common sense are required for collection of the information needed to do the analysis. Information is gathered during this phase with the help of many information-gathering techniques. These include interviewing the users, questionnaires and observation methods etc. The people who use the new system and the people responsible for the new system can best describe its needs. The systems analyst, therefore, should interview the workers who use the data. The managers are also interviewed, as they are the ones who see a wider picture of the system that will fit into the company's overall operations. This user involvement is very much essential. In addition, analysts must spend considerable time examining components, such as the various forms used in the system, as well as the operation of existing systems. Data collected in the analysis is based upon available files, decision points and transaction handled by the present system.

So, system analysis is a detailed study of the various operations performed by a system and their relationship within and outside of the system. System analysis also defines the boundaries of the system. Following this phase, the analyst should be familiar with the detailed operation of the system and what is required of the new system. Analysis determines whether or not a proposed system should be considered. Once analysis is completed, analyst has a complete, clear understanding of what is to be done. This phase results in a detailed model of the system, which describes the system functions, data and information flows. The output of this phase includes detailed explanation of the user requirements and changes in the objectives for the new system.

2.6 System Design

After the systems analysis phase has determined how the current system works and what the needs of the new system are, the systems design begins. The systems design phase converts the general requirements defined in the analysis phase into detailed specifications for the new system.

System design is the most challenging phase of the system life cycle. The system design describes the final system and the process by which it is developed. It refers to the technical specifications (similar to an architect's blueprints) that will be applied in implementing the proposed system. It also includes the construction of programs and program testing. Here, format of output is determined. Sample input, output is presented. Also, along with it design of input data and master files is done. Until now, the analyst has been using general business knowledge, knowledge about the specific operations involved, and an ability to get information from people. The detailed specifications of the systems design include hardware needs, data descriptions, communications specifications, and software needs for each step of the operations necessary for the new system. The design phase therefore requires detailed knowledge about computer hardware, software, data handling, and communications needs for each step. Tools which are used in these are flow chart, report layout, etc. Implementation plan is also decided upon. Method of data capture is also elaborated in this. Justification of the system, estimate and impact of the system on to an organisation are documented.

System design usually proceeds in two steps: Conceptual design and Detailed design.

a) Conceptual Design

During this phase, the conceptual solutions proposed by the feasibility study are looked at in more detail. Major new functions are proposed and change to existing functions defined. Important inputs and outputs are also defined and performance requirements are specified. Thus, in case of computerizing the function, we may consider such decisions as whether to place the actual ordering on the computer or to have manual ordering and only use the computer for dissemination of information. At the conclusion of conceptual design, we may know what we need in order to build the system. This may include the size of the computer and the software needed to put the system together. It will also state which software can be purchased off-the-shelf and which requires new programs to be developed. The design may also suggest whether the computer should be rented or purchased and whether programs are to be developed using internal programmers or external software development agencies.

b) Detailed Design

It is only when a conceptual design is chosen that detailed design starts. During the detailed design, the database and program modules are designed and detailed user procedures are documented. The interaction between the system users and computers

is also defined. These interfaces define exactly what the user will be expected to do to use the system. Thus, the output of this phase includes a proposed equipment configuration together with specifications for the database and computer programs. The user-manual is also prepared during this phase.

The main outputs of the design phase are input design, output design, database design and processing design. All above should be documented. This should be presented to management along with main features of design, the objectives, cost and benefit expected. Operational procedures and documentation should be completed. Security and audit procedures must be developed. It is the most creative phase in the system life cycle.

2.7 System Development and Implementation

This is the phase in which computer-based system is constructed from the specifications prepared in the design phase. Hardware is acquired and installed during this phase. All necessary procedures, manuals, software specifications, and other documentation are completed. This is analogous to the actual construction of a house from the architect's blueprints prepared in the design phase.

In the systems implementation phase, the organisation adopts the new system. Ongoing maintenance or support is required to keep the new system running properly until it is time to replace it with another system. Implementation also covers user training, site preparation and file conversion. During the final testing, user acceptance is tested followed by user training. The user is trained, and the complete system is tested for operational readiness. System testing checks the readiness and accuracy of the system to access, update and retrieve data from new files. The programs become available; test data are read into the computer and processed against the files provided for testing. Most conversions, a parallel run is conducted where new system run simultaneously with the old system. The new system is installed, replacing the old one. Users are properly trained before they are put into the actual operation. At the end of this phase, users are provided with a working system. This includes the set of working programs and an initialized database. In addition, any system documentation describing the programs is also completed. The implementation phase is analogous to moving into and living in the new house that we have built. Implementation can take one of the following forms:

- Implementation (in one go) of a computer system to replace a manual system. A direct conversion requires stopping the old system and then starting the new system. It is the most risky type of conversion but may be necessary in some situations.
- Implementation of a new computer system to replace an existing one or in other words, up gradation of the existing system.
- Implementation of a modified application to replace an existing one.

- Phased implementation occurs when the new system is implemented in different time periods, one part at a time. After one part of the new system is running, another piece is implemented.

Major issues in the implementation

Main issues in the implementation are conversion, training and change over.

a) Conversion

It means changing from one system to another. The objective is to put the tested system into operation. It involves creating computer compatible files, training the operating staff and installing the system. The conversion phase begins with a review of the project plan, the system test documentation and implementation plan. Conversion plan is finalized and approved. Files are converted and parallel processing between the existing system and the new system is initiated. Result of computer runs and operations for the new system are logged on a special form. Assuming no problem, parallel processing is discontinued. Implementation results are documented. Conversion completes here. File conversion involves capturing data and creating a computer file from existing files. Once it is determined the next step is to specify the data to be converted. The files to be copied must be identified by name. This is the only way by which the accuracy of the copying will be verified.

b) User Training

The two factors are taken into consideration: user capabilities and nature of the system installed. User must be informed of how the whole system works, objectives of the system along with documentation, files and procedures. User must be instructed how to perform their new tasks. Training sessions must provide user the specific skills required in their new job. The sessions for this should be short and regular once containing the practical. The tools which are useful in the user training are manuals which provide detailed information for reference, visual tools such as flow charts for better explanation.

c) Change Over

The entire process and new system need to be evaluated to see whether the problem that initiated the new system was corrected. Even if the system is working properly and many people seem happy with it, the new system is not successful unless it solves the original problem. The change over from the old to the new system may take place when the system has been proved to the satisfaction of the system analyst and the other activities have been completed. Users are satisfied with the results of the system tests, training and reference manual.

2.8 System Evaluation and Maintenance

After installation phase is completed and user is adjusted to the change create by the system, evaluation and maintenance begins. After the evaluation, the new system requires continuous support and maintenance until the system is replaced. Regardless of how good a system is, modifications are usually necessary. Evaluation of the system is performed to identify its strengths and weaknesses. The actual evaluation can occur along any one of the following dimensions:

(i) Operational Evaluation: Assessment of the manner in which the system functions,
(ii) Organisational Impact: Identification and measurement of benefits to the organisation in such areas as financial concerns, operational efficiency, and competitive impact.
(iii) User Manager Assessment: Evaluation of the attitudes of senior manager and user within the organisation, as well as end-users.
(iv) Development Performance: Evaluation of the development process in accordance with such yardsticks as overall development time and effort, conformance to budgets and standards and other project management criteria.

In the newly designed system, if the new information is inconsistent with the design specifications then the changes have to be incorporated to meet the requirements. The evaluation of the system takes place after the system is implemented. It evaluates the new system to see if it has indeed satisfied the goals set for it. The system is examined to see if the benefits expected of it have been realized. If they have not, a study is made to see why not. Part of this study is the life cycle itself. It is important at this stage to go back to the original goals of the project. Post-evaluation may suggest minor changes to be made to the system. In exceptional cases, where the system is performing badly, post-evaluation may suggest a total redesign of the system.

Maintenance is necessary to eliminate errors in the system during its working life and to tune the system to any variations in its working environment. There are always some errors detected that must be corrected. Changes are made to remove these errors and deficiencies. If a major change to the system is required, a new project may have to be set up to carry out the change. This new project will then follow all the above system development life cycle activities.

Hardware also requires periodic maintenance to keep in time with design specification. The importance of maintenance is to continue to bring the new system to standards. User priorities, changes in organizational requirements, or environmental factors also call for system enhancements. To contrast maintenance with enhancement, if a bank decided to increase its service charges for checking accounts from Rs.30 to Rs.40 for a minimum balance of Rs.3,000, it is maintenance. However, if the same bank decided to create a personal loan on negative balances when customers overdraw their account, it is enhancement. This change requires evaluation, program modifications, and future testing.

3.0 Role of Systems Analyst

A systems analyst is a person who conducts a study, identifies activities and objectives and determines a procedure to achieve the objectives. Designing and implementing systems to suit organisational needs are the functions of the systems analyst He plays a major role in seeing business benefit from computer technology. The analyst is a person with unique skills. He uses these skills to coordinate the efforts of different type of persons in an organisation to achieve business goals.

A system analyst carries out the following job:

(a) The First and perhaps most difficult task of systems analyst is problem definition. Business problems are quite difficult to define. It is also true that problems cannot be solved until they are precisely and clearly defined.

(b) Initially a systems analyst does not know how to solve a specific problem. He must consult with managers, users and other data processing professionals in defining problems and developing solutions. He uses various methods for data gathering to get the correct solution of a problem.

(c) Having gathered the data relating to a problem, the systems analyst analyses them and thinks of plan to solve it. He may not come up personally with the best way of solving a problem but pulls together other people's ideas and refines them until a workable solution is achieved.

(d) Systems analysts coordinate the process of developing solutions. Since many problems have number of solutions, the systems analyst must evaluate the merit of such proposed solutions before recommending one to the management

(e) Systems analysts are often referred to as planners. A key part of the systems analyst's job is to develop a plan to meet the management's objectives.

(f) When the plan has been accepted, systems analyst is responsible for designing it so that management's goal could be achieved. Systems design is a time consuming, complex and precise task.

(g) Systems must be thoroughly tested. The systems analyst often coordinates the testing procedures and helps in deciding whether or not the new system is meeting standards established in the planning phase.

Attributes of an effective Systems Analyst

Systems analyst must have the following attributes:

- *Knowledge of people*: Since a systems analyst works with others so closely, he or she must understand their needs and what motivates them to develop systems properly.
- *Knowledge of Business functions*: A systems analyst must know the environment in which he or she works. He must be aware of the peculiarities of management and the users at his installation and realize how they react to systems analyst. A working knowledge of accounting and marketing principles

is a must since so many systems are built around these two areas. He must be familiar with his company's product and services and management's policies in areas concerning him.

- *Knowledge of Data processing principles*: Most systems today are computer based. The systems analyst must be fully aware about the potential and limitations of computers.
- *Ability to communicate*: As a coordinator, a systems analyst must communicate properly with people of different levels within an organisation. Systems analyst must listen carefully to what others say and integrate the thoughts of others into the systems development process.
- *Flexibility*: Systems analysts must be flexible in their thinking since they often do not get-their own way. Different factions in an organisation have conflicting needs and most systems are the result of compromise. The analyst's goal is to produce the system that will be the best for the organisation. This requires an open mind and flexibility in his ideas.
- *An analytical mind*: It takes an unusual person to see through problems facing an organisation and develop solutions that will work. Systems analysts often find themselves with more data than they can cope with. It requires an analytical mind to select pertinent data and concentrate on them in defining problems and forming solutions.
- *Well educated with sharp mind*: Systems analysts are called upon to work with people at all levels virtually in every aspect of business. They must know how to work with all of them and gain their confidence. Analysts must have sharp mind to learn quickly how people do their jobs and develop ways for them to do it better.

4.0 Keywords

SDLC	Systems development life cycle
Systems Analysis	a detailed appraisal of the existing system and includes finding out how the system works and what it does
System Design	converts the general requirements defined in the analysis phase into detailed specifications for the new system
Conceptual Design	Logical design
Detailed Design	the database and program modules are designed and detailed user procedures are documented.

Conversion	changing from existing system to new system.
System Evaluation	Study of the system to identify its strengths and weaknesses
Maintenance	tune the system to any variations in its working environment
Systems Analyst	a person who conducts Systems development life cycle activities

5.0 Summary

The system approach is a way of looking at how the elements of an entity are coordinated and managed, and how they interact and achieve their goals. The form of any system will be the result of a particular system's goals, components and environment; but the principles of operation will be the same for any system. Systems within an organisation are an integral part of the organisation. They reflect the organisation's objectives. To start system analysis and design, an informed awareness of the organisation is necessary. This provides a view into the management's working and decision-making. The organisation must be studied for its dependence on older structures and how independent are the new changes of the older structure. The organisation chart must also be studied in detail and all the line functions and the support functions must be identified. The organisation chart may or may not be indicative of the flow of control. The task of the analyst should be to identify the real lines of communication. This exercise provides knowledge about how changes introduced in one area may affect the work of others. The analyst must also look at the environment under which the organisation operates. One must also look at the organisation's position within its industry, the labour relationships in the industry, and the effect of government policies on the industry.

The starting point for building a new system is the anticipation of future benefits by improving the operations of the old system. The goal of any computer-based system is to enable organisation to perform efficiently as it helps in taking prompt and better decisions. Next is the refinement of that idea into a specific statement of what the proposed system should accomplish, how the automation should help, and what parts of the system will be automated. Analysts and designers decide how to create computer programs that accomplish the functions on specific hardware. The technical staff either writes the programs or buys them. The organisation acquires whatever hardware is needed. The programs are tested to ensure the correct functions are performed in the correct manner. While designing a system, the analyst must also

take care to determine the form of output. Management will be more interested in the way the output is generated. Many a times, the analyst will have to design his input based on the output desired by the management. This may have to be followed several times before one arrives at a feasible solution. Ultimately, it will be the end user who can comment on the effectiveness of the system.

A team implements the new system in the organisation through a process involving user training and conversion from the previous system to new system. System then goes into operation and is modified as necessary for further improvements in business systems. One of the most critical factors for success in any project is to convince people to accept the change. The analyst must get rid of the fear of change in people. The analyst must answer all possible queries of people and stress on the benefits to them and always keep them informed of the real picture. He must also involve them in the decision making in the areas concerning to their work. He must provide support to the people in terms of training them and making them understand the system. This should be done not only during implementation, but the analyst must also make himself available for any queries or problems the user may face after that. Wherever possible the analyst must give full cooperation and support to the people in the organisation.

6.0 Self Check Exercise

1. Define the following terms:
   (a) Systems Approach
   (b) System Analysis
   (c) System Design
2. "Feasibility study of any system is an important and necessary part of system development life cycle". Justify this statement.
3. Discuss the difference between implementation and post-implementation maintenance with supporting examples?
4. What is the end product of each system analysis phase? Explain the purpose and contents of each of these products.
5. Identify and briefly describe the purpose of system design phase.
6. "Identification and analysis of problem is one of the most important aspects of any system development." Justify this statement with supportive example.
7. Write short notes on following:
   a) Feasibility study
   b) Analysis
   c) Design
   d) Implementation
   e) Evaluation and maintenance.

7.0 Suggested Readings

- V. Rajaraman, “Analysis & Design of Information Systems”, Prentice Hall of India Pvt. Ltd.
- James A. Senn,” Analysis & Design of Information Systems”, McGraw-Hill Publishing Co.
- Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa Publishing House
- Henry Lucas, “The Analysis, Design and Implementation of Information Systems”, McGraw-Hill International
- Systems Analysis and Design by Elias M. Awad, Galgotia Publications Pvt. Ltd.
- Systems Analysis and Design by Alan Dennis, Barbara Haley Wixom, Roberta M. Roth, John Wiley & Sons.

LESSON No. 1.3 **AUTHOR: Dr. VISHAL SINGH**

System Analysis

Objectives

Objectives

In this lesson we will discuss about problem definition, User requirements and ways of determining user's requirement. We will also study about feasibility study in detail.

1.0 Problem Definition

The first step in an initial investigation is to define the problem that the user led to the user request. The problem must be stated clearly understood and agreed upon by the user and the analyst. It must state the objectives the user is trying to achieve

and the results the user want to see. Emphasis should be on the logical requirements rather than the physical requirements.

2.0 Determining the User's Information Requirements

Shared, complete, and accurate information requirements are essential in bui1ding computer-based information systems. Unfortunately, determining the information each user needs is a particularly difficult task. In fact, it is recognized as one of the most difficult tasks in system development. The Association for Computing Machinery (ACM) Curriculum Committee on Computing Education for Management recognized this by suggesting two, distinct job titles for systems development: "information analyst" and "systems designer" rather than the more general term "systems analyst". The information analyst determines the need of the user and the information flow that will satisfy those needs. The usual approach is to ask the user what information is currently available and what other information is required. Interaction between the analyst and the user usually leads to an agreement about what information will be provided by the candidate system:

There are several reasons why it is difficult to determine user requirements:

1. System requirements change and user requirements must be modified to account for these changes.
2. The articulation of requirements is difficult, except for experienced users. Functions and processes are not easily described.
3. Heavy user involvement and motivation are difficult. Reinforcement for their work is usually not realized until the implementation phase-too long to wait.
4. The pattern of interaction between users and analysts in designing information requirements is complex.

User’s and analysts traditionally do not share a common orientation towards problem definition. For example, in the analyst's view, the problem definition must be translatable into a system design expressed quantitatively in terms of outputs, inputs, processes and data structures. This is an ideal way to develop a good system when all features are known, under the best of situations and within time constraints. In contrast, the user seems to be satisfied with a qualitative definition that specifies the system in generalities. Flexibility is a key consideration. System specifications must change with their needs, as must the system after implementation.

Based on these contrasting views, users who try to define their information requirements with the analyst's dews find themselves in a predicament. According to Scharer, they defend themselves by producing strategies that will satisfy the analyst.

1. In the Kitchen *sink* strategy the user throws everything into the requirement definition-overstatement of needs such as an overabundance of reports, exception processing, and the like. This approach usually reflects the user lack of experience in the area.

2. The *smoking strategy* sets up a smoke screen by requesting several system features when only one or two are needed. The extra requests are used as bargaining power. This strategy usually reflects the user's experience in knowing what he/she wants. Requests have to he reduced in one that is realistic, manageable, and achievable.

3. The *same thing* strategy indicates the user's laziness, lack of knowledge, or both. "Give me the same thing but in a better format through the computer is a typical statement. Here the analyst has little chance of succeeding because only the user can fully discover the real needs and problems.

Humans have problems specifying information requirements. "Asking" the user what is needed of a candidate system docs not often yield accurate and complete requirements. According to Davis, humans have these Limitations:

1. *Humans as information processors*. The human brain has both high capacities, long term memory and limited-capacity (but fast), short term memory. The limits of short-term memory affect the information requirements obtained, because the user who is interviewed has a limited number of requirements that he/she defines as important. This limits processing responses. He/she may have selectively emphasized a few items of information and recorded them in long-term memory as being the most important. They may be the only ones that are recalled during the interview.

2. *Human bias in data selection and use.* Humans are generally biased in their selection and use of data. Their behavior' becomes a representation of the bias. For example, users are influenced more by recent events than by past events. Thus, an information need that was discovered recently tends to carry great weight than a need experienced in the distant past. This is called the recency effect. In another bias, users tend to use only information that is available in the form in which it is displayed. This means that the requirements provided by the user are biased by currently available information.

3. *Human problem-solving behavior*. Humans have a limited capacity for rational thinking. According to Simon, they must simplify it in order to deal with it. Coined as the concept of bounded rationality, it means that rationality for determining information requirements is "bounded" by a simplified model (as well as by limited training, prejudice and attitude of user! that may not reflect the real situation. Bounded rationality is often reflected in the behavior of

system analysts. A successful analyst uses a general model to search for information requirements. It includes the consideration of organizational and policy issues' in arriving at realistic requirements. The poorly rated analyst does not consider these issues, but focuses on the immediate (short-term) requirements facing the user.

3.0 Strategies for Determining Information Requirements

There are three key strategies or general approaches for eliciting information regarding the user's requirements: (1) asking, (2) getting information from the existing information system, and (3) prototyping.

1. Asking. This strategy obtains information from users by simply asking them about the requirements. It assumes a stable system where users are well informed and can overcome biases in defining their problem. There are three key asking methods:

(i) ***Questions*** may be open-ended or closed. An open-ended question allows the respondent to formulate a response. It is used when feelings or opinions are important. For example, "How do you evaluate the latest addition to your hardware?" In contrast, a closed question requests one answer from a specific set of responses. It is used when factual responses are known. For example, "How long have you been manager of the computer center?"

(ii) Brainstorming is a technique used for generating new ideas and obtaining general information requirements. This method is appropriate for eliciting non conventional solutions to problems. A guided approach to brainstorming asks each participant to define ideal solutions and then select the best feasible one. It works well for users who have system knowledge but have difficulty accepting new ideas.

(iii) Group consensus asks participants for their expectations regarding specific variables. In a Delphi inquiry, for example, each participant fills out a questionnaire. The results are summarized and given to participants along with a follow-up questionnaire. Participants are invited to change their responses. The results are again summarized and fed back to the participants. This debate by questionnaire continues until participants' responses have converged enough. This method has an advantage over brainstorming in that participants are not subjected to psychological pressure from others with presumed authority or influence.

2. Getting information from the Existing information System: Determining information from an existing application has been called the *data analysis* approach. It simply asks the user what information is currently received and what other information is required. It relies heavily on the user to articulate information needs. The analyst examines all reports, discusses with the user each piece of information examined and determines unfulfilled information needs by interviewing the user. The

analyst is primarily involved in improving the existing flow of data to the user. In contrast to this method is *decision analysis*. This breaks down a problem into parts, which allows the user to focus separately on the critical issues. It also determines policy and organizational objectives relevant to the decision areas identified and the specific steps required to complete each major decision. Then the analyst and the user refine the decision process and the information requirements for a final statement of information requirements,

The data analysis method is ideal for making structured decisions. Although it requires that users articulate their information requirements. A major drawback is a lack of established rules for obtaining and validating information needs that are not linked to organizational objectives. In the decision analysis method, information needs are clearly linked to decision and organizational objectives.

3. Prototyping, The third strategy for determining user information requirements is used when the user cannot establish information needs accurately before the information system is built. The reason could be the lack, of an existing model on which to base requirements or a difficulty in visualizing candidate systems. In this case, the user needs to anchor on real-life systems from which adjustments can be made. Therefore the iterative discovery approach captures an initial set of information requirements and builds a system to meet these requirements. As user gain experience in its use they request additional requirements or modifications (iterations) in the system. In essence, information requirements are discovered by using the system. Prototyping is suitable in environments where it is difficult to formulate a concrete model for defining information requirements and where the information needs of the user are evolving, Such as in DSS.

4.0 Feasibility Analysis

Objectives of Feasibility Analysis

The main objectives of feasibility analysis are –

- To identify the deficiencies in the current system.
- To determine objectives of the proposed system.
- To acquire a sense of scope of the system.
- To identify the responsible users.
- To determine whether it is feasible to develop the new system.

Consider our case scenario 'Stock Monitoring System' for finding the main objectives of feasibility study. The various objectives of feasibility analysis for are discussed below.

Deficiencies in the Current System

The major deficiencies in the manual 'Stock Monitoring System' are:

Searching for a particular item or transaction is time consuming.

- There is a possibility of making wrong entries in stock register by the store clerk.
- The management does not get stock status reports on time.
- The purchase department cannot place orders on time

5.0 Steps in Feasibility Analysis

Feasibility analysis is carried out in following steps:

1. Form a Project Team and Appoint a Project Leader: First of all project management group of the organization forms separate teams for independent projects. Each project team comprises of one or more systems analysts and programmers with a project leader. The project leader is responsible for planning and managing the development activities of the system.
2. Start Preliminary Investigation: The systems analyst of each project team starts preliminary investigations through different fact finding techniques
3. Prepare the Current Systems Flowchart: After preliminary investigations, the analysts prepare the systems flowchart of the current system. These charts describe the general working of the system in a graphical way.
4. Describe the Deficiencies in the Current System: On studying the systems flowcharts, the analysts identify and describe the deficiencies in the current system.
5. Determine Objectives of the Proposed System: The major objectives of the proposed systems are listed by each analyst and are discussed with the project leader.
6. Prepare the Proposed Systems Flowchart: After determining the major objectives of the proposed system, the analysts prepare their systems flowcharts. Systems flowcharts of the proposed system are compared with those of current system in order to ensure that they meet the objectives.
7. Determine the Technical Feasibility: The existing computer systems (hardware and software) of the concerned department are identified and their technical specifications are noted down. The analysts decide whether the existing systems are sufficient for the technical requirements of the proposed system or not.
8. Determine the Economic Feasibility: The analysts determine the costs and benefits of proposed system in order to ensure that the project is economically feasible.
9. Determine the Operational Feasibility: After determining the economic feasibility, the analysts identify the responsible users of the system and hence determine the operational feasibility of the project.

10. Presentation of Feasibility Analysis: During the feasibility study, the analysts also keep on preparing the feasibility study report. At the end of feasibility analysis, the feasibility analysis report is given to the management along with the oral presentation.

6.0 Types of Feasibility

During feasibility analysis, the analyst considers the three main types of feasibility – technical, economical and operational feasibility, all of which are interrelated.

1. **Technical Feasibility**: During this study, the analyst identifies the existing computer systems (hardware and software) of the concerned department and determines whether these technical resources are sufficient for the proposed system or not. If they are not sufficient, the analyst suggests the configuration of the computer systems that are required. The analyst generally pursues two or three different configurations which satisfy the key technical requirements but which represent different costs. During technical feasibility study, financial resources and budget is also considered. The main objective of technical feasibility is to determine whether the project is technically feasible, provided it is economically feasible.
2. **Economic Feasibility**: Economic feasibility is the most important study that determines the cost and benefits of the proposed system and compares with the budget. The cost of the project should not outweigh the budget. The cost of the project includes the cost of hardware, software, development and implementation. Cost/benefit analysis is the common method to determine the benefits that are expected from the proposed system and compare them with the costs expected to spend on development of the system. If benefits are found to be more than costs, then the analyst decides to continue the development of the proposed system otherwise considers it economically not feasible. The feasibility study presents both tangible (e.g., increased productivity, low operating cost, etc.)and intangible benefits (e.g., improved organizational planning, improved asset utilization, etc.) in a formal way. We will discuss the cost/benefit analysis in a subsequent sub-section.
3. **Operational Feasibility**: When it is found that the project is both economic and technical feasible, the next step is to determine whether it is operationally feasible or not. During operational feasibility study, it is determined whether the system will operate in the way that user wants. Operational feasibility depends upon human resources for the development and implementation of the system. It is considered whether the qualified and experienced manpower is available for development and implementation of the system. User involvement is more required in determining the operational feasibility.
4. **Social Feasibility**: Social feasibility is a determination of whether a proposed project will be acceptable to the people or not. This determination typically

examines the probability of the project being accepted by the group directly affected by the proposed system change.

5. **Management feasibility**: It is a determination of whether a proposed project will be acceptable to management. If management does not accept a project or gives a negligible support to it, the analyst will tend to view the project as a non-feasible one.
6. **Legal feasibility**: Legal feasibility is a determination of whether a proposed project infringes on known Acts, Statutes, as well as any pending legislation. Although in some instances the project might appear sound, on closer investigation it may be found to infringe on several legal areas.
7. **Time feasibility**: Time feasibility is a determination of whether a proposed project can be implemented fully within a stipulated timeframe. If a project takes too much time it is likely to be rejected.

After the feasibility study, a document is prepared that is known as 'Feasibility Study Report'. Besides this report, the analyst also gives the oral presentation of feasibility study to the management.

7.0 Feasibility Analysis Report

Feasibility analysis report is a formal document for management use and is prepared by systems analyst during or after feasibility study. This report generally contains the following sections:

(a) **Covering letter**: It formally presents the report with a brief description of the project problem along with recommendations to be considered.

(b) **Table of Contents**: It lists the sections of feasibility study report along with their page numbers.

(c) **Overview**: It presents the overview of the project problem along with the purpose and scope of the project.

(d) **Description of Existing System**: brief descriptions of the existing system along with its deficiencies are presented in this section.

(e) **System Requirements**: The system requirements, which are either derived from the existing system or from the discussion with the users, are presented in this section.

(f) **Description of Proposed System**: It presents a general description of the proposed system, highlighting its role in solving the problem. A description of output reports to be generated by the system is also presented in the desired formats.

(g) **Development Plan**: It presents a detailed plan with starting and completion dates for different phases of SDLC. A complementary plan is also needed for hardware and software evaluation, purchase and installation.

(h) **Technical Feasibility Findings**: It presents the findings of technical feasibility study along with recommendations

(i) **Costs and Benefits**: The detailed findings of cost and benefits analysis are presented in this section. The savings and benefits are highlighted to justify the economic feasibility of the project.

(j) **Operational Feasibility Findings**: It presents the findings of operational feasibility along with the human resource requirements to implement the system.

(k) **Alternatives considered/Rejected**: The different alternatives that an analyst usually considers and rejects during feasibility study, should also be included in the feasibility study report. These alternatives are required to be discussed because they show how the suggested system is the best alternative to solve the problem.

(l) **Recommendations and Conclusions**: The benefits and savings are summarized and it is recommended whether the management should decide to proceed with the project or abort the project.

(m) **Appendixes**: In the last section of feasibility study report, all memos, documents and data compiled during study are enclosed for reference.

List of Processes in Requirement Analysis

1. Prepare for System Requirement Analysis
2. Determine Business Requirement
3. Define Process Model
4. Define Logical Data Model
5. Reconcile Business Requirements with Models
6. Produce Functional Specification

Categories of Requirements

1. Functional Requirements
2. Technical Requirements
3. Operational Requirements
4. Transitional Requirements

8.0 Summary

In this lesson we have discussed determining users' requirements in system analysis and design which is a crucial phase that involves identifying, documenting, and prioritizing the needs and expectations of the intended users or stakeholders. This process entails conducting thorough interviews, surveys, and workshops to gather insights into user workflows, functionalities, and pain points. It's important to clarify both functional requirements (specific tasks the system must perform) and non-functional requirements (qualities like performance, security, and usability). Effective user requirement determination ensures that the resulting system aligns with user expectations and delivers a solution that meets their genuine needs. We have also studied about feasibility analysis in detail in this lesson.

9.0 Self Check Exercise

1. Discuss the different ways of determining user's requirements.
2. What is feasibility analysis? Discuss various steps in feasibility analysis.
3. What are the main considerations of a feasibility study?

10.0 Suggested Readings

- Systems Analysis and Design by Elias M. Awad, Galgotia Publications Pvt. Ltd.
- Systems Analysis and Design by Alan Dennis, Barbara Haley Wixom, Roberta M. Roth, John Wiley & Sons.

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Mandatory Student Feedback Form

https://forms.gle/KS5CLhvpwrpgjwN98

Note: Students, kindly click this google form link, and fill this feedback form once.