1- Introduction to Information Systems Development

Introduction

Most computer-based Information Systems are conceived, designed, and implemented using some form of systematic development process or methodology. Most methodologies consist of a finite number of phases. In this unit, you will understand various phases of information system development. A Systems analyst is a person who is overall responsible for development of a software. The role of system analyst is discussed in the unit. Also you will understand the concept of system analysis and design, categories of information systems, system development strategies, and discuss implementation and evaluation.

1.1 Information System Development

The number of phases in the information system development may vary from methodology to methodology. Each phase gives an output that becomes input of next phase. Mainly the process comprises of:

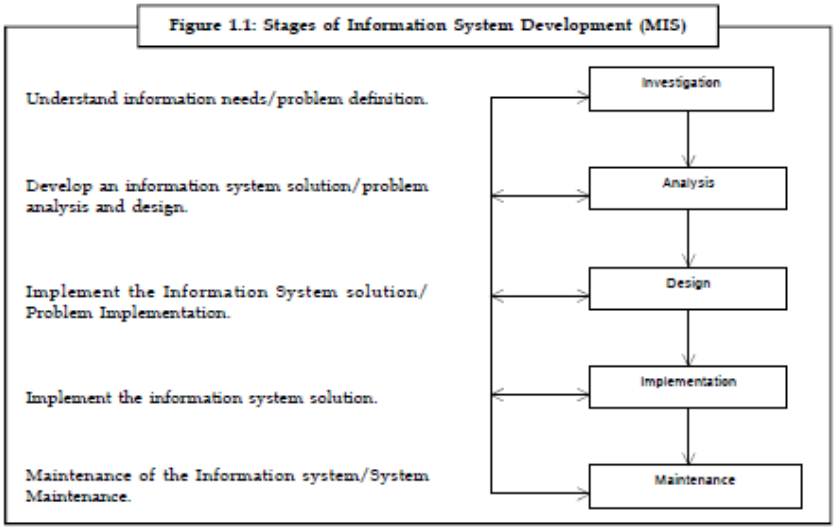
1. Investigation
2. Feasibility Study
3. Analysis
4. Design
5. Implementation
6. Maintenance

This can be represented by a flowchart shown in Figure 1.1.

Each stage of this development process is highly interrelated and interdependent on each other. The system developer has to perform many activities to accomplish each stage. Sometimes he has to go back to the previous stage to implement some changes so that a better system will be there or to produce a better solution to the organization problem or provide the best product to the users of Management Information System.

Now we take each stage individually and the activities related to each stage and how these activities are performed.

Notes



1.1.1 Investigation

This is the first step in preparation of a Management Information System. This stage includes the preliminary study of proposed information system solution to the end users problems.

Because the development of Management Information System is a time consuming and costly effort, feasibility studies have to be conducted. This study is a preliminary study which investigates the information needs of the users and determines the resource requirement, costs, benefits and feasibility of a proposed project.

1.1.2 Feasibility Study

The goal of feasibility study is to evaluate an alternative system and to propose the most feasible and desirable systems for development. The feasibility study is conducted in four different areas:

1. Organizational feasibility
2. Economic feasibility
3. Technical feasibility
4. Operational feasibility.

Figure 1.2 shows the various components of a feasibility study.

The focus of organizational feasibility is on how well a proposed system supports the values and objectives of the organization.

In economic feasibility, the developer conducts cost/benefit analysis, i.e., whether the cost of developing a system is more than benefit or loss because, if the development cost increases than the proposed benefit then the purpose of making Management Information System is defeated or it is not an efficient Management Information System.

This comprises of the study of the hardware and software requirements, availability of these media with in the organization or they have to be arranged. It also includes whether we have to develop our own system or buy some readymade solutions with some modification to meet our needs, etc.

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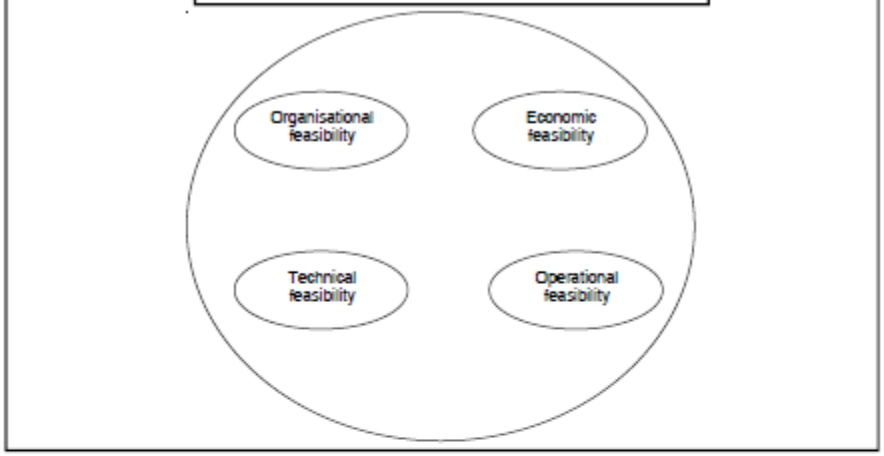
Figure 1.2: Components of Feasibility Study (MIS/D.K.)



In this the willingness and ability of management, employees, customer suppliers and others to operate, use and support a proposed system is studied.

Make distinction between organizational feasibility and economic feasibility.

1.1.3 Analysis

This is the next stage of development process of Information System. It is applicable to both, i.e., for making an entirely new system or improving or replacing the existing one. Some activities of this stage are the next step of feasibility study but it is not a preliminary study like feasibility study. It is an in-depth study and results in the functional requirement hat provide the basis for system design. System analysis involves knowing the information needs of the end user and the organization employees, what are the resources activities and products presently available and the information system capability to meet these information needs.

The process of system analysis starts with analyzing the organization's present system if any, and functional requirement analysis.

To achieve effectiveness in Information System one must know something about the organization like, about its culture, management their experience, qualification, attitude towards computerized Information System, organizational values & norms/organizational working, etc. in detail, in general and specific to each organizational unit so that a balanced Information System comes into existence.

If the company has some information system in existence then it is very important to analyze that system. In this, one must analyze each component of system like hardware, software, people resource, networking and data resources. Whether the existing system serves the purpose of management or it is lacking at some end to serve the solution of information need, so that proper action should be taken at the time of designing the system so that these loop holes can be removed.

Functional requirements are end user information requirements that comprise of:

1. *User interface requirements:* In which one determines what type of input and output requirements of the user are there. It also includes source, formats, contents, etc., of each input & output media.

2. *Processing requirements:* What are decision rules, calculations are required to convert input into output. How much time it takes for processing the input into output?

3. *Storage requirement:* What is the size of data base, whether it is a common data base or distributed. What are the queries of the user?

4. *Control requirements:* What are the types of measures of accuracy, validity, safety, security and adaptability requirement for system input processing, output and storage function adopted.

1.1.4 Design

The previous stages depict what users demand from the system in order to fulfill their information needs and aims at answering "What is needed?" System design stage gives answer to the question "How" the system will accomplish the objective. Systems design consists of design activities that produce system specifications, satisfying the functional requirements developed at the analysis stage. System design consists of two steps – conceptual design and the a detailed design of the information system.

Conceptual Design

Conceptual design represents the structure of Information System. The input to this stage is information requirement and management objective and the output is the performance requirement of those who will develop the detailed design.

The process of conceptual design involves showing the feasibility of meeting the management objective for Information System. This is the phase of system development which gives answer to the question "how" the system will work at gross or high level.

Figure 1.3 shows various activities at the time of design.

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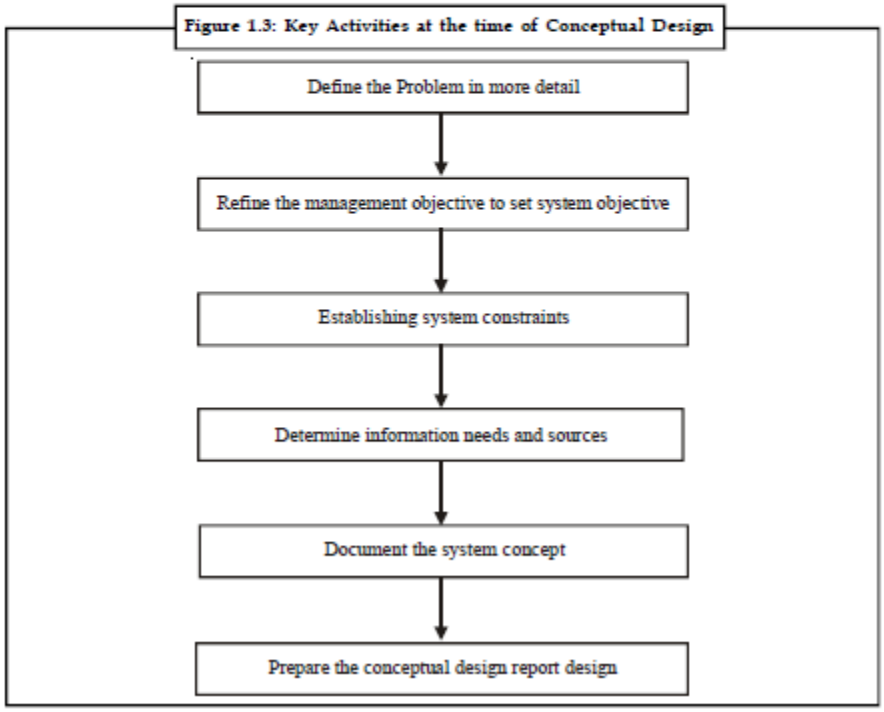


Figure 1.3: Key Activities at the time of Conceptual Design

Define the Problem: With their dynamic nature, the problems must reside in an organization. What really or usually lacks is their proper definition and priority to solve them. Therefore, the first step in Management Information System design is to know the problem in detail. This is achieved by a continuous and iterative process of:

1. Stating the information need
2. Asking questions about that need
3. Suggesting the interpretations of that need
4. Detailing the original statement
5. Reviewing the more detailed statement of need with management.

This process will be repeated until we really understand the information needs and problems to be solved.

Set System Objectives: Like other functional areas, the manager should set objectives in terms of design of information system. Various organizations aiming for information of the records or the processing of the dates, over look the main objective of the information system, i.e., proper management of the information resources.

Although it is a difficult task to set objectives, because most of the organizations set their objectives very vaguely like "improve efficiency;" meet the production schedule" and so on. In order to achieve the objectives successfully they should be specific.

Information system objectives must ultimately be stated in terms of the objectives of the department, group, or in terms of the functions the information system is to perform. Information system objectives should be expressed in terms of what managers can do after their information needs have been full-filled. After setting the objectives, system designer should state them by using descriptive statement, or flowchart, or data flow diagrams and so on, to convert the objectives for the manager which they want to accomplish from the emerging information System.

The objective should be expressed not quantitatively rather qualitatively so that, alternative information system design in particular, and system performance in general can be measured, for information system's effectiveness and efficiency. To conclude, the information system objectives should be aligned with the overall objectives of the organization.

Establish System Constraints: Constraints mean problems, boundaries or restriction that enable the designer to stipulate the condition under which objective may be attained and to consider the limitation that restricts the design.

Determine Information Need: A clear statement of information need is fundamental and necessary for a good system design. If the manager does not convey his or her information needs, a good design will not be prepared. The type of information needs depends on two factors – one is personal managerial attributes of the individual manager and the organizations environment

Develop alternative conceptual designs and select one: Every problem can be solved in a number of ways. So before selecting the most feasible alternative, one has to evaluate each alternative in the light of:

1. Compare anticipated performance of the conceptual design with the objectives of the system.
2. Prepare a rough or preliminary cost-effectiveness analysis of the information system.
3. Examine the flow chart for strength and weakness of each conceptual design.
4. Expand the conceptual design in more details, if none of these provides a preferred design.

Document the System Concept: In this stage manager participation to the design process shows what input, output, master files and rules for processing are required. The general system flow chart is a common method of indicating the general structure of a computer based information system. System flow also reflects the design efforts before and after this stage. At this stage the formats of input are designed. The input received from outside sources is then converted into machine usable forms. The output data definition includes the specifications of the destination like where they go and in what form, etc. Including the specification in what percentage one gets the output and at what frequency and form it will take, i.e., hard copy, soft copy, etc. After preparing the output and after input has been documented, the last step is to prepare a report for the manager.

Prepare the Conceptual Design Report: The conceptual design report, is in a sense a proposal for the expenditure of funds and for organizational change. In nutshell, it consists of performance specification, function to be performed by the system and means by which each function is measured. Along with this report separate documentation should be provided.

Detailed Design

In order to make a detailed design, first of all the system designers have to gain the support of all the staff members from top to bottom level. To seek their acceptance it is better to involve them in the designing process.

The designer uses four sources for the design of the Information System. They are task force meeting; for a larger system an interview with the top, intermediate level manager and a selected group of operating staff; study the internal and external source document; and at last personal observation of operations and communications.

The detailed design is done for the areas of designing user interface, data design and process design.

1. *User Interface Design:* The user interface design activity is related to facilitate the interaction between the user and their computer based application. This involves:
   - On which operating system the Management Information System should be based.
   - Concentrate on the design of attractive and efficient forms of user input and output.
   - Design methods of converting source document into object document means converting human understandable form to machine understandable language.

   This activity produces the detailed design specifications for information product like display screen, forms, documents and reports.
2. *Data design:*
   - It includes the design of the structure of databases i.e. what type of specific data element is carried.

2- System Analyst

1.2 System Analyst

The system analyst is overall responsible for the development of a software. He is the crucial interface between users, programmers and MIS managers. He conducts a system's study, identifies activities and objectives and determines a procedure to achieve the objective. He has a very important role in the development of a system. The concerned person should also have some special qualities which we are going to discuss in this unit.

A Systems analyst is a person who is overall responsible for development of a software. He is the computer professional charged with analyzing, designing and implementing computer based information systems. He is the crucial interface among users, programmers and MIS managers. A Systems analyst can be defined as follows:

A Systems analyst is a computer specialist who translates business problems and requirements into information systems and acts as liaison between IS (Information Systems) department and rest of the organization.

The analyst conducts a systems study, identifies activities and objectives and determines a procedure to achieve the objectives. He is the key member of both MIS organization and the software project team. He is a person with unique skills, experience, personality and common sense. His role has been emerging with advances in technology.

1.2.1 Roles of a Systems Analyst

The Systems analyst performs the following roles during various phases of SDLC. He works as a:

(a) ***Problem Investigator:*** The analyst studies the problems and needs of an organization during feasibility and requirements analysis phases of SDLC. He visits the various departments of the organization and interviews the users. He analyses the problems of the current system and collects their new requirements. The analyst initially works as an investigator by extracting the real problems of the users.

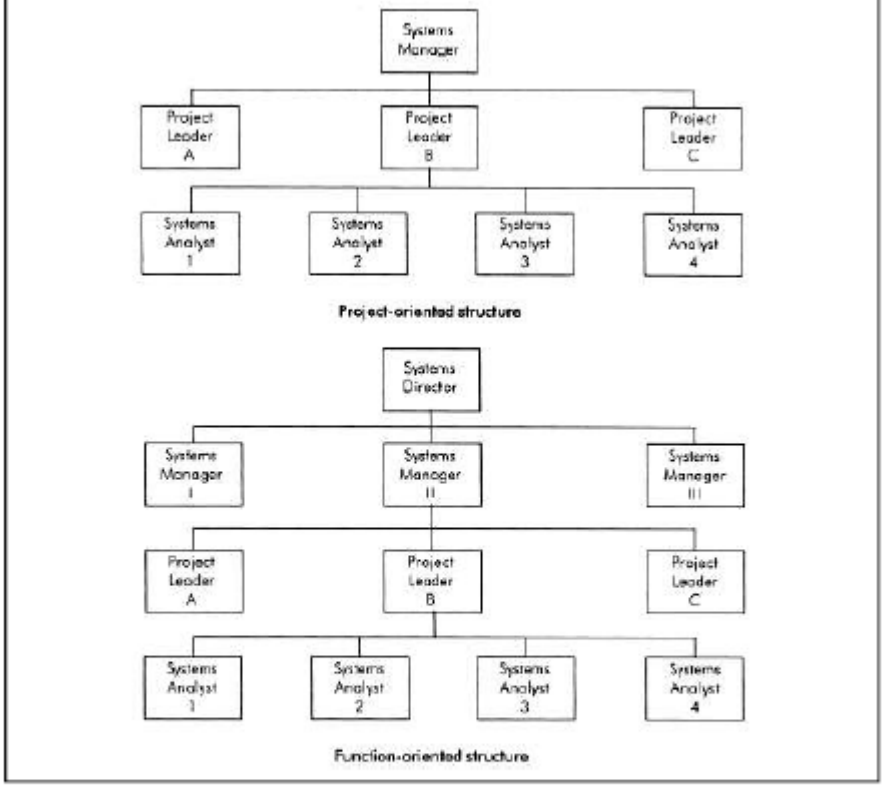
(b) ***Problem Solver:*** The analyst solves the problems of the current system faced by the users. He determines how people, method and technology can improve the current system After feasibility analysis, he presents the system proposal to the management.

(c) ***Systems Designer:*** The analyst creates a detailed physical (current) and logical (proposed) design of the system.

(d) ***Motivator:*** The analyst motivates users to participate in development and implementation of the proposed system. This helps to understands user's feelings about the proposed system. The analyst interprets the thoughts of users and hence, draws conclusions. He appeals management and users for getting the support in development and implementation of the proposed system.

(e) ***Project Manager:*** The analyst monitors the development and implementation of software in relation to quality, cost and time. He works with the project leader for managing the project properly. For development of small systems, the Systems analyst is generally the project leader.

Figure 1.4: Two Types of Project Team Structures



1.2.2 Qualities of Systems Analyst

Success in systems analysis requires interpersonal and technical skills of the analyst. The systems analyst is expected to possess the following qualities:

(a) *Qualified:* The analyst must be highly qualified in software technology. Besides software, he should have a good knowledge of hardware and latest communication and networking technology. He must have a thorough awareness about the working (manual and

(b) *Analytical Thinker:* The analyst must be capable to extract real problems of the users by analyzing the existing system. He is expected to provide the best solutions to the problems. He should be able to provide more than one solution to a single problem so that the users can select the best one. The systems analyst must be capable of tackling any problem of the user. He must be a problem solver and not a problem creator.

(c) *Good Communicator:* The analyst must have a good communication and presentation skills. He must have an excellent command on the language which the user can understand. There should not be any communication gap between the systems analyst and users.

(d) *Experienced:* The analyst should be experienced in both information and management technologies. He should be associated with all types of business concerns

(viz., Manufacturing, Trading, Financial, etc.). The present day systems analysts are expected to possess a good experience in development of software using 4GLS (such as Oracle, Sybase, etc.) and object-oriented languages (such as C++).

(e) *Creator:* The analyst should possess excellent creativity skills that help to convert ideas of the users into concrete plans. He/she should be capable of creating plans and designing systems by drawing diagrams, charts and other illustrations.

(f) *Trainer:* The analyst should be a good teacher for educating and training users in computer-based information systems.

3 -System Analysis & Design

1.3 System Analysis & Design

The study of "Systems" is by no means a new or even recent endeavour. Systems have been in use for the last thousands of years. The Egyptians used bookkeeping system over 5000 years ago for keeping their accounts, while Phoenician astronomers tried to study the systems of stars for making predictions.

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

All organizations need systems for processing of their routine transactions. An information system is a system that provides information to management and other people in an organization. As computers are becoming part of every activity in most of the organizations, many information systems now use computer systems for manipulating information. Systems analysis is the application of the systems approach to develop Computer-Based Information Systems (CBIS) or a computer-based MIS (Management Information System). Before studying the concepts of systems analysis, we must understand the basic systems concepts.

System 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: System Analysis and System Design. System design is the process of planning a new system or replace or complement an existing system. But before this planning can be done, we must thoroughly understand the existing system and determine how computers can best be used to make its operation more effective. System analysis, is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvement to the system. In brief, we can say that analysis specifies what the system should do. Design states how to accomplish the objective.

1.3.1 System

The term system is derived from the Greek word systems, which means an organized relationship among functioning unit's or components. A system exists because it is designed to achieve one or more objectives.

A system is a set of interrelated elements that collectively work together to achieve some goal. For instance, accounting is a system with elements, viz., journals, ledgers, people, etc. and its basic goal is to maintain book of accounts along with preparation of financial and MIS statements. Computer is also a system with elements such as CPU (Central Processing Unit), input device, output device and users; and its basic goal is to process the data and provide information. There are hundreds of definitions of the word 'System', but here we define it as follows:

A system is a set of interrelated elements that form an activity or a processing procedure in order to achieve a common goal or goals by operating on data to yield information.

1.3.2 Subsystems

Most systems are part of a larger system. For instance, Financial Accounting System, Marketing System, and HRD (Human Resource Development) System are parts of a larger system, MIS (Management Information System) and are called subsystems. A system can be made up of many subsystems. A subsystem is defined as follows:

A subsystem is that part of a system that carries one part of the system function.

1.3.3 System Study

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

1.3.4 System Approach

The information systems (such as MIS) are designed on the basis of synergy of subsystems (such as Production, Inventory, Sales and Marketing systems) in order to achieve a net unified cohesive system.

The approach in developing information systems involves focus on the design of a whole integrated system rather than on independent subsystems in order to optimize the net results of the operations of an organization. This is called the systems approach.

1.3.5 Difference between System Approach and System Analysis

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

1.3.6 System Characteristics

A system has the following characteristics:

1. *Organization:* Organization implies structure and order. It is the arrangement of components that helps to achieve objectives. The various elements of a system are organized to achieve objectives. For instance, input devices, output devices and the CPU of a computer system are organized to process the data and produce information.
2. *Interaction:* Interaction refers to the procedure in which each component functions with other components of the system. The various elements of a system are interacted with others to achieve a common goal. For instance, the ledger, journals and people are interacted in a financial accounting system for preparing the final financial statements (e.g., Profit and Loss A/c, Balance Sheet, etc.) of an organization.
3. *Interdependence:* Interdependence means that components of the organization or computer system depend on one another. The various subsystems of a system depend on one another for sharing of input data. For instance, in a computerised MIS (a system), the financial accounting system (a subsystem) receives the input data (e.g., financial data from Invoices, cash memo etc.) from the invoicing system (a subsystem).
4. *Integration:* 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 typically produce a better result as a whole rather than if each component works independently.
5. *Central objective:* Central objective is the last characteristic of a system. Objectives may be real or stated. Although a stated objective may be the real objective, it is quite common that organization may set one objective and operate to achieve another. The important point is that users must be aware about the central objective well in advance.

4-Categories of Information System

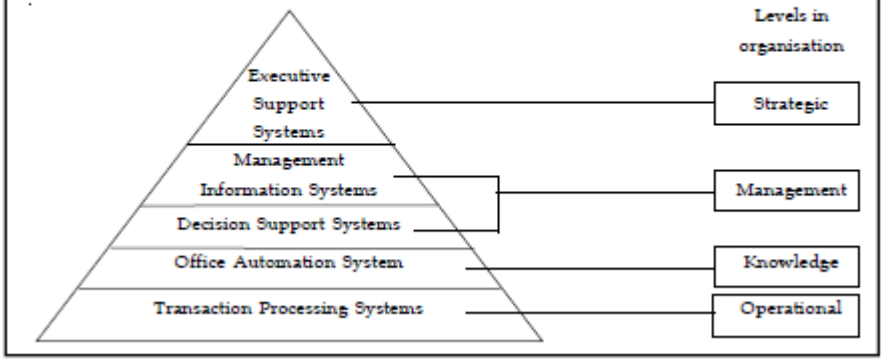
1.4 Categories of Information System

There are five major types of information systems for various management levels of an organization which are illustrated in Figure 1.5 and are discussed below:

1.4.1 Executive Support System (ESS)

This system is designed to address unstructured decision-making at the strategic level of an organization. The systems at strategic level help senior managers in long-term planning. ESS employ advanced graphics and communications software for creating a generalized computing and communications environment.

Figure 1.5: Types of Information Systems Supporting Different Levels of Management



1.4.2 Management Information System (MIS)

This system is designed to serve the functions of planning, controlling and decision-making at the management level of an organization. The system at management level support monitoring, controlling and decision-making activities of middle level managers.

While computers were ideal for routine transaction processing, managers soon realized that the computers' capability of performing rapid calculations and data comparisons could produce meaningful information for management. Management information systems thus evolved out of transaction processing systems. A Management Information System, or MIS (pronounced em-eye-ess), is an information system that generates accurate, timely and organized information so managers and other users can make decisions, solve problems, supervise activities, and track progress. Because it generates reports on a regular basis, a management information system sometimes is called a Management Reporting System (MRS).

Management information systems often are integrated with transaction processing systems.

Example: To process a sales order, the transaction processing system records the sale, updates the customer's account balance, and makes a deduction from inventory. Using this information, the related management information system can produce reports that recap daily sales activities; list customers with past due account balances; graph slow or fast selling products; and highlight inventory items that need reordering.

An MIS generates three basic types of information: detailed, summary and exception. Detailed information typically confirms transaction processing activities. A Detailed Order Report is an instance of a detail report. Summary information consolidates data into a format that an individual can review quickly and easily. To help synopsize information, a summary report typically contains totals, tables, or graphs. An Inventory Summary Report is an instance of a summary report.

Exception information filters data to report information that is outside of a normal condition. These conditions, called the exception criteria, define the range of what is considered normal activity or status.

Example: An example of an exception report is an Inventory Exception Report that notifies the purchasing department of items it needs to reorder.

Exception reports help managers save time because they do not have to search through a detailed report for exceptions. Instead, an exception report brings exceptions to the manager's attention in an easily identifiable form. Exception reports thus help them focus on situations that require immediate decisions or actions.

1.4.3 Decision Support System (DSS)

This system also serves the information needs at management level of an organization. DSS differ from MIS in mainly having more analytical power and more user-friendly capabilities. DSS combine data and analytical/modeling tools to support semi-structured/unstructured decision- making.

Transaction processing and management information systems provide information on a regular basis. Frequently, however, users need information not provided in these reports to help them make decisions.

Example: A sales manager might need to determine how high to set yearly sales quotas based on increased sales and lowered product costs. Decision support systems help provide information to support such decisions.

A Decision Support System (DSS) is an information system designed to help users reach a decision when a decision-making situation arises. A variety of DSSs exist to help with a range of decisions.

A decision support system uses data from internal and/or external sources. Internal sources of data might include sales, manufacturing, inventory, or financial data from an organization's database. Data from external sources could include interest rates, population trends, and costs of new housing construction or raw material pricing. Users of a DSS, often managers, can manipulate the data used in the DSS to help with decisions.

Some decision support systems include query language, statistical analysis capabilities, spreadsheets, and graphics that help you extract data and evaluate the results. Some decision support systems also include capabilities that allow you to create a model of the factors affecting a decision.

Example: A simple model for determining the best product price would include factors for the expected sales volume at each price level.

With the model, you can ask what-if questions by changing one or more of the factors and viewing the projected results. Many people use application software packages to perform DSS functions.

Example: Using spreadsheet software, you can complete simple modeling tasks or what-if scenarios.

A special type of DSS, called an Executive Information System (EIS), is designed to support the information needs of executive management. Information in an EIS is presented in charts and tables that show trends, ratios, and other managerial statistics. Because executives usually focus on strategic issues, EISs rely on external data sources such as the Dow Jones News/Retrieval service or the Internet. These external data sources can provide current information on interest rates, commodity prices, and other leading economic indicators.

To store all the necessary decision-making data, DSSs or EISs often use extremely large databases, called data warehouses. A data warehouse stores and manages the data required to analyze historical and current business circumstances.

1.4.4 Office Automation System (OAS)

This system serves the knowledge level of an organization for supporting knowledge workers like production managers, EDP managers, etc. OAS use computer system to increase the productivity of technical managers in the office.

An Office Information System, or OIS (pronounced oh-eye-ess), is an information system that uses hardware, software and networks to enhance work flow and facilitate communications among employees. With an office information system, also described as office automation; employees perform tasks electronically using computers and other electronic devices, instead of manually.

Example: With an office information system, a registration department might post the class schedule on the Internet and e-mail students when the schedule is updated. In a manual system, the registration department would photocopy the schedule and mail it to each student's house.

An office information system supports a range of business office activities such as creating and distributing graphics and/or documents, sending messages, scheduling, and accounting. All levels of users from executive management to non management employees utilize and benefit from the features of an OIS.

The software an office information system uses to support these activities include word processing, spreadsheets, databases, presentation graphics, e-mail, Web browsers, Web page authoring, personal information management, and groupware. Office information systems use communications technology such as voice mail, facsimile (fax), videoconferencing, and Electronic Data Interchange (EDI) for the electronic exchange of text, graphics, audio, and video. An office information system also uses a variety of hardware, including computers equipped with modems, video cameras, speakers, and microphones; scanners; and fax machines.

1.4.5 Transaction Processing System (TPS)

This system is designed to serve the operational level of an organization. TPS record and process the daily routine transactions of the organization like, accounting, payroll, order processing, etc.

A Transaction Processing System (TPS) is an information system that captures and processes data generated during an organization's day-to-day transactions. A transaction is a business activity such as a deposit, payment, order or reservation.

Clerical staff typically performs the activities associated with transaction processing, which include the following:

Recording a business activity such as a student's registration, a customer's order, an employee's timecard or a client's payment. Confirming an action or triggering a response, such as printing a student's schedule, sending a thank-you note to a customer, generating an employee's paycheck or issuing a receipt to a client. Maintaining data, which involves adding new data, changing existing data, or removing unwanted data.

Transaction processing systems were among the first computerized systems developed to process business data – a function originally called data processing. Usually, the TPS computerized an existing manual system to allow for faster processing, reduced clerical costs and improved customer service.

The first transaction processing systems usually used batch processing. With batch processing, transaction data is collected over a period of time and all transactions are processed later, as a group. As computers became more powerful, system developers built online transaction processing systems. With Online Transaction Processing (OLTP) the computer processes transactions as they are entered. When you register for classes, your school probably uses OLTP.

1.4.6 Stationary and Non-stationary System

The operations and properties of a stationary system do not change significantly while those of a non-stationary system change with time.

Example: A computerized MIS is a stationary system because once designed, the MIS handles problems and provides information on a routine basis without any significant changes.

Example: An organizational system that tends to adapt to a changing environment is an example of a non-stationary system.

1.4.7 Adaptive and Non-adaptive System

Adaptive System tend to adapt to a changing environment while non-adaptive systems do not adapt.

Example: An organizational system is an adaptive system and a MIS system is a non-adaptive system.

Stationary system is always non-adaptive while non-stationary systems are adaptive systems.

5-System Development Strategies

1.5 System Development Strategies

After designing the input and output, the analyst begins developing the software using a programming language. This is the phase, when the programmers play their major role in development. They start designing the data structures and writing of programs as per the documents prepared during design phase. So, this phase can be categorized into two

Did u know? Systems development is, basically, a problem-solving action. A problem in an application domain is malformed by the systems development procedure into a solution in the computer's implementation field.

1.5.1 Unified Methodology Approach

Methodologies are a formal effort to address intricacy via the use of standard, conventional strategies to systems development. Current methodologies are apt to concentrate on chiefly one unit of disintegration, but they fluctuate on what that unit of disintegration is. Most general methodologies base disintegration on either process or data, or some combination of the two.

The procedure approach to managing intricacy is seen, for instance, in the structured techniques – structured analysis, design, and coding. It is, possibly, the oldest and most broadly accessed methodology, and also is the one most often referenced in the information systems concept. The structured techniques all mainly utilize process decomposition, even though the seminal functions on structured analysis also incorporated normalization of data as a secondary concentration of the methodology.

The data approach to managing intricacy is observed in information engineering. It has its origins in the entity relationship strategy to modeling data. Information engineering originally employs data decomposition at the enterprise or organization stage to manage problem intricacy, the motive being that an enterprise's data is, in common, more steady than the processes accessed to proceed on that data. After the preliminary data analysis, systems projects are produced by means of process decomposition, which is, as a result, a secondary importance.

Caution The dissimilarity between process and data-oriented methodologies is one of preliminary emphasis. So, ultimately, both orientations must be measured.

The object-oriented strategy to managing intricacy considers both data and procedure as a package. An object is a constituent of the problem's world, a consistent compilation of data coupled with the procedures (methods or functions) acting on that data. The function of systems development by means of the object-oriented approach interleaves analysis and design of objects with analysis and design of the processes concerning to those objects. The foundation for the object-oriented strategy is that application problems frequently develop around real-world objects and the manners in which they interrelate.

sub-phases, i.e., database design and program design. Database design is the most important aspect of developing a new system. As data is the basic component or raw material of any information system, it is needed to be stored in an organized way. How data has to be organized, depends on the requirement specifications, hardware configurations and the features of programming language and DBMS used. What is DBMS and how database can be organized and managed?

Program design is mainly concerned with writing of programs (coding), editing of programs using a text editor or word processor, debugging and finally testing them. There is generally a team of programmers, who work under guidance of their project leader/systems analyst and do all the codings.

Two method-dependent strategies for systems development can be recognized. The first strategy depends on methodology; and the second on technique.

Whether the systems developer utilizes a process, data, or object-oriented strategy, the methodology concerning the strategy will be consistent and organized. Such a methodology is termed here as "unified."

1.5.2 Technique Approach

Methodologies are, certainly, compilations of connected techniques. Disaggregating most methodologies consequences in recognizes techniques of unstable utility – some techniques are exceptionally important, some are comparatively valuable, and some have only minor value.

Example: A previous constituent of the structured techniques was the concept of a "Chief Programmer Team." Over the years, as it became obvious that this was not a victorious part of the structured techniques, that concept was removed.

Due to this inconsistency in the value of constituent methods, there are those who utilize collections of suitable techniques instead of unified methodologies.

With this approach, systems developers are taught in the utilization of "best of practice" techniques recognized to have been victorious in resolving an enterprise's troubles.

Self Assessment

Fill in the blanks:

13. Program ..... is mainly concerned with writing of programs (coding), editing of programs using a text editor or word processor, debugging and finally testing them.

14. The foundation for the ..... strategy is that application problems frequently develop around real-world objects and the manners in which they interrelate.

6-Implementation

1.6 Implementation

Implementation means to introduce the designed system into practice or in use. The implementation process covers the following:

1. Acquisition of hardware and software resources required by the proposed system.
2. Develop the computer program or perform any modification in the existing programs or the software package purchased.
3. Train the end user - it involves (a) preparing training program and documents that explain how to operate the proposed system. i.e. to make manual of the Information System. (b) Educate and train managers, sales person, computer operators who operate the system.
4. Test the system and remove errors if any. This process is continued till system is free from errors.
5. Conversion process i.e. to introduce a new system.

The conversion process has many ways to convert from old system to new system.

A. *Parallel:* When new and old systems are run in parallel for a trial period and a comparison of both is done. If the proposed system gives a satisfactory solution to information need, it is accepted and the old one becomes obsolete.

B. *Pilot:* In this the new system is introduced at one location or site only for trial. If its performance is according to the need, it is introduced in whole of the company or organization.

C. *Phasing:* Introduce the system in phases i.e. the new system is introduce at one site at a time. This method is useful when upgrading of old system is done.

D. *Plunge:* It is also known as an immediate cut over or change-over. Introduce the new system as and when it is ready to work and remove the old one directly.

Except for the timing and for obvious variations, the implementation steps for all four methods may be covered together.

Notes It should be pointed out that occasionally design and implementation are carried on simultaneously. Such a process provides operational testing of the design on a continuous basis, but it limits consideration of major design alternatives. It is a trial-and-error process. Completion of conceptual and analytical design in advance of equipment installation offers many advantages besides cost.

So these are the four basic methods of implementing Information System in an organization, after the completion of the design stage.

Self Assessment

Fill in the blanks:

15. ..... means to introduce the designed system into practice or in use.
16. ..... is also known as an immediate cut over or change-over.

7- Evaluation and Maintenance

1.7 Evaluation and Maintenance

After introducing the system for some time usually after a month, the system developer takes feed back from the manager, sales person, operators and users of the system that whether the system is achieving its objective or not. This process is known as evaluation.

System maintenance is the last or concluding stage of Information System development process. But it's importance is not less being the last stage because an effective systems can fail if they are not maintained properly.

Maintenance involves control, evaluation and modification to make a better system. Maintenance is required, because sometimes operators develop their own private procedure, or make some short cuts, or some unauthorized person introduces some changes in the present system without taking permission. Maintenance activity is initiated by error reports, a user change request, a member of maintenance team, or by the management.

Proper planning is done for maintenance. It involves:

a. Collect all requests for change.

b. Give priority to each request after analysing their long run benefit and cost effects.

c. Prepare short plans.

d. Document the maintenance as it occurs.

Again review the Information System design manual.

But sometimes there are certain problems or barriers in performing maintenance. They are related to, when there is no proper plan for maintenance; resources are not allocated for this purpose, lack of qualified staff, lack of management and user's support and interest for maintenance.

Maintenance activity is related to make some modification i.e.,

1. To change the policy statement
2. To change forms
3. To change operating system
4. To change procedures, etc.

Self Assessment

Fill in the blanks:

17. After introducing the system for some time usually after a month, the ..... takes feed back from the manager, sales person, operators and users of the system that whether the system is achieving its objective or not.

18. ..... involves control, evaluation and modification to make a better system.

Case Study

A Nontraditional Systems Analysis and Design

The termed software crisis was coined in 1968 by the NATO Software Engineering Conference for the myriad of problems in the development of quality software. The field of Software Engineering grew as a response to those problems and system analysis and design were recognized as important components of quality software. Since 1968, hardware costs have dramatically dropped and many software problems can be addressed through the use of application utilities - word processors, spreadsheets, data bases, etc.

With the hardware and software in the hands of the users, program solutions can be created by the users, and thus, analysis and design may be done by "anyone."

We present a case study of the design of a system by an end user. The user was technology literate, but had no formal training on systems analysis and design. A comparison is drawn between this approach and classic system analysis and design. The benefits and problems with this modern approach are also considered.

This modern approach has the potential to provide systems solutions to many problems, but could lead to a different problem, a new software crisis – using modern hardware and software with ad hoc analysis and design. These system solutions are developed very quickly and cheaply, but many times without consideration for the users or proper data handling methods.

Producing reliable, robust, cost-effective software systems has always been a problem for the computing industry. In 1968 the term software crisis was coined by the NATO Software Engineering Conference for the myriad of problems in the development of quality software. In those days, computers were less common and more expensive; there were few programmers and analysts; every system was developed from "scratch." Even small projects took months to develop and were thus expensive undertakings.

Computer Science (CS) and Computer Information Systems (CIS) programs have responded to the problem in a number of ways. Early programming courses taught not only the particular language, but also how to develop quality programs; sometimes called program engineering. Both programs provided courses in Systems Analysis and Design and later in Software Engineering.

Students were taught a systematic approach to the development of computer systems.

They learned the lifecycle of a system and how to approach the analysis, design, and implementation to produce reliable and robust software. In many programs, students were expected to demonstrate their competence through a project courses before they graduated and joined an IT department and at the time, the only people developing systems were the IT departments.

However, computing has changed since 1968. Computers are now cheap and plentiful.

Modern programming languages have been developed, providing a number of improvements, most notably ease in developing a graphical user interface.

A useful development, for creating software systems, has been the creation of application utilities – word processors, spreadsheets, data bases, etc. Now many "programming" solutions can be developed primarily by customizing these packages.

Furthermore, the combination of inexpensive hardware and application utilities has allowed the end-user to develop their own unique software applications. Users no longer need to wait for an IT department or consultant. Those who are interested may develop their own. Development has moved from the hands of the CS/CIS, IT expert into the general population.

The following is a study of one particular system developed in this new style: a technology savvy user implementing a system with application utilities. The chosen problem is simple and straight forward; one that could be approached by a sophomore/junior CS/CIS major. Names and identities have not been used to ensure privacy.

Case Study: Problem

A local public school system provides special education services to preschool children by sending itinerant teachers to service these children at various preschool and day care facilities. These teachers must periodically (yearly) conduct "case conferences," which provide progress reports using multiple state and local mandated forms. These multi-copy forms are preprinted, filled out by hand by the teacher, and then distributed to the parents and the student's permanent file. The file is intended to follow the student as he/she enters the public school system.