Dr. C.V. Raman University
Kargi Road, Kota, BILASPUR, (C. G.),
Ph. : +07753-253801, +07753-253872
E-mail : info@cvru.ac.in | Website : www.cvru.ac.in

Management Information System

Institute of **Open** and **Distance Education**

Faculty of Management

Management Information System

3BBA6

DR. C.V. RAMAN UNIVERSITY
Chhattisgarh, Bilaspur
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Management Information Systems

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Compiled, reviewed and edited by Subject Expert team of University

1. Dr. Archana Agrawal

(Associate Professor, Dr. C. V. Raman University)

2. Dr. Vaibhav Sharma

(Associate Professor, Dr. C. V. Raman University)

3. Dr. Pritendra Malakar

(Assistant Professor, Dr. C. V. Raman University)

Published by:

Dr. C.V. Raman University

Kargi Road, Kota, Bilaspur, (C. G.),

Ph. +07753-253801,07753-253872

E-mail: info@cvru.ac.in

Website: www.cvru.ac.in

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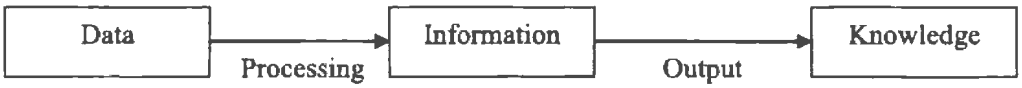
INTRODUCTION

This chapter provides the basics of information systems, a requirement for everyone working in various types of organizations today. As tomorrow's managers, entrepreneurs, or business specialists, business students need to know how to use and manage information technology in today's networked enterprises and global markets. In this dynamic environment, they will rely on interconnected networks of information systems for end user collaboration, including communications and computing among end user work groups and teams, and enterprisewide computing, including communications and information processing for business operations, managerial decision making, and strategic advantage. Information technology is an extremely important and increasingly complex component of business and professional organizations. Decisions related to information technology and the related information systems can be a major factor influencing an organization's survival.

Managers at all levels must make decisions about which systems are best for specific situations. The personnel within organizations today must have an understanding of the role of information systems, as well as appropriate methods for using the technology effectively. Let's study some basic concepts of Information System.

DATA, INFORMATION AND KNOWLEDGE

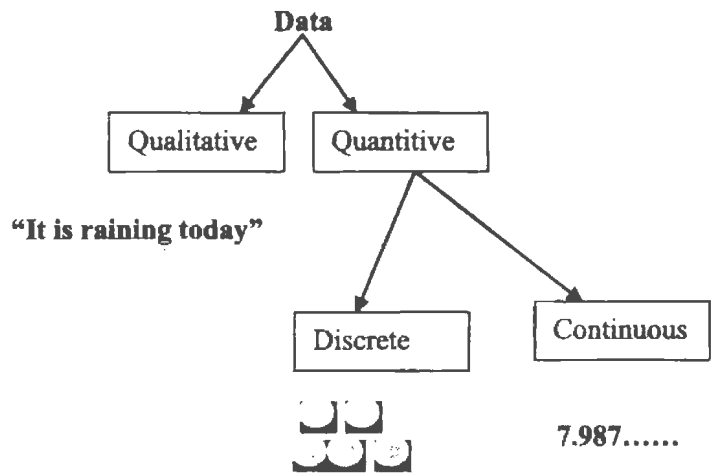
Data after processing gets converted into information. Therefore data is the foundation of information. Information enhances the knowledge, therefore information is the basis of knowledge. In this way data, information and knowledge are mutually related.



Data

Data is a collection of facts, such as values or measurements. It can be numbers, words, measurements, observations or even just descriptions of things. Data can be qualitative or quantitative.

- **Qualitative data** is descriptive information (it *describes* something)
- **Quantitative data**, is numerical information (numbers).



And **Quantitative data** can also be Discrete or Continuous:

- **Discrete data** can only take certain values (like whole numbers)
- **Continuous data** can take any value (within a range)

Data is raw. It simply exists and has no significance beyond its existence (in and of itself). It can exist in any form, usable or not. It does not have meaning of itself.

Information

Information is data that has been given meaning by way of relational connection. This "meaning" can be useful, but does not have to be.

(1) Data that has been verified to be accurate and timely, (2) is specific and organized for a purpose, (3) is presented within a context that gives it meaning and relevance, and (4) that can lead to an increase in understanding and decrease in uncertainty.

The value of information lies solely in its ability to affect a behavior, decision, or outcome. A piece of information is considered valueless if, after receiving it, things remain unchanged.

Characteristics of Information

Information incorporates the following characteristics :

- meaningfulness
- surprising element
- conformity with previous knowledge
- correction to previous knowledge
- brevity
- accuracy
- timeliness
- action oriented

■ **Meaningfulness :**

The relevance of information with requirement should be maintained otherwise the information would be meaningless. For example, if we want to go to Paris but we are collecting information about Shanghai, it will solve no purpose to us and will remain irrelevant.

■ **Surprising Elements :**

Information should also cover the knowledge about exceptions such that if any exception occurs, then we should be able to tackle it efficiently.

For example , in an intelligence bureau, some of its members are spying for other agencies, then it is necessary to take immediate action to stop them. But if bureau is unaware of such persons, they may lose many vital information to enemy agency.

■ **Conformity with Previous knowledge :**

If the information is changed suddenly and lacks conformity with previous information then it may misguide us in attaining our objective.

■ **Correction of Previous knowledge :**

The information gathered may have some deficiency or may have some changes, in comparison to the previous knowledge. But the new information should either insert some positive changes to the previous knowledge or nullify the previous deviations. New information may be modified but it should not be so exceptional that it becomes difficult to believe in.

Check Your Progress :

1. How does data information and knowledge are relate to each other ?
2. What do you mean by data ?
3. What are characteristics of information ?

- **Brevity :**

  In any detailed report, information should not incorporate irrelevant data with it. If a detailed report is given to the decision makers then it will be difficult for them to emphasis on vital items of desired project.Therefore the information should be brief, so that decision maker can evaluate the projects under considerations and conclude out the best result.

- **Accuracy :**

  Information should be accurate. The rate of accuracy could vary with the requirement. The estimate of the population of a country may have tolerance level of 15% which means that the data is 85% correct still it is accepted. But in the case of a bank, the statement of an account should be 100% accurate, otherwise it may lose its goodwill among its customers.

- **Timeliness :**

  To initiate a work, or to rectify any deviation in any activity a timely information is required. If a doctor receives the reports of the seriousness of the diseases after the death of the patient, it would be meaningless. If a manager receives the report of zero inventory after the production has stopped, it would solve no purpose. Timeliness should be maintained.

- **Action Oriented :**

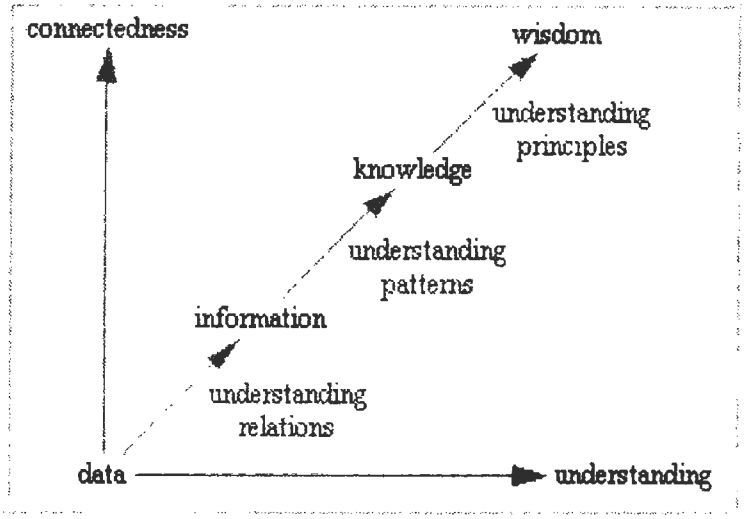
  Many managers receive the information on time but they find it deficient in some or other means items. This creates difficulties in planning and actuating the job. So the information should be sufficient in itself, and helpful in reaching some purposeful decision.

Knowledge

Knowledge is the appropriate collection of information, such that it's intent is to be useful. Knowledge is a deterministic process. When someone "memorizes" information (as less-aspiring test-bound students often do), then they have amassed knowledge. This knowledge has useful meaning to them, but it does not provide for, in and of itself, an integration such as would infer further knowledge.

According to Russell Ackoff, a systems theorist and professor of organizational change, the content of the human mind can be classified into five categories:

1. **Data**: symbols
2. **Information**: data that are processed to be useful; provides answers to "who", "what", "where", and "when" questions
3. **Knowledge**: application of data and information; answers "how" questions
4. **Understanding**: appreciation of "why"
5. **Wisdom**: evaluated understanding.



CONCEPT OF SYSTEM

To understand what system is, let us consider the example of our body. Our body is a structure based on several systems. It contains respiratory system, digestive system, reproductive system etc. Our body functions smoothly only because of the mutual co-operation of these systems. If any of these systems develop a snag it affects the normal functioning of the whole body. Similarly the computer system has various units, the co-operation amidst all these is required to run it smoothly.

System is a combination of two words- syn+histanai which stands for "standing together". In Latin and Greek languages these are known as systema. Systema means - organized whole. The Webster's Dictionary has defined it as follows :

"System is an orderly combination or arrangement, as of parts or elements, into a whole; specifically, such combination according to some rational principle; any methodical arrangement of parts."

The Oxford Dictionary has given its terse definition :

"A group of things, pieces of equipment, etc. that are connected or work together : a transport system, a stereo system, a computer system."

We can conclude it as the following -

"A system is a whole of different parts, which in a basic and arranged way, are related to one another. Their objective is to achieve a certain aim."

Here parts means, machine, engine, wheels or different arranging activities (planning, directing, controlling etc.).

Therefore we can say -

- A system is prepared to achieve a pre-set goal.
- There must be inter relation and interdependence amidst different parts of a system.
- In a system, the aim defined by an organisation is more important than that defined by a part. It means the aim of the different units of a system is to attain the principal aim and not those ones decided by the units themselves.

CHARACTERISTICS OF A SYSTEM

A system should contain the following characteristics -

- Organisation
- Interaction
- Interdependence
- Integration
- Central Objective

Organisation

It stands for an order or structure. It is such an arrangement of different units which helps obtain a certain objective. For example, in a Commercial Organisation, the relation between the manager and the general manager, between the manager and other staff displays a structure.

This order displays a relation between the sub units of different systems, structure, communication and a chain of commands.

We can understand this order through computer. As the input device, the output device, the central processing unit, the memory etc. collectively constitute a computer, different small units form a big one. The structure of an organisation has been displayed in the figure.

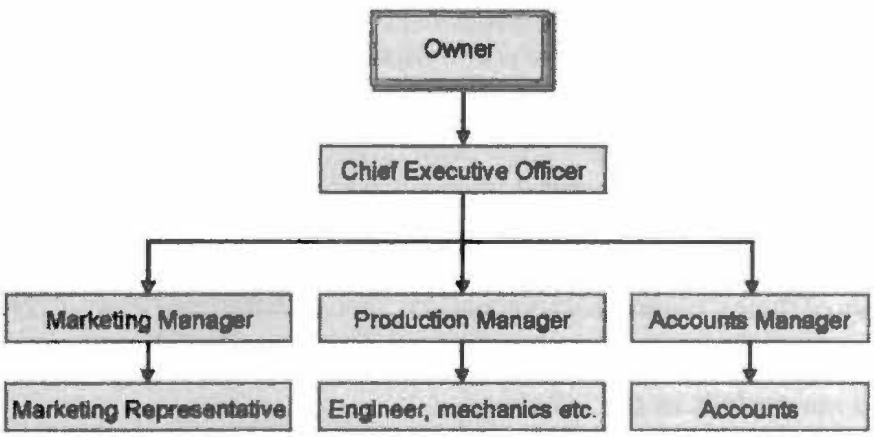


Figure : Organisation Structure

Interaction

Interaction stands for the method, by which different units or sub-units of a system relate to one-another or function together. In a Commercial System the production unit has to relate to the purchase unit. The advertising unit has to relate to the sales unit and the pay-roll unit has to relate to the personnel unit, so that they can accomplish a particular task successfully.

In a Computer System, the C.P.U. connects with the input device. The principal memory contains more programs and data, which it uses for some calculation.

The inter-relation amongst these different units enable a computer to function properly.

Interdependence

Interdependence refers to the dependence of different parts of a system upon one another. These different sections are connected to one-another under certain planning. A sub-system in a system depends upon the input provided by some other sub-system.

The same output supplied by some sub-system after passing through certain procedure is used as input by some other sub-system. Thus this procedure keeps on going and every sub-system contributes to attaining the goal. Figure shows three levels of sub-units.

Integration

Integration means an understanding between all the principal as well as sub-units of a system so that they contribute to the attainment of the goal.

If even the smallest part of a system is incapable of doing this, it can be synonymous with the failure of the whole system.

Central Objective

The final feature of a system is its Central Objective.Any purpose or objective can be real or defined. It is also possible for an organisation that it can make an effort to attain a defined objective and some other objective together. It is necessary for the successful design of a system that the user knows about the Central Objective at the time of analysis.

The whole system contains many parts and their sub-parts. Each of them has its

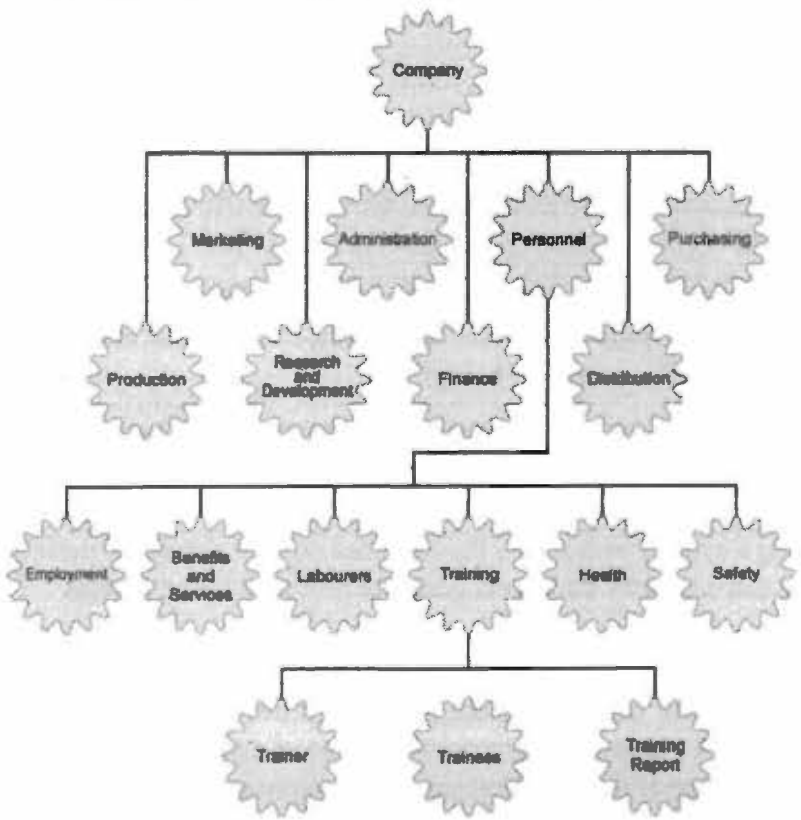


Figure : Principal sub-system of a productive Organisation

own specific duty which it accomplishes and its accomplishment is not its central objective. It means the central objective remains unaccomplished until the objective fixed at the time of building the system is achieved. For example, a company launches a very good product but owing to some drawback in its marketing policy the product doesn't catch the market. In this situation, though the production unit has accomplished its target well, yet its central objective, which was to establish it into the market remains unfulfilled. Therefore, we can state, that the central objective is based on the success of the whole system. One more example, suppose the body of a man is a system, the central objective of which is to keep itself alive. If the digestive system functions well but the respiratory system fails to do so, the man's body will turn inactive and even the digestive system will stop functioning.

ELEMENTS OF A SYSTEM

In a system there are three principal activities to attain an objective –

To get probable output we give input which is acted upon and we get expected result. For this, the following important elements are responsible :

- Inputs and Outputs
- Processors
- Control
- Feedback

Inputs And Outputs

The major objective of any of the systems is to give output to the user. In addition, it is also required that the output should be important for the user. The output provided by the system could be in the form of objects, services or information.

Inputs are those parts of a system, which are provided to the system to complete a certain activity procedure. Generally, these inputs are in the form of articles, information or human beings.

Output is the outcome of the activity. As in a trade, human beings, financial and material resources are used to produce some articles or services, inputs are provided to a system to get outputs from it. Hence, it is required that before providing a system with inputs the expected outputs should be defined so that keeping them in view the inputs could be provided to the system.

Processor

A processor is the part of a system which turns the inputs into outputs. It is an active part of a system. A processor is capable of altering the inputs as per the outputs. It means if the specification of the output is altered, its procedure too is altered.

Control

This very element of the system conducts the system. None of the systems is complete without this element. This is a decision making sub-system which arranges the ways of conducting the inputs, processing and outputs. For example the Computer System Control Unit directs the actions of Arithmetic and Logic unit as well as Main Memory unit and reins in all its actions.

Feedback

Feedback is such an information which tells how the system is working and on that basis the system can be modified.

Feedback is a way of measuring the output. Through it the accomplished outputs and the expected outputs are compared. If there is no similarity between the desired and the accomplished outputs, some changes are made in the inputs and the processing and the desired outputs are tried to be accomplished. The output is again brought back to the input or management controller, so that the desired output can be obtained.

Feedback is generally either positive or negative. Generally the positive feedback strengthens the system. It has a regular nature.

The negative Feedback provides information to the controller, which points out to changes. The controller is the person or the system which controls the activities of a system. Feedback generally takes place in two stages :

- **System Analysis** – In the stage of analysis the user provides the analyst with feedback, with the help of which, the analyst can make alterations in the system.
- **Post System Implementation** – When the system is implemented, the user, after reckoning its performance, gives the feedback so that the performance of the system can be improved or desired changes can be caused in it.

SYSTEM ENVIRONMENT AND BOUNDARY

System components have a temporary arrangement and various components of that system function within a limit. This limit itself is called boundary. This boundary decides a particular time for a specific system and separates it from the other system. A system has several sub systems which to attain an objective, work within a boundary created by the system.

The surroundings around or outside a system is called environment. The environment is a source of external elements which ensures the action mode of the system. To understand what system environment and boundary is we, for example, take several units of a company. The account section of the company is restricted only to the accounts of the company which is its boundary and it is not allowed to interfere with the marketing section. But the environment of the company is based

NOTES

on different sections of the company, its creditors, debtors, competitor companies, bankers, customers etc. The system has to achieve its goal on the basis of mutual co-operation with all the elements of the environment.

The system gets the input from the environment itself and returns the output to the same.

TYPES OF A SYSTEM

- Physical System
- Abstract System
- Open System
- Closed System
- Information System

Physical System

Physical systems are tangible and they can be static or mobile. For example the things being used in a company like the office, the tables, the chairs etc are helpful in running a computer. These are countable and concrete. These are static. At the same time a programmed computer is a system in motion. Its data program, outputs and inputs vary with the demand of the user.

Abstract System

Abstract systems are imaginary and intangible. In such systems there is abstract conceptualization of physical situations. The model or algorithm of a system can be taken as an abstract system. Algorithm or any other model completes any physical conditions on imaginary basis which is significant in accomplishing the real tasks.

Open System

It is a system which relates to its environment independently and receives input from it and returns it and it keeps on changing according to the environment. For instance, an ocean exemplifies an open system. An ocean is an element of the hydrosphere and the oceanic surface acts as an interface between the hydrosphere and the atmosphere. The solar radiation passes through the atmosphere and is absorbed by the ocean, then the absorbed energy evaporates the water and it returns as vapour to the atmosphere. And again it condenses in the atmosphere and joins the ocean as water. The information system is also an example of the open system which first takes input from its environment and then returns the same as output.

Closed System

The closed system in no way relates to its environment. As a result the changes occuring in its environment do not affect it. We can consider the earth as a closed system. The boundary of the earth is the outer end of the atmosphere. Generally there is no exchange of any sort between the earth and the rest universe. Though it is not an entirely closed system for the energy passes through the boundary of the earth but there is no exchange of its mass.

Sprain Your Brain

What importance do the following general systems concepts have for the systems analyst who is working on development of a computer-based information system? Give examples of each as they apply to information systems.

a. system boundary

b. system environment

c. feedback

d. open system

e. closed system

f. subsystem

g. interface

h. performance standard

Information System

The information system is a system which collects or provides information either for decision making or for the important operations of the system. For decision making in a system, the information plays an important role. For instance, the price of the products of your competitors available in the market which you produce also, helps you decide the price of your own products. Similarly if your work is related to shares, then the information like the government policies, the policies of the international markets, the price of petroleum products etc. would help you take decision and guide your policies further.

Greater risks can be avoided with the help of the information system. You must be remembering how the tsunami unleashed terror and destruction in Srilanka and Indonesia as well as India. This too has reached your ears after tsunami, seeing the wide-spread destruction caused by tsunami it is being stressed in our country that a system which would cost in billions must be developed that can give us prior information about tsunami, other oceanic earthquakes and tempests. The long and short of this is, an information system can save us from wide-spread destruction by giving prior information about the imminent dangers.

Many types of information systems have been created keeping in view the requirements of trade. These are, generally, called computer based information system. As we have many means of communication, there are many types of information systems. These are classified as the following:

- Office Automation System
- Transaction Processing System
- Management Information System
- Decision Support System
- Expert System
- ERP System

Check Your Progress :

4. What are the characteristics of a system.
5. Write the name of elements of a system.
6. In system analysis stages how does use give feedback.

Office Automation Systems

Office Automation systems are the latest and the most rapidly popularising systems amidst computer based information systems. These are being used in most of the institutions and organisations. The objective of these systems is to improve the efficiency and productivity of the staff of the organisation.

Many of the organisations have turned their offices into completely automated offices with the help of this system. It includes many manual activities like textworks such as correspondence and creating notice, circular and other textual documents on computer which not only speed the text works but includes activities like collecting the task, editing it and printing it with the help of printers so that it can be done again in no time. In this direction the computer based communication is also a big task in which the electronic mail is chiefly being used. With the help of electronic mail people can send and receive their messages very rapidly. A lot of financial institutions such as banking, insurance companies, stock exchanges etc. are using this facility on large scale. The use of personal computers by executives for their defined tasks is much in vogue. The documentation of such people is supposed to be very good and organised. The Office Automation System can be defined as this-

"Office Automation System is a multi-functional, integrated computer based system which accomplishes several activities taking place in the electronic phase in the office."

Office automation Systems are not only used in the above said manner but also can be tagged to some other types of computer based information systems. For example, word processor is mainly for the micro computer but a few organisations are using them in the form of transaction processing applications. These are the micro computers which the office staff use as terminals to access the corporate data files and use the Management Information System. Besides, some decision support systems are being developed on micro computers by the professionals.

Most Office Automation Systems get appointments, documents, address etc. in the form of inputs. As the process of Office Automation systems there are word processing operations, data collection and retrieval. Their outputs are time schedule, memoranda, mail and several other administrative reports.

Transaction Processing System

It includes all sorts of activities related to trade processing such as invoicing, billing, order entry, despatch, delivery, store accounting etc. In all such applications, it is necessary to update data collection to perform any task such as creating invoice, receiving orders, supplying the product or receiving it or paying the bill. A transaction is supposed to be complete only when all the databases are updated and all the updates are completed. In the case of incomplete update the information too is considered incomplete and any decision taken on the basis of this incomplete information may bring harm. For instance, some goods are dispatched from a warehouse in the inventory control system. After the dispatch it was processed in the dispatch file but the effect of this dispatch was not entered into the sales report. Obviously, the sales report data will not be correct.

Transaction process is a set of several procedures which contains the following activities.

- Calculation
- Classification
- Sorting
- Storage and retrieval
- Summarization

All the above mentioned activities are completed in the order given above.

In a Transaction Process, there are three methods of Data Processing -

- Batch Processing
- Online Processing
- Real-Time Processing

- **Batch Processing :** In Batch Processing data are collected for a certain period and are processed in a batch. Batch Processing becomes more useful when records in a large database are to be acted upon. Many organisations give priority to Batch Processing for the act of billing.
- **Online Processing :** Though a few organisations use Batch Processing in some specific applications, most of them still use Online Transaction Processing Systems. Online systems reduce the cost of data processing and provide better service. In this method, the data are very swiftly acted upon by the C.P.U.

  Whenever the user wants to enter or access the data he can complete it in a few seconds. Unlike batch processing, in it every data is separately acted upon as a result there is no need to wait for action. Online system is much in vogue in banks.
- **Real-Time Processing :** Online information system is not always real time information system whereas the real time systems must have online capacity device. In the real-time system the time consumed between entering and processing the data should be minimum. The time interval consumed in it depends on the need of the user. It can be either the thousandth or the millionth part of the second or a few seconds.

Management Information System

Management Information System makes the Transaction Processing systems perfect by adding the requirements of management report to it. These reports are helpful in the planning condition and control of the transaction processes. It means -

Management Information = Transaction Processing System + Management Report

Management information system is an information system which prepares the management report in pre-defined and definite formats. Management information system creates information on the basis of accepted management and statistical models. For instance, Materials Requirement Planning is a formal model for Building Production

and Material Procurement schedules on the basis of sales projections. MIS will create the schedule for MRP on that model.

Management information is created by a shared database which obtains the data from many sources including transaction processing system. Thus data analysis and database design become analytical for MIS design.

Management information systems produce detailed information, brief information as well as information. The detailed information is used in operation management and regulatory necessities. Brief information informs about the trends and probable problems by supressing the raw data. Exceptional information filters the information and informs about the exceptions of some rules and standards. For example exceptional information reports about those products which are available in low quantity in the inventory.

Better Perception : Management Information System

Management Information Systems (MIS) is a general name for the academic discipline covering the application of people, technologies, and procedures — collectively called the information system — to solve business problems. MIS are distinct from regular information systems in that they are used to analyze other information systems applied in operational activities in the organisation. Academically, the term is commonly used to refer to the group of information management methods tied to the automation or support of human decision making, e.g. Decision Support Systems, Expert systems, and Executive information systems. This chapter delivers information on MIS in details.

MIS may be defined as the combination of men, machines and procedures for collecting pertinent information from the internal and external source of a firm, and processing these information for the purpose of facilitating the process of decision making.

The Management Information System (MIS) is a concept of the last decade or two. It has been understood and described in a number of ways. It is also popularly known as the Information System, the Information and Decision System, the Computer-based Information System.

The MIS has more than one definition, some of which are given below.

- *The MIS is defined as a system which provides information support for decision making in the organization.*
- *The MIS is defined as an integrated system of man and machine for providing the information to support the operations, the management and decision making function in the organization.*
- *The MIS is defined as a Computer-based Information System.*

Though there are a number of definitions, all of them converge on one single point, i.e., the MIS is a system to support the decision making function in the organization. The difference lies in defining the elements of the MIS. However, in today's world, the MIS is a computerized business processing system generating information for the people in the organization to meet the information needs for decision making to achieve the corporate objectives of the organization.

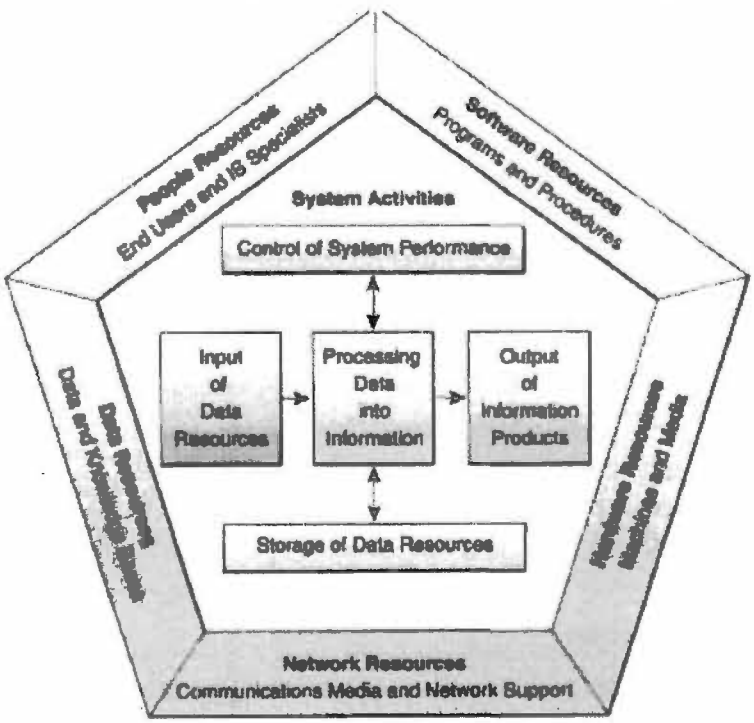
However, the truth is that this is not process of creating new software rather it is a philosophy. Linux operating system developed by Linus Torvalds was likely first of the sort. Now these include Apache for developing a Web server, the browser called Mozilla Firefox, etc..

Open source development is useful for many applications running on diverse technologies, including handheld devices and communication equipment. Its use may encourage progress in creating standards for devices to communicate more easily. Widespread use of open source software may lessen some if the severe shortages of programmers, and some large problems may be solved through intense and extensive collaboration.

COMPONENTS OF INFORMATION SYSTEM

An information system is a system that accepts data resources as input and processes them into information products as output. An information system depends on the resources of people (end users and IS specialists), hardware (machines and media), software (programs and procedures), data (data and knowledge basis), and networks (communications media and network support) to perform input, processing, output, storage, and control activities that convert data resources into information products.

This information system model highlights the relationships among the components and activities of information systems. It provides a framework that emphasizes four major concepts that can be applied to all types of information systems:



- People, hardware, software, data, and networks are the five basic resources of information systems.

- People resources include end users and IS specialists, hardware resources consist of machines and media, software resources include both programs and procedures, data resources can include data and knowledge bases, and network resources include communications media and networks.
- Data resources are transformed by information processing activities into a variety of information products for end users.
- Information processing consists of input, processing, output, storage, and control activities.

Information System Resources:

(i) People Resources:

People are required for the operation of all information systems. These people resources include end users and IS specialists.

- **End users** are people who use an information system or the information it produces. They can be accountants, salespersons, engineers, clerks, customers, or managers. Most of us are information system end users. We also call them users or clients.
- **IS Specialists** are people who develop and operate information systems. They include systems analysts, programmers, computer operators, and other managerial technical, and clerical IS personnel. Briefly, systems analysts design information systems based on the information requirements of end users, programmers prepare computer programs based on the specifications of systems analysts, and computer operators operate large computer systems.

(ii) Hardware Resources:

Hardware resources includes all physical devices and materials used in information processing. Specially, it includes not only **machines,** such as computers and other equipment, but also all data **media,** that is, all tangible objects on which data is recorded, from sheets of paper to magnetic disks. Example of hardware in computer-based information systems are:

- **Computer systems,** which consist of central processing units containing microprocessors, and variety of interconnected peripheral devices. Examples are microcomputer systems, midrange computer systems, and large mainframe computer systems.
- **Computer peripherals,** which are devices such as a keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for storage of data resources.

(iii) Software Resources:

Software Resources includes all sets of information processing instructions. This generic concept of software includes not only the sets of operating instructions called **programs,** which direct and control computer hardware, but also the sets of information processing instructions needed by people, called **procedures**.

It is important to understand that even information systems that don't use computers have a software resource component. This is true even for the information systems of ancient times, or the manual and machine-supported information systems still used in the world today. They all require software resources in the form of information processing instructions and procedures in order to properly capture, process, and disseminate information to their users.

The following are the examples of software resources:

- **System Software,** such as an operating system program, which controls and supports the operations of a computer system.
- **Application Software,** which are programs that direct processing for a particular use of computers by end users. Examples are a sales analysis program, a payroll program, and a work processing program.
- **Procedures,** which are operating instructions for the people who will use an information system. Examples are instructions for filling out a paper form or using a software package.

(iv) Data Resources:

Data is more than the raw material of information systems. The concept of data resources has been broadened by managers and information systems professionals. They realize that data constitutes a valuable organization resource. Thus, you should view data as data resources that must be managed effectively to benefit all end users in an organization.

Data can take many forms, including traditional alphanumeric data, composed of numbers and alphabetical and other characters that describe business transactions and other events and entities. Text data, consisting of sentences and paragraphs used in written communications; image data, such as graphic shapes and figures; and audio data, the human voice and other sounds, are also important forms of data.

The data resources of information systems are typically organized into:

- Database that hold processed and organized data.
- Knowledge bases that hold knowledge in variety of forms such as facts, rules, and case examples about successful business practices.

For example, data about sales transactions may be accumulated and stored in a sales database for subsequent processing that yields daily, weekly, and monthly sales analysis reports for management. Knowledge bases are used by knowledge management systems and expert systems to share knowledge and give expert advice on specific subjects.

Network Resources:

Telecommunications networks like the Internet, intranets, and extranets have become essential to the successful operations of all types of organizations and their computer-based information systems. Telecommunications networks consist of computers, communications processors, and other devices interconnected by communications media and controlled by communications software. The concept of**Network resources** emphasizes that communications networks are a fundamental resource component of all information systems. Network resources include:

- **Communication media,** Examples include twisted pair wire, coaxial cable, fiber-optic cable, microwave systems, and communication satellite systems.
- **Network Support,** This generic category includes all of the people, hardware, software, and data resources that directly support the operation and use of a communications network. Examples include communications control software such as network operating systems and Internet packages.

INFORMATION SYSTEM ACTIVITIES

The process of converting raw materials into finished goods requires some processing because data is not useful until subjected to "value added processing". Data processing can also be defined as collection of data, process it & producing valuable info. We were using different methods of data processing but computers are using all these applications so this is known as "Electronic Data Processing"

The major activities of an information system are;

(i) **Input of data resource :** Data about business transactions and other events must be captured and prepared for processing by the input activity. Input typically takes the form of data entry activities such as recording and editing. End uses typically record data about transactions on some type of physical medium such as paper form, or enter it directly into a computer system. This usually includes a variety of editing activities to ensure that they have recorded data correctly. Once entered, data may be transferred onto a machine-readable medium such as a magnetic disk until needed for processing.

For example, data about sales transactions can be recorded on source documents such as paper sales order forms. (A source document is the original formal record of a transaction). Alternately, salespersons can capture sales data using computer keyboards or optical scanning devices; they are visually prompted to enter data correctly by video displays. This provides them with a more convenient and efficient **user interface,** that is, methods of end user input and output with a computer system. Methods such as optical scanning and displays of menus, prompts, and fill-in-the-blanks formats make it easier for end users to enter data correctly into an information system.

(ii) **Processing of data into information :** Data is typically subjected to processing activities such as calculating, comparing, sorting, classifying, and summarizing. These activities organize, analyze and manipulate data, thus converting them into information for end users. The quality of any data stored in an information system must also be maintained by a continual process of correcting and updating activities.

For example, data received about a purchase can be (1) added to a running total of sales results, (2) compared to a standard to determine eligibility for a sales discount, (3) sorted in numerical order based on product identification numbers, (4) classified into product categories (such as food and non-food items), (5) summarized to provide a sales manager with information about various product categories, and finally, (6) used to update sales records.

(iii) Output of information products : Information in various forms is transmitted to end-users and made available to them in the output activity. The goal of information systems is the production of appropriate information products for end users. Common information products messages, reports, forms, and graphic images, which may be provided by video displays, audio responses, paper products, and multimedia. For example, a sales manager may view a video display to check on the performance of a salesperson, accept a computer-produced voice message by telephone, and receive a printout of monthly sales results.

(iv) Storage of data resource : Storage is a basic system component of information systems. Storage is the information system activity in which data and information are retained in an organized manner for later use. For example, just as written text material is organized into words, sentences, paragraphs, and documents, stored data is commonly organized into fields, records, files, and database. This facilitates its later use in processing or its retrieval as output when needed by users of a system.

(v) Control of system performance : An important information system activity is the control of its performance. An information system should produce feedback about its input, processing, output, and the system is meeting established performance standards. Then appropriate system activities must be adjusted so that proper information products are produced for end users.

For example, a manager may discover that subtotals of sales amounts in a sales report do not add up to total sales. This might mean that data entry or processing procedures need to be corrected. Then changes would have to be made to ensure that all sales transactions would be properly captured and processed by a sales information system.

EVOLUTION OF AN INFORMATION SYSTEM

From EDP to MIS

Until the 1960s, the role of most information systems was simple. They were mainlyused for electronic data processing (EDP),purposes such as transactions processing,record-keeping and accounting. EDP is often defined as the use of computers inrecording, classifying, manipulating, and summarizing data. It is also calledtransaction processing systems (TPS), automatic data processing, or informationprocessing.

Transaction processing systems – these process data resulting

from business transactions, update operational databases, andproduce business documents. Examples: sales and inventoryprocessing and accounting systems.

In the 1960s, another role was added to the use of computers: the processing of datainto useful informative reports. The concept of management information systems(MIS) was born. This new role focused on developing business applications thatprovided managerial end users with predefined management reports that would givemanagers the information they needed for decision-making purposes.

Management information systems – provide information in the form of prespecified reports and displays to support business decision-making. Examples:

Check Your Progress :

7. What is abstract system.
8. What do you understand by MIS ?
9. What types of Resources are required for information system.

sales analysis, production performance and costtrend reporting systems.

By the 1970s, these pre-defined management reports were not sufficient to meetmany of the decision-making needs of management.In order to satisfy such needs,the concept of decision support systems (DSS) was born. The new role forinformation systems was to provide managerial end users with ad hoc and interactivesupport of their decision-making processes.

Decision support systems – provide interactive ad hoc support for

the decision-making processes of managers and other businessprofessionals. Examples: product pricing, profitability forecasting andrisk analysis systems.

In the 1980s, the introduction of microcomputers into the workplace ushered in a newera, which led to a profound effect on organizations. The rapid development ofmicrocomputer processing power (e.g. Intel's Pentium microprocessor), applicationsoftware packages (e.g. Microsoft Office), and telecommunication networks gavebirth to the phenomenon of end user computing. End users could now use their owncomputing resources to support their job requirements instead of waiting for theindirect support of a centralized corporate information services department. Itbecame evident that most top executives did not directly use either the MIS reports or the analytical modelling capabilities of DSS, so the concept of executive information systems (EIS) was developed.

Executive information systems – provide critical information from

MIS, DSS and other sources, tailored to the information needs ofexecutives. Examples: systems for easy access to analysis ofbusiness performance, actions of all competitors, and economicdevelopments to support strategic planning.

Moreover, breakthroughs occurred in the development and application of artificialintelligence (AI) techniques to business information systems. With less need forhuman intervention, knowledge workers could be freed up to handle more complextasks. Expert systems (ES) and other knowledge management systems (KMS) alsoforged a new role for information systems. ES can serve as consultants to users byproviding expert advice in limited subject areas.

Expert systems – knowledge-based systems that provide expert

advice and act as expert consultants to users. Examples: creditapplication advisor, process monitor, and diagnostic maintenancesystems.

Knowledge management systems – knowledge-based systems that

support the creation, organization and dissemination of businessknowledge within the enterprise. Examples: intranet access to bestbusiness practices, sales proposal strategies and customer problemresolution systems.

The mid- to late 1990s saw the revolutionary emergence of enterprise resourceplanning (ERP) systems. This organization-specific form of a strategic informationsystem integrates all facets of a firm, including its planning, manufacturing, sales,resource management, customer relations, inventory control, order tracking, financialmanagement, human resources and marketing – virtually every business function.The primary advantage of these ERP systems lies in their common interface for allcomputer-based organizational functions and their tight integration and data sharingneeded for flexible strategic decision making.

From MIS to e-commerce

The rapid growth of the Internet, intranets, extranets and other interconnected globalnetworks in the 1990s dramatically changed the capabilities of information

systems inbusiness. Internet-based and web-enabled enterprise and global electronic businessand commerce systems are becoming commonplace in the operations andmanagement of today's business enterprises.

Indeed today's information systems are still doing the same basic things that theybegan doing over 50 years ago.We still need to process transactions, keep records,provide management with useful and informative reports, and provide support to theaccounting systems and processes of the organization.However, what has changedis that we now enjoy a much higher level of integration of system functions acrossapplications, greater connectivity across both similar and dissimilar systemcomponents, and the ability to reallocate critical computing tasks such as datastorage, processing, and presentation to take maximum advantage of business andstrategic opportunities. With increasing capabilities, future systems will focus on increasing both the speed and reach of our systems to provide even tighter integration combined with greater flexibility.

The Internet and related technologies and applications have changed the waybusinesses operate and people work, and how information systems support businessprocesses, decision-making and competitive advantage. Today many businesses areusing Internet technologies to web-enable business processes and to createinnovative e-business applications.

E-business is the use of Internet technologies to work and empower businessprocesses, electronic commerce and enterprise collaboration within a company andwith its customers, suppliers and other business stakeholders. The Internet andInternet-like networks – those inside the enterprise (intranet) and those between anenterprise and its trading partners (extranet) – have become the primary informationtechnology infrastructure that supports the e-business applications of manycompanies. These companies rely on e-business applications to (i) reengineerinternal business processes, (ii) implement electronic commerce systems with theircustomers and suppliers, and (iii) promote enterprise collaboration among businessteams and workgroups.

IMPACTS OF INFORMATION SYSTEM

Organizational impacts of information systems

Information systems bring new options to the way companies interact, the way organizations are structured, and the way workplaces are designed. In general, use of network-based information systems can significantly lower the costs of communication among workers and firms and enhance coordination on collaborative projects. This has led many organizations to concentrate on their core competencies and to outsource other parts of their value chain to specialized companies. The capability to communicate information efficiently within a firm has also led to the deployment of flatter organizational structures with fewer hierarchical layers.

Nevertheless, information systems do not uniformly lead to higher profits. Success depends on both the skill with which information systems are deployed and the availability of other assets. In particular, "virtual" organizations have emerged that do not rely on physical offices and standard organization charts. Two notable forms are a network organization and a cluster organization.

In a network organization, long-term corporate partners supply goods and services to and through a central firm. Together, a network of small companies can present

the appearance of a large corporation. Indeed, at the core of such an organization may be nothing more than a single entrepreneur supported by only a few employees. Thanks to information systems, product specifications in an electronic form can be modified during computerized video conferences between employees throughout an organization—after which supplies can be secured and distribution coordinated, using automatic electronic forms as sales orders are received. Wide area networks, and the Internet in particular, help partnering organizations to facilitate the interaction of widely dispersed business units.

In a cluster organization, the principal work units are permanent and temporary teams of individuals with complementary skills. Team members, who are often widely dispersed around the globe, are greatly assisted in their work by the use of corporate intranets and groupware.

Information systems built around portable computers, mobile telecommunications, and groupware have enabled employees to work not just outside the corporate offices but virtually anywhere. "Work is the thing you do, not the place you go to," has become the slogan of the emerging new workplace. Virtual workplaces include home offices, regional work centres, customers' premises, and mobile offices of people such as insurance adjusters. Employees who work in virtual workplaces outside their company's premises are known as telecommuters.

Information systems in the economy and society

Along with the global transportation infrastructure, network-based information systems have been a factor in the growth of international business and corporations. Although studies have yet to show a relationship between the deployment of information systems and higher productivity, it is widely believed that such a relationship exists. In addition to investing in other information systems, a large and growing number of organizations have embraced **electronic commerce** over the Internet.

As the use of information systems has become pervasive in advanced economies and societies at large, several ethical and social issues have moved into the forefront. The most important are issues of individual privacy, property rights, universal access and free speech, information accuracy, and quality of life.

Individual privacy involves the right to control personal information. While invasion of privacy is generally perceived as an undesirable loss of autonomy, government and business organizations do need to collect data in order to facilitate administration and exploit marketing opportunities. Electronic commerce presents a particular challenge to privacy, as personal information is routinely collected and disseminated in a largely unregulated manner. Preventing abusive invasions of privacy is complicated by the lack of an international legal standard.

Intellectual property, such as computer software, books, music, and movies, is protected, albeit imperfectly, by patents, trade secrets, and copyrights. However, such essentially intangible goods can be easily copied and transmitted electronically over the Web for unlawful reproduction and use. Combinations of legal statutes and technological safeguards, such as antipiracy encryption and electronic watermarks, are emerging.

Access to public information systems, such as the World Wide Web, is increasingly necessary for full participation in modern society. In particular, it is necessary to avoid the emergence of "digital divides" between nations and between social and ethnic

groups. Open access to the Internet as a medium for human communication and as a repository for shared knowledge is treasured. Indeed, many people consider free speech a universal human right and the Internet the most widely accessible means to exercise this right. Yet legitimate concerns arise about protecting children without resorting to censorship. Technological solutions, such as software that filters out pornography, are partially successful.

Of concern to everyone is the accuracy and security of information contained in databases—whether in health and insurance records, credit bureau records, or government files—as misinformation can adversely affect personal safety, livelihood, and everyday life. Individuals must cooperate in reviewing and correcting their files, and organizations must ensure appropriate access to and use of such files.

Information systems have affected the quality of personal and working lives. In the workplace, information systems can be deployed to eliminate tedious tasks and give workers greater autonomy, or they can be used to eliminate jobs and subject the remaining workforce to pervasive electronic surveillance. Consumers can use the Internet to comparison shop for everything from manufactured goods to financial services or even to participate in auctions—but at the cost of contending with spam (unsolicited e-mail), intercepted credit card numbers, and malicious computer viruses.

Information systems can expand participation by ordinary citizens in government through electronic elections, referendums, and polls and also provide electronic access to government services and information—permitting, for instance, electronic filing of taxes, direct deposit of government checks, and distant viewing of current and historical government documents and photographs. Yet information systems have also conjured Orwellian images of government surveillance and intrusion into private lives. It remains for society to harness the power of information systems by strengthening legal, social, and technological controls.

LEVEL OF MANAGEMENT DECISION-MAKING

Information systems can support a variety of management decision-making levelsand decisions. These include the three levels of management activity: strategicmanagement, tactical management, and operational management.

(i) **Strategic management :** It is typical for a board of directors and an executive committee of the CEOand top executives to develop the overall organization goals, strategies, policies andobjectives as part of a strategic planning process. They also monitor the strategicperformance of the organization and its overall direction in the political, economicand competitive business environment.

(ii) **Tactical management :** Increasingly, business professionals in self-directed teams as well as business unit managers develop short- and medium-range plans, schedules and budgets and specify the policies, procedures and business objectives for their sub-units of the company. They also allocate resources and monitor the performance oftheir organizational sub-units, including departments, divisions, process teams andother workgroups.

(iii) **Operational management :** The members of self-directed teams or operating managers develop short-range plans such as weekly production

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schedules. They direct the use of resourcesand the performance of tasks according to procedures, and within budgets andschedules they establish for the teams and other workgroups of the organization.

INFORMATION SYSTEM IN BUSINESS

Information support business process and operations. IS helps manager to conduct their daily activities and functions properly. e.g. in bank different activities like account creating, withdrawal of money, statement generation etc take place. IS help mangers to conduct such activities accurately and timely manner with the helop of softwares. - support decison making for employees and managers. IS can simply be defined as input -> process -> information. IS takes data as input and processes them and generate information. Managers can use these information for the betterment of their organizations. e.g. IS can analyze exisiting historical data about customers in bank and generate informations like good customers, bad customers etc. Managers can use this information while deciding to provide loan for new customers.

Information systems perform three vital roles in business firms.

Business applications of IS support an organization's business processes and operations, business decision-making, and strategic competitive advantage. Major application categories of information systems include operations support systems, such as transaction processing systems, process control systems, and enterprise collaborationsystems, and management support systems, such as management information systems, decision support systems, and executive information systems. Other major categories are expert systems, knowledge management systems, strategic information systems, and functional business systems. However, in the real world most application categories are combined into cross-functional information systems that provide information and support for decision-making and also perform operational information processing activities.

Information system support in making strategic decision for competitive advantages. IS can give informations like which items to launch in which location by analyzing data collected from different sources such that company can have advantage by using these information over their competitors. IS also can help business houses in conducting their business process differently than thier competitors. Strategic role is also helpful for the planning of the organisation because through strategic role the future will be planned.

An understanding of the effective and responsible use and management of information systems and technologies is important for managers, business professionals, and other knowledge workers in today's internetworked enterprises. Information systems play a vital role in the e-business and e-commerce operations, enterprise collaboration and management, and strategic success of businesses that must operate in an internetworked global environment. Thus, the field of information systems has become a major functional area of business administration. Information systems perform three vital roles in any type of organization.That is, they support an organization's:

- Business processes and operations

- Decision making by employees and managers
- Strategies for competitive advantage

An IS Framework for Business Professionals

The IS knowledge that a business manager or professional needs

to know includes

(1) foundation concepts: fundamental behavior, technical, business, and managerial concepts like system components and functions, or competitive strategies;

(2) information technologies: concepts, developments, or management issues regarding hardware, software, data management, networks, and other technologies;

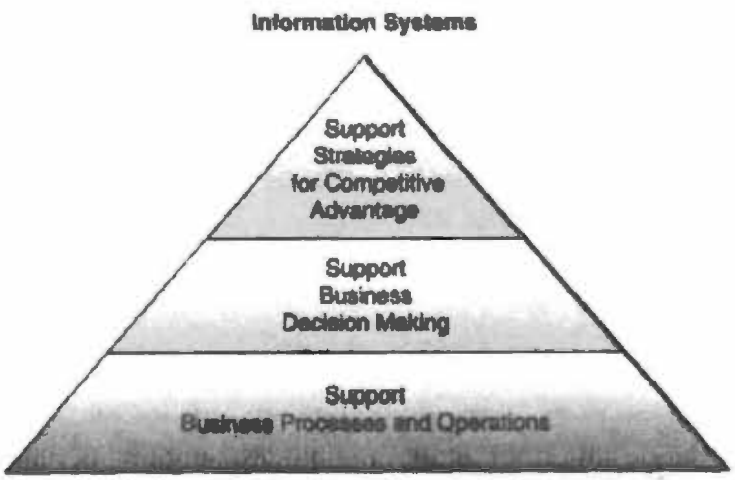
(3) business applications: major uses of IT for business processes, operations, decision making, and strategic/competitive advantage;

(4) development processes: how end users and IS specialists develop and implement business/IT solutions to problems and opportunities arising in business; and

(5) management challenges: how to effectively and ethically manage the IS function and IT resources to achieve top performance and business value in support of the business strategies of the enterprise.

Three major roles of the business applications of information systems include:

- Support Business Processes – involves dealing with information systems that support the business processes and operations in a business.
- Support Decision Making – help decision makers to make better decisions and attempt to gain a competitive advantage.
- Support Competitive Advantage – help decision makers to gain a strategic advantage over competitors requires innovative use of information technology.



Case study

A waiter takes an order at a table, and then enters it online via one of the six terminals located inthe restaurant dining room. The order is routed to a printer in the appropriate preparation area:the cold item printer if it is a*salad*, the hot-item printer if it is a hot*s andwich* or the bar printer ifit is a*dr ink*. A customer's meal checklisting (bill) the items ordered and the respective pricesare automatically generated. This ordering system eliminates the old three-carbon-copy guest check system as well as any problems caused by a waiter's handwriting. When the kitchen runs out of a food item, the cooks send out an 'out of stock' message, which will be displayed on the dining room terminals when waiters try to order that item. This gives the waiters faster feedback, enabling them to give better service to the customers. Other system features aid management in the planning and control of their restaurant business. The system provides up-to-the-minute information on the food items ordered and breaks out percentages showing sales of each item versus total sales. This helps management plan menus according to customers' tastes. The system also compares the weekly sales totals versus food costs, allowing planning for tighter cost controls. In addition, whenever an order is voided, the reasons for the void are keyed in. This may help later in management decisions, especially if the voids consistently related to food or service. Acceptance of the system by the users is exceptionally high since the waiters and waitresses were involved in the selection and design process. All potential users were asked to give their impressions and ideas about the various systems available before one was chosen.

Answer of the Check Your Progress

1. Data after processing gets converted into information. Therefore data is the foundation of information. Information enhances the knowledge, therefore information is the basis of knowledge. In this way data, information and knowledge are mutually related.

2. Data is a collection of facts, such as values or measurements. It can be numbers, words, measurements, observations or even just descriptions of things. Data can be qualitative or quantitative.

3. Information incorporates the following characteristics :
   - meaningfulness
   - surprising element
   - conformity with previous knowledge
   - correction to previous knowledge
   - brevity
   - accuracy
   - timeliness
   - action oriented

4. A system should contain the following characteristics -
   - Organisation
   - Interaction
   - Interdependence
   - Integration
   - Central Objective
5. The following important elements of a system are :
   - Inputs and Outputs
   - Processors
   - Control
   - Feedback
6. In the stage of analysis the user provides the analyst with feedback, with the help of which, the analyst can make alterations in the system.
7. Abstract systems are imaginary and intangible. In such systems there is abstract conceptualization of physical situations. The model or algorithm of a system can be taken as an abstract system. Algorithm or any other model completes any physical conditions on imaginary basis which is significant in accomplishing the real tasks.
8. Management information system is an information system which prepares the management report in pre-defined and definite formats. Management information system creates information on the basis of accepted management and statistical models.
9. - People Resource–Its includes end users and information system specialists;
   - Hardware resources includes all physical devices and materials used in information processing and materials used in information processing;
   - Software Resources includes all sets of information processing instructions;
   - Data Resource–Data are in the forms of alphanumeric date, text data, images graphics, audio-video, database forms.
   - Network Resource–It includes internet, intranet and extranet telecommunication N/Ws.

EXERCISE

1. Discuss difference between data and information.
2. Explain information and its characteristics.
3. What do you mean by system? Explain.
4. Explain following with regard to system:
   (i) Characteristics
   (ii) Elements
   (iii) Types

5. Explain difference between Open and Closed system.
6. What do you mean by information system.
7. Explain various types of information system.
8. Explain methods of Data Processing.
9. Write short notes on following:
   (i) Expert System
   (ii) Management Information System
   (iii) Decision support System
   (iv) Open Source Software
10. Explain components of information system.
11. Explain activities and resources of information system.
12. Explain impacts of information system in business.
13. Explain levels of management decision making.
14. Explain evolution of information system.

2 Management Information System

The Chapter Covers :

- Introduction
- Management Information System (MIS)
- Fields of Information System
- Elements Of MIS
- Objectives Of MIS
- Characteristics of mis
- Impact Of MIS
- Designing An MIS
- Placement Of Mis
- Views Of MIS
- Pitfalls In Designning an MIS
- Components of Management Information System
- Outputs of a Management Information System
- Management Information Systems for Competitive Advantage
- MIS Function in an organisation
- Role of MIS in Management:

INTRODUCTION

Management Information Systems (MIS) is a general name for the academic discipline covering the application of people, technologies, and procedures — collectively called the information system — to solve business problems. MIS are distinct from regular information systems in that they are used to analyze other information systems applied in operational activities in the organisation. Academically, the term is commonly used to refer to the group of information management methods tied to the automation or support of human decision making, e.g. Decision Support Systems, Expert systems, and Executive information systems. This chapter delivers information on MIS in details. An Information System is an organized combination of people, hardware, software, communications networks, and data resources that collects, transforms and disseminates information in an organization. People have

relied on information systems to communicate with each other using a variety of physical devices (hardware), information processing instructions and procedures (software), communication channels (networks), and stored data (data resources) since the dawn of civilization.

Today's end users rely on many types of information systems(IS). They might include simple manual (paper-and-pencil) hardware devices and informal (word-of-mouth) communications channels.

MANAGEMENT INFORMATION SYSTEM (MIS)

MIS may be defined as the combination of men, machines and procedures for collecting pertinent information from the internal and external source of a firm, and processing these information for the purpose of facilitating the process of decision making.

The Management Information System (MIS) is a concept of the last decade or two. It has been understood and described in a number of ways. It is also popularly known as the Information System, the Information and Decision System, the Computer-based Information System.

The MIS has more than one definition, some of which are given below.

- The MIS is defined as a system which provides information support for decision making in the organization.
- The MIS is defined as an integrated system of man and machine for providing the information to support the operations, the management and decision making function in the organization.
- The MIS is defined as a Computer-based Information System.

Concept of MIS is to provide right information to the right person at the right place at the right time in the right form at the right cost.

Though there are a number of definitions, all of them converge on one single point, i.e., the MIS is a system to support the decision making function in the organization. The difference lies in defining the elements of the MIS. However, in today's world, the MIS is a computerized business processing system generating information for the people in the organization to meet the information needs for decision making to achieve the corporate objectives of the organization.

In any organization, small or big, a major portion of the time goes in data collection, processing, documenting and communicating it to the people. Hence, a major portion of the overhead goes into this kind of unproductive work in the organization. Every individual in an organization is continuously looking for some information which is needed to perform his/her task. Hence, the information is people-oriented and it varies with the nature of the people in the organization.

FIELDS OF INFORMATION SYSTEM

The field of information systems encompasses many complex technologies, abstract behavioral concepts, and specialized applications in countless business and non-business areas. As a manager or business end user you do not have to absorb all

of his knowledge. It emphasizes that you should concentrate your efforts in five areas of knowledge :

(i) **Foundation Concepts :** Fundamental behavioural and technical concepts that will help you understand how information systems can support the business operations, managerial decision making and strategic advantage of business firms and other organizations.

(ii) **Technology Concept :** Major concepts, developments and management issues in information technology – that is , hardware, software, networks, database management, and other information processing technologies.

(iii) **Applications :** The major uses of information systems for the operations, management, and competitive advantage of an enterprise, including electronic commerce and collaboration using the Internet, and extranets are covered.

(iv) **Development :** How end users or information specialists develop information systems solutions to business problem fundamental problem-solving and development methodologies.

(v) **Management :** The challenges of effectively and ethically managing the resources and business strategies involved in using information technology at the end user, enterprise, and global levels of business.

ELEMENTS OF MIS

The MIS can be subdivided into four categories. Each type of system is designed to cater to a specific requirement. The types are:

(i) **Transaction Processing System :** These systems are designed for processing day to day transactions occurring in the organization. These systems involve large volume of data and mainly help in the operation control area of the company.

(ii) **Information Providing System :** Attempt is made here to generate information to help decision making activity. Starting with transaction processing system, summary and exception reports are produced. Summary reports are tabulation of detail by categories. Exception reports provide information about deviations of actual from planned and indicate the reasons of deviations.

(iii) **Decision Support System :** This system is for improving the analytical capability of the decision maker. Attempt is made here to create an interactive model of a real life situation, so that the decision maker can interrogate the system for generation and evaluation of various alternatives.

(iv) **Programmed Decision Making System :** This involves creating systems for programmed decision areas, so that a decision is made by the system instead of a person. This requires very clear specifications of the procedure used.

OBJECTIVES OF MIS

The purpose of MIS is to determine and provide an efficiently, effectively and economically as possible, what management needs to know. It should facilitate the

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accomplishment of objectives, prevent failure to reach the objectives and correct conditions which hamper the fulfillment of the objectives.

Three basic objectives of MIS are discussed below:

(i) **Operational Control :** It is the process of assuring that the specific tasks are carried out efficiently and effectively.

(ii) **Management Control :** It is the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of organizational objectives.

(iii) **Strategic Planning :** It is the process of deciding on objectives of the organization, on changes in these objectives and on the policies that govern the acquisition, use and disposition of these resources.

The nature and extent of information required for these purposes greatly depends upon the business environment in which it operates. As small or medium size organizations do not have the resources nor the organization to have a systematic information system. They collect information only when required.

Thus, the information needs of management vary from organization to organization depending upon the complexity of business faces.

CHARACTERISTICS OF MIS

A. **Management Oriented :** The system is designed from the top to work downwards. It does not mean that the system is designed to provide information directly to the top management. Other levels of management are also provided with relevant information. For example, in the marketing information system, the activities such as sales order processing, shipment of goods to customers and billing for the goods are basically operational control activities. This information can also be tracked by a salesman, to know the sales territory, size of order, geography and product line, provided the system has been designed accordingly. However, if the system is designed keeping in mind the top management, then data on external competition, market and pricing can be created to know the market share of the company's product and to serve as a basis of a new product or market place production.

B. **Management Directed :** Because of management orientation of MIS, it is necessary that management should actively direct the system development efforts. In order to ensure the effectiveness of system designed, management should continuously make reviews. For example, in the marketing information system, the management must determine what sales information is necessary to improve its control over marketing operations.

C. **Integrated :** The word 'integration' means that the system has to cover all the functional areas of an organization so as to produce more meaningful management information, with a view to achieving the objectives of the organization. It has to consider various sub-systems , their objectives, information needs, and recognize the interdependence, that these sub systems have amongst themselves, so that common areas of information are identified and processed without repetition and overlapping. For example, in the development of an effective

production scheduling system, a proper balance amongst the following factors are desired:

- Set up costs
- Overtime
- Inventory level
- Customer service
- Manpower
- Production capacity
- Money available

D. **Common data flows :** Because of the integration concept of MIS, common data flow concept avoids repetition and overlapping in data collection and storage, combining similar functions and simplifying operations wherever possible. For example, in the marketing operations, orders received for goods become the basis of billing of goods ordered, setting up of the accounts receivable, initiating production activity, sales analysis and forecasting etc.

E. **Heavy Planning Element :** A management information system cannot be established overnight. It takes almost 2 to 4 years to establish it successfully in an organization. Hence, long-term planning is required for MIS development in order to fulfill the future needs and objectives of the organization. The designer of an information system should therefore ensure that it will not become obsolete before it actually gets into operation. An example of such a feature of MIS may be seen in a transportation system where a highway is designed not to handle today's traffic requirements but to handle the traffic requirements of ten years hence.

F. **Flexibility and ease of use :** While building an MIS system all types of possible means which may occur in future are added to make it flexible. A feature that often goes with flexibility is the ease of use. The MIS should be able to incorporate all those features that make it readily accessible to a wide range of users with easy usability.

IMPACT OF MIS

Since MIS plays a very important role in the organization, it creates an impact on the organizations functions, performance and productivity. The impact of MIS on the functions is in its management. With a good MIS support, the management of marketing , finance, production and personnel becomes more sufficient. The tracking and monitoring of the functional targets become easy. The functional managers are informed about the progress, achievements and shortfalls in the activity and targets. The manager is kept alert by providing certain information indicating the probable trends in the various aspects of business. This helps in forecasting and short term perspective planning. The managers attention is brought to a situation which is exceptional in nature, inducing him to take action or a decision in the matter. A disciplined information reporting system creates a structured database and a knowledge base for all the people in the organization. The information is available in such a form that it can be used straight away or by blending and analysis, saving the manager, some valuable time.

MIS creates another impact in the organization, which relates to the understanding of the business itself. MIS begins with the definition of a data entity and its attributes. It uses a dictionary data, entity and attributes respectively, designed for information generation in the organization. Since all information systems use the dictionary, there

is common understanding of terms and terminology in the organization bringing clarity in communication and also a similar understanding of an event in the organization. MIS calls for systemization of the business operation for an effective system design. This leads to streamlining of the operations, which complicate the system design. It improves the administration of the business by bringing a discipline in its operations, as everybody required to follow and use systems and procedures. This process brings a high degree of professionalism in the business objectives. Since the goals and objectives of MIS are the products of business goals and objectives, it helps indirectly to pull the entire organization in one direction towards the corporate goals and objectives by providing the relevant information to the people in the organization.

A well designed system with a focus on the manager makes an impact on the managerial efficiency. The fund of information motivates an enlightened manager to use a variety of the tools of management. It helps him to resort to exercises such as experimentation and modelling. The use of computers enables him to use the tools and techniques, which are impossible to use manually. The ready made packages make this task simpler. The impact is on the managerial ability to perform. It improves the decision making ability considerably.

DESIGNING AN MIS

While designing a management information system, a general approach has to be followed so that a suitable system can be devised to cater to the needs of different organizations as per their functions and decision making requirements. Irrespective of the organization in question, the data gets generated at various levels of management. These data when processed and analyzed become information which, when properly communicated in time to the decision-maker helps in making decisions and taking actions.

The following steps are generally taken in the design of an MIS:

a. **Identifying information needs at all levels of management :** There are problems in every growing business organization, but most of the time a clear definition of problems and a priority system for their solution is not known. Thus, as a first step in MIS design, the management should identify, in detail, the problems to be solved.

b. **Listing objectives of MIS and anticipated benefits :** The users must define the system objectives in terms of information demands. For example, in several government departments, prior to the designing of an information system, the system objective was the automation of hundreds of report without looking at the management of tasks related to functional or resource system represented by the report. These are training needs, employee relations safety, recruitment, staffing.

   Such attention is possible only by automation of records or processing of existing data, otherwise the true objectives of the organization represented by the system are overlooked. The system objective should be defined in terms of what a decision-maker can do and how effectively he would be able to function after his information requirements have been complied with.

In any organization, small or big, a major portion of the time goes in data collection, processing, documenting and communicating it to the people. Hence, a major portion of the overhead goes into this kind of unproductive work in the organization. Every individual in an organization is continuously looking for some information which is needed to perform his/her task. Hence, the information is people-oriented and it varies with the nature of the people in the organization.

Decision Support system

Decision Support System is such an information system application which provides the user with decision oriented system whenever there arises a need to take decisions. When this system is applied on managers or executive managers, it is called executive information system.

We should mind that D.S.S. doesn't take the decisions nor does it provide solutions to the problems. It only provides with important information which plays a significant role in taking decisions. Especially, Decision Support System is used in such decision creating situations which can't be guessed beforehand.

Better Perception : Decision Support System

There are many approaches to decision-making. There are also a wide range of fields in which decisions are made. If we look at the approaches and fields concerned with decisions making, it is quite difficult to define decision support system in a plain way. Decision Support System can take many different forms. Generally, DSS can be defined as a computerized system that helps you in make decisions. Prior to understanding what DDS is you should understand first ***what is decision?*** *Decision is a choice between alternatives based on estimates of the values of those alternatives.*

Supporting a decision means helping people working alone or in a group gather intelligence, generate alternatives and make choices. Supporting the choice making process involves supporting the estimation, the evaluation and/or the comparison of alternatives. In practice, references to DSS are usually references to computer applications that perform such a supporting role.

According to Keen, the concept of decision support has evolved from two main areas of research: the theoretical studies of organizational decision making done at the Carnegie Institute of Technology during the late 1950s and early 1960s, and the technical work on interactive computer systems, mainly carried out at the Massachusetts Institute of Technology in the 1960s. It is considered that the concept of DSS became an area of research of its own in the middle of the 1970s, before gaining in intensity during the 1980s. In the middle and late 1980s, executive information systems (EIS), group decision support systems (GDSS), and organizational decision support systems (ODSS) evolved from the single user and model-oriented DSS.

It is clear that DSS belong to an environment with multidisciplinary foundations, including (but not exclusively) database research, artificial intelligence, human-computer interaction, simulation methods, software engineering, and telecommunications.

Expert Systems

Expert System is an extension of the Decision Support System. The Expert System is such an information system application which simulates the knowledge and expertise of the skilled troubleshooter and decides and prepares their approach for those who are less experienced and skilled. Expert System lays stress on duplicating the skill of the experienced troubleshooters, managers, tradesmen and technicians. These experts have such knowledge as well as expertise which cannot be duplicated.

The Expert system simulates the views and analysis of the experts.

For example - A food manufacturer saves the production expertise of experienced engineers, who relieve themselves from their jobs.

The Expert System is applied with artificial intelligence which is called Expertise System Shells. It receives the logics of the experts and simulates them.

The most common form of expert system is a computer program, with a set of rules, that analyzes information (usually supplied by the user of the system) about a specific class of problems, and recommends one or more courses of user action. The expert system may also provide mathematical analysis of the problem(s). The expert system utilizes what appears to be reasoning capabilities to reach conclusions.

For example you must have used Wizard in different applications. This may be taken as an instance of Decision Support System. Wizard is actually a name where you have to select the best alternative among many options. Using Wizard you can accomplish more complex tasks in a jiffy.

An expert system, also known as a knowledge based system, is a computer program that contains the knowledge and analytical skills of one or more human experts, related to a specific subject. This class of program was first developed by researchers in artificial intelligence during the 1960s and 1970s and applied commercially throughout the 1980s.

ERP System

ERP stands for **Enterprise Resource Planning**. Many organizations predict potential benefits from the integration of many information systems existing on different management levels and within different functions. Enterprise resource planning systems are designed to perform this integration. Instituting ERP requires enormous commitment and organizational change. Often systems analysts serve as consultants to ERP endeavours that use proprietary software. Popular ERP software includes that from SAP and Oracle. Some of these packages are targeted toward moving enterprises onto the Web. Typically, analysts as well as some users require vendor training, support and maintenance to be able to properly design, install, maintain, update, and use a particular ERP package.

WHAT DO YOU MEAN BY OPEN SOURCE SOFTWARES ?

Open Source System or in brief OSS is an alternative to traditional software developments. The code of OSS can be studied, shared, and modified by many users and programmers. There is a large community for OSS with the idea that any program modifications must be shared with all the people on the project.

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The basic questions which are asked, while listing down the objectives of the MIS system design are:

What is the purpose of the system?

Why is it needed?

What is it expected to do?

Who are the users and what are their objectives?

c. **Identifying systems constraints (internal and external) :** The systems constraints are also called problem boundaries or restrictions under which objectives may be achieved. These constraints (or limitations) in the designing of the system are the creation of the manager- user or the designer himself, because of his limited freedom of a action in designing a system, to achieve the objectives.

The internal constraints are viewed in terms of:

- Top management support
- Organizational policy
- Manpower needs and availability
- Cost and resource
- Acceptance

The external constraints are mainly concerned with the customer. Order entry, billing and other systems that interface with the systems of the customer must be designed with the customer's need in mind.

d. **Determining information needs and resources** : The system design must begin with determining the real information needs of the management information that can increase the perception of managers in critical areas such as problems, alternatives, opportunities and plans. In other words, if a decision maker can define his objectives and spell out the items of information that are needed to attain the objectives, then he/she is at least half way through in a good system design.

A decision maker needs information for a variety of reasons concerned with the management process. The type of information which is required at various times and for various purposes depends on two factors :

- Persona managerial attitudes like knowledge of information systems, managerial style, perception of information needs, etc. of the individual manager.
- Organizational environment like nature of the company, level of management, structure of the organization.

After estimating the need of information and clearly defining the objectives, the next step in MIS system design is to determine the sources of information. The sources of information may be categorized as follows:

- internal sources : It is in the form of written materials like file records, letters, reports containing information about the existing system etc.

Check Your Progress :

1. MIS can be subdivided into which categories name it.
2. what do you understand by Management control ?
3. What is strategic planning.
4. what are the steps are generally taken in the design of MIS.

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- external sources : It may be in the form of trade and government publications, personal interview of managers and personal interaction with decision makers.

e. **Developing alternative conceptual design and selecting one :** The conceptual design of MIS is considered a skeleton of the MIS, which guides and restricts the form of the detailed design. The concept of design of an MIS consists of patterns of information flow, channels of information, role of decision makers and competitions etc.

The alternative concepts of a system can be evaluated on the basis of the following:

- compare anticipated performance of the conceptual design with respect to objectives of the system developed earlier;
- for qualified comparison amongst systems, prepare a preliminary cost effectiveness data for the system;
- examine the quality of databases and information to be made available. Study the number of operations, dispersions and duplication of files and potential breakdown points;
- expand the conceptual designs in greater detail if none of these provide a preferred design.

f. **Preparing the conceptual design report** : The conceptual design report is a proposal prepared for the expenditure of funds and possible changes in the organizational set-up. Since this report is submitted to management, it must contain the summary of problems that necessitate the system, the objective, the general nature of the system, reasons why this concept was selected over other, and time and resources required to design and implement the system.

PLACEMENT OF MIS

Before installing a new MIS in any organization, it is desirable to know whether there is already an old MIS in operation. If so, then the old system is allowed to operate in parallel, till the new system is fully operational. The implementation plan involves the following steps:

(a) Preparing organization plans
(b) Planning of work flow
(c) Training of personnel
(d) Development of software
(e) Acquiring computer hardware
(f) Designing the format for data collection
(g) Construction of data files
(h) Operation of old and new systems in parallel
(i) Phasing out the old and inducting the new system
(j) Evaluation, maintenance and control of the new system

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VIEWS OF MIS

There are three views of MIS as being discussed here-

The First View Of MIS

The organization may be divided into four levels. They are

- Strategic Planning Level
- Management Control Level
- Operational Control Level
- Transaction Processing Level

- ***Startegic Planning Level :*** This is the topmost level as in Figure 18.2. This level is dedicated to making strategy and policies for the organization for far future of the organization. This level leads to Decision Support System and makes the organization work in a direction laid by it. For example, if a company is engaged in manufacturing some specific product, it will look into issues like consumers needs and demands, present market scenario that includes the standard of the products of the competitors, technology being used and to be used.

- ***Management Control Level :*** Decisions made at this level are related with the tactics. These tactics help the organization carry out the policy handed down from the top level. The decision made at this level is a high level decision but demands detailed knowledge of numerous areas that include consumer needs and company's production capability which can be provided by the MIS. The MIS at this level must contain information about past performance and about policy decisions in order to make it useful for the managers. This means that information is passed up to this level from low levels and passed down from the top level.

- ***Operational Control Level :*** At the third level, decisions are made about how to produce and sell the products. The focus is on the next four months. This is indeed an important decision, but it is not nearly so critical as the decisions made at the policy and tactical levels. Making decisions at this level requires knowing what is currently happening. The information must come from both upper and lower levels. Reports from below outliving inventory levels, current sales trends, and production costs are important. Reports from above communicate the more general tactical decisions that must be carried out.

- ***Trascation Processing Level :*** The bottom level is concerned with recording transactions. The focus is on what has happened. Sales, purchases, labour hour and so forth are recorded. Such information is necessary for doing the organization's bookkeeping. System developers have the easiest task when designing information system at this level. It is easier to specify needs and suggest improvements for accounting oriented systems than for policy-related systems. This is because of the clarity of the job. A job description for a sales clerk is much more tangible than one for a corporate vice-president. A sales clerk seldom wonders what is expected of him, but a corporate vice-president must often think about this.

In short, a strategic planning level develops policy and strategy; a management control level develops tactics to meet those objectives; an operational control level schedules tasks for carrying out the tactics; and the transaction processing level records the tasks as they are perferred. Occasions at all levels are based on the information provided by the MIS.

The Second View of MIS

The second view combines the ideas of first view with the different functions in a typical organization and ties them together with a database management system (DBMS). The result is the grid, as shown in Figure 18.3. The view suggests that there are many functions in an organization, each of which contains tasks at the different levels of management. In a manufacturing company, for example, there are strategic as well as transaction processing activities in each of the functional areas of the organization, such as marketing, production and personnel.

An example of strategic decision making in the manufacturing company's marketing department would include outliving a new general approach to marketing their products. Instead of emphasizing the fresh scent of a product, the decision makers may choose to stress the safety of the product's new packaging. The same marketing department also includes low-level transaction processing activities. It keeps careful track of how many advertisements are run by the competition in each to call newspaper.

The Third View of MIS

Like the other views, the third view also identifies the different levels of an organization. It then looks at the type of information required at the different levels and identifies the characteristics of the information. The characteristics include the source, scope, aggregation, time horizon, currency, required accuracy and frequency of use.

In the model one can see that at high organizational levels, most information comes from outside the organization. This is because the decisions made at this level are related to concerns about customers, government and competition. At low levels, most information comes from within the organization, with a focus on the actual performance of various functions. The scope of information about customers may be discovered through marketing surveys or through observations of buying habits. Information about the government may be tracked by a legal department or discovered in the local newspaper. Information about the competition may be discovered through discussions or through articles in trade Journals.

The aggregation or combining of information is very huge at the top and low at the bottom. At the lower level, managers must deal with a great amount of detailed data; at the top, managers see only selected data. Top-level information emphasises the future, while bottom level information is mostly about the past. New trends and technology are always important at the top level when making policy decisions, while actual (historical) transactions are the focus at the bottom.

Strangely enough, top-level information is usually much older than low-level information. Policy decisions are made on the basis of a lifetime of learning about the business world's customers, competitors and so on. Bottom-level activity is usually based on records of current operations. Accuracy is not important at the top level

whereas it is crucial at the bottom. Guessing whether a competitor is trying to gain 30 percent of the market may not be important even though an error may involve millions of dollars. The strategic decisions made would probably be the same in either case.

However, while recording transactions accuracy is a must. Ask any accountant if the financial records can be "off" by a mere Rs. 100, and one may hear many reasons why they should be exact. Finally, low-level information is used heavily, high-level information is used infrequently. This is because a high-level executive may not face the same problem twice in a month, while similar transaction at the lower level occur many times per day.

This view provides a richer look at information needs in an organization. All three views combine to provide an understanding of the levels, functions and types of information needed throughout the organization. The understanding could be valuable for system developers in creating an MIS that meets the needs of all the users of the system.

PITFALLS IN DESIGNNING AN MIS

Experience has uncovered several erroneous assumptions which help account for the failure of countless MIS projects. Reviewing them should provide some useful insight into effective MIS design.

The first wrong assumption is that managers suffer from a lack of relevant information. There is some truth to this; however, it seems more realistic to say that they suffer more from an overabundance of irrevelant information. Therefore, the focus of an effective MIS should not be on supplying relevant information but on eliminating irrevelant information. If the emphasis was on relevant information, the information specialists would busy themselves with generation, storage and retrieval of information. The consequence of this would be a profusion of data difficult to absorb and analyze.

The second erroneous assumption is that MIS systems should be based on the kinds of information that management needs. Since most managers do not understand the structure displayed in some decision situations, they will likely ask for more information than is needed. In this way they play it safe. Once their questions like what are the kinds of decisions made ? what information is required ? are answered, only those data which one needed should be supplied. The MIS should be a subsystem of the decision process and not the other way around.

The third erroneous assumption is that if a manager has the information he needs, his decision making will improve. That this may not be true can be seen from a simple example. Consider the travelling salesman problem. Where a salesman must be routed to each of 10 cities. If a manager is given the driving time between each possible pair of cities, it is very unlikely that we could structure a tour such that driving time was minimized. With over 3,000,000 possible tours, a sure effective

Finally we turn to the erroneous assumption that a manager does not have to understand how the information system works to use it. If, in fact, the decision maker does not understand how the information system works, he probably had no role in its design and currently has no role in its control. As a result, few decision makers would place much confidence to its use. If, on the other hand he were to use the output, the decision maker would be in the position of being controlled by the information system rather than controlling it.

Understanding the MIS is not easy. It takes some knowledge of management science and the computer. Most important, it takes confidence to ask the information system people the right kinds of questions. What are the assumptions of the model ? How, where and when are the data collected? In addition, a continual feedback process is essential so that the information system people may be kept sensitive to the dynamic nature of the decision environment; there is nothing quite so irrelevant as a decision model which was designed two years ago to solve a problem which has dramatically changed over time. Stagnant information systems such as this are doomed to failure. The only way to avoid this pitfall is to encourage understanding and participation by information specialists, management scientists and managers.

COMPONENTS OF MANAGEMENT INFORMATION SYSTEM

A management information system (MIS) is an organized combination of people, hardware, communication networks and data sources that collects, transforms and distributes information in an organization. An MIS helps decision making by providing timely, relevant and accurate information to managers. The physical components of an MIS include hardware, software, database, personnel and procedures.

- **Hardware**

  All physical components of a computer system that we can touch or see compose the computer hardware. Important components include the central processing unit, input/output devices, storage units and communication devices. Communication can be over fiber-optic cables or wireless networks.

- **Software**

  Software provides the interface between users and the information system. Software can be divided into two generic types: system software and applications. The system software comprises of the operating system, utility programs and special purpose programs. Applications are developed to accomplish a specific task. For users of MIS it is much more important to understand the software than the hardware. Software maintenance can take 50 to 70 percent of all personnel activity in the MIS function. When the organization moves to implement an advanced information system the hardware and software environment becomes more complex.

- **Database**

  A database is a centrally controlled collection of organized data. Central control reduces redundancy and duplication of data. Data is stored in an organized and

structured way to facilitate sharing and improve availability to those who need it. The database improves efficiency of storage by elimination of redundant files and improves efficiency of processing by providing all required data in a single file rather than separate files. This also improves efficiency of information retrieval.

- **Procedures**

  Three types of procedures are required for an MIS to operate effectively: user instructions, instructions for input preparation and operating instructions for MIS personnel who maintain the MIS.

- **Personnel**

  The personnel in the MIS function include computer operators, programmers, systems analysts and managers. Human resource requirements should be assessed by considering both the present system needs and the future system growth. The quality of MIS personnel is a key factor in its effectiveness. An MIS manager needs a combination of both managerial and technical skills.

Outputs of a Management Information System

- Scheduled reports
- Produced periodically, or on a schedule (daily, weekly, monthly)
- Key-indicator report
- Summarizes the previous days critical activities
- Typically available at the beginning of each day
- Demand report
- Gives certain information at a manager's request
- Exception report
- Automatically produced when a situation is unusual or requires management action

Advantages of MIS : Advantages of an MIS include-

- It facilitates the decision making process by furnishing information in the proper time frame.
- It provides requisite information at each level of management to carry out their functions.
- It helps in highlighting the critical factors to the closely monitored for successful functioning of the organisation.
- It supports decision-making in both structured and unstructured problem environments.
- It provides a system of people, computers, documents for collecting, storing, retrieving and transmitting information to the users.

Disadvantages of MIS : Disadvantages of MIS may be as follows-

- MIS cannot replace managerial judgements in decision making. It is merely an effective tool for the managers in decision making and problem solving.
- The quality of output of MIS is directly proportional to the quality of input and processes.
- MIS cannot provide tailor made information of packages. It is required to analyze the available information before decision making.
- In a fast changing and complex environment, MIS may not have enough flexibility to update itself quickly.
- MIS takes only quantitative factors into account.
- MIS is less useful for making non-programmed decisions.
- MIS is less effective in organizations where information is not being shared with others.
- MIS is less effective due to frequent changes in top management, organizational structure and operational staff.

MANAGEMENT INFORMATION SYSTEMS FOR COMPETITIVE ADVANTAGE

MIS provides competitive advantage in following ways:

- Provides support to managers as they work to achieve corporate goals
- Enables managers to compare results to established company goals and identify problem areas and opportunities for improvement

There are two ways businesses can respond to the competitive forces.

- They can gain a competitive advantage via their products and services.
- They can gain a competitive advantage by developing superior business processes.
  - A business can gain a competitive advantage via its products by
- Creating new products and services, or
- Enhancing its existing products or services, or
- Differentiating its products and services from its competitors
  - Information systems can help create a competitive advantage by being part of the product or by providing support to the product.
  - A company can gain a competitive advantage by using business processes to
- Lock in customers via high switching costs, making it too expensive for the customer to switch to a competitor.
- Lock in suppliers via easy-to-use connections, discouraging them from changing to another business.

- Create entry barriers for new competitors, thereby raising the costs to enter the market.
- Establish alliances with other organizations and set standards, reducing purchase costs and providing benefits for everyone. Reduce cost which in turn reduces prices and increases profitability.

MIS FUNCTION IN AN ORGANISATION

When information systems are designed to provide information needed for effective decision making by managers, they are called management information systems. MIS is a formal system for providing management with accurate and timely information necessary for decision making.

The system provides information on the past, present and project future and on relevant events inside and outside the organization. It may be defined as a planned and integrated system for gathering relevant data, converting it in to right information and supplying the same to the concerned executives. The main purpose of MIS is to provide the right information to the right people at the right time.

The Concept of management information systems originated in the 1960s and become the byword of almost all attempts to relate computer technology and systems to data processing in business. During the early 1960s, it became evident that the computer was being applied to the solution of business problem in a piecemeal fashion, focusing almost entirely on the computerization of clerical and record – keeping tasks. The MIS concepts are important for efficient and effective computer use in business because of two major reasons:

- It serves as a systems framework for organizing business computer applications. Business applications of computers should be viewed as interrelated and integrated computer – based information systems and not as independent data processing job.
- In emphasizes the management orientation of electronics information processing in business. The primary goal of computer based information systems should be the processing of data generated by business operations.

A management information system is an integrated man – machine systems that provides information to support the planning and control function of manager in an organization. The output of an MIS is information that sub serves managerial functions. When a system provides information to persons who are not managers, then it will not be considered as part of an MIS. For example, an organization often processes a lot of data which it is required by law to furnish to various government regulatory agencies. Such a system, while it may have interfaces with an MIS, would not be a part of it. Instances of such systems are salary disclosures and excise duty statements.

Generally, MIS deals with information that is systematically and routinely collected in accordance with a well-defined set of rules. Thus, and MIS is a part of the formal information network in an organization. Information that has major managerial planning significance is sometimes collected at golf courses. Such information is not part of MIS, however, one- shot market research data collected to gauge the potential of a new product does not come within the scope of an MIS by our definition

Check Your Progress :

5. Organization can be divided into how many levels.
6. Write any three disadvantages of MIS.
7. Write some use of MIS in management (Any three).

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because although such information may be very systematically collected it is not collected on a regular basis.

Some of the functions can be listed as below,

1. **data processing**:

   It includes the collection, transmission, storage, processing and output of data. It simplifies the statistics and reduces to the lowest cost by supplying an unified format.

2. **function of prediction:**

   It predicts the future situation by applying modern mathematics, statistics or simulation.

3. **function of plan**:

   It arranges reasonably the plans of each functional department in accordance with the restrictions afforded by enterprises and provides the appropriate planning reports according to different management.

4. **function of control**:

   It monitors and inspects the operation of plans and comprises with the differences between operation and plan in accordance with the data afforded by every functional department, and be assistant to managers to control timely each method by analyzing the reasons why the differences comes into being.

5. **function of assistance**:

   It derives instantly the best answers of related problems by applying to various of mathematics' mode and analyzing a plentiful data stored in computers in the hope of using rationally human resource, financial resource, material resource and information resource for relative abundant economic benefits.

A management information system is a system that has important tools to supports, analyse, delivery and adding reliability to any organisation. Also this helps to solve businesses problems. The term MIS is often used to submit to a group of information management methods tied to the support of human decision making, e.g. Decision Support Systems, Expert systems, and Executive information systems.

ROLE OF MIS IN MANAGEMENT:

We can compare the role of the MIS in an organization to the role of heart in the body. Here information acts as blood and MIS acts as the heart. As in the body the heart plays the role of supplying pure blood to all the elements of the body including the brain. Similarly MIS provides information to all levels of management. The MIS plays exactly the same role in the organization. The system ensures that an appropriate data is collected from the various sources, processed, and sent further to all the needy destinations. The system is expected to fulfill the information needs of an individual, a group of individuals, the management functionaries: the managers and the top management.

The MIS helps the clerical personnel in the transaction processing and answers their queries on the data pertaining to the transaction, the status of a particular record and references on a variety of documents. The MIS helps the middle management in short them planning, target setting and controlling the business functions. It is supported by the use of the management tools of planning and control.

The MIS plays the role of information generation, communication, problem identification and helps in the process of decision making. The MIS, therefore, plays a vital role in the management, administration and operations of an organization.

Uses of MIS in Management:

- It deals with transaction processing such as answering the questions, status of a particular record and variety of documents.
- It gives operational data for planning, scheduling and control.
- It helps in decision making and to correct an out of control situation.
- It helps middle management in short term planning, target setting and control the business functions.
- It helps top management in goal setting, planning business planes and its implementations.
- It helps in generating information, communicating of the generated information, problem identification and helps in the process of decision making.

Answer of the Check Your Progress

1. MIS can be subdivided into four categories. These are :—
   a) Transaction processing system;
   b) Information providing system;
   c) Decision suppor system; and
   d) Programmed desision making system.
2. It is the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of organizational objectives.
3. It is the process of deciding on objectives of the organization, on changes in these objectives and on the policies that govern the acquisition, use and disposition of these resources.
4. The following steps are taken :—
   a) Identifying information needs at all level of management;
   b) Listing objectives of MIS and anticipated benefits;
   c) Identifying systems constraints (internal & external);
   d) Determining information needs and resources,
   e) Developing alternative concaptual design and selecting one,
   f) Preparing the conceptual design report.
5. The organization may be divided into four levels. They are
   - Strategic Planning Level

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- Management Control Level
- Operational Control Level
- Transaction Processing Level

6. MIS cannot replace managerial judgements in decision making. It is merely an effective tool for the managers in decision making and problem solving.

   The quality of output of MIS is directly proportional to the quality of input and processes.

   MIS is less effective in organizations where information is not being shared with others.

7. It deals with transaction processing such as answering the questions, status of a particular record and variety of documents.

   It gives operational data for planning, scheduling and control.

   It helps in decision making and to correct an out of control situation.

EXERCISE

1. Explain concept of management information system.
2. Explain fields of information system.
3. How can you divide MIS? Explain
4. Explain objectives and characteristics of MIS.
5. Write down steps taken to design an MIS.
6. Explain views of MIS.
7. Write notes on following:
   (i) Components of MIS
   (ii) Output of MIS
8. Explain advantages and disadvantages of MIS.
9. Writ e down pitfalls in designing MIS.
10. Explain role of MIS in management.

3 Information Systems Concepts

The Chapter Covers :

- MIS versus Data Processing
- MIS & Decision Support System
- MIS & Information Resources Management
- End-user computing
- Uses of Management Information System in Finance
- Uses of Management Information System in Marketing
- Functions of MKIS
- Components of an MKIS
- Uses of Management Information System in Manufacturing
- Information system for Human Resource

Management Information System (MIS) is a subset of the overall internal controls of a business covering the application of people, documents, technologies, and procedures by management accountants to solving business problems such as costing a product, service or a business-wide strategy. Management Information Systems are distinct from regular information systems in that they are used to analyze other information systems applied in operational activities in the organization. Academically, the term is commonly used to refer to the group of information management methods tied to the automation or support of human decision making, e.g. Decision Support Systems, Expert systems, and Executive information systems.

This is an emerging science which sets its the main task of it is to strengthen the information management of enterprises by taking advantage of modern computer and network communication technology to the largest extent, and set up the correct data based on the research of human resource, financial resource, equipments, technology, etc. owned by enterprises, and provide timely various of processed and

systemized information data to the manager so as to make correct decisions and improve continuously the management level and economic benefits of enterprises. MIS is generally used for system decision-making. For instance, enterprise employee can make use of MIS to find out problems that need to be solved urgently and feedback in time to the upper managers in order to make them understand the current progress and its shortages.

MIS VERSUS DATA PROCESSING

Data processing refers to a class of programs that organize and manipulate data, usually large amounts of numeric data. Accounting programs are the prototypical examples of data processing applications. In contrast, word processors, which manipulate text rather than numbers, are not usually referred to as data processing applications.

Data Processing is the term generally used to describe what was done by large mainframe computers from the late 1940's until the early 1980's (and which continues to be done in most large organizations to a greater or lesser extent even today): large volumes of raw transaction data fed into programs that update a master file, with fixed-format reports written to paper.

The term Information Systems refers to an expansion of this concept, where the raw data, previously copied manually from paper to punched cards, and later into data-entry terminals, is now fed into the system from a variety of sources, including ATMs, EFT, and direct customer entry through the Internet. The master file concept has been largely displaced by database management systems, and static reporting replaced or augmented by ad-hoc reporting and direct inquiry, including downloading of data by customers.

The ubiquity of the Internet and the Personal Computer have been the driving force in the transformation of Data Processing to the more global concept of Information Systems.

MIS & DECISION SUPPORT SYSTEM

A **decision support system (DSS)** is a computer-based information system that supports business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization and help to make decisions, which may be rapidly changing and not easily specified in advance.

DSS can be described as a computer-based interactive human–computer decision-making system that:

- supports decision makers rather than replaces them;
- utilizes data and models;
- solves problems with varying degrees of structure

DSSs include knowledge-based systems. A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from a combination of raw data, documents, personal knowledge, or business models to identify and solve problems and make decisions.

Decision support systems (DSS) are a subset of computer-based information systems (CBIS). The general term'computer-based information systems' is a constellation of a variety of information systems such as office automation systems, trans-

action processing systems, management information systems and management support systems. Management support systems consist of DSS, expert systems and executive information systems. In the early 1970s, scholars in the CBIS area began to recognize the important roles information systems play in supporting managers in their semi-structured or unstructured decision-making activities. It was argued that information systems should exist only to support decisions, and that the focus of the information systems

development efforts should be shifted away from structured operational control to unstructured critical decisions in organizations. Decisions are irreversible and have far-reaching consequences for the rest of organizational life. The importance of effective decision making can never be overemphasized. Decision making is, in effect, synonymous with management.

Typical information that a decision support application might gather and present are:

- inventories of information assets (including legacy and relational data sources, cubes, data warehouses, and data marts),
- comparative sales figures between one period and the next,
- projected revenue figures based on product sales assumptions.

A decision support system (DSS) is a computer system that typically encompasses mathematical models as well as informational databases and a user interface in order to provide recommended decisions to manager-users. A DSS differs from a traditional information system (IS) or management information system (MIS) in that it not only provides the user with information, databases or reports, as does an IS or MIS, but it also provides answers to user queries, i.e., decisions, through its modeling component. In essence a DSS is a computer system that helps managers make decisions.

MIS provide managers with reports and, in some cases, online access to the organization's current performance, and historical records. They are developed to facilitate the use of diverse sets of data. Generally, they condense information obtained from TPS and present it to management in the form of routine summary and exception reports. However, MIS have limited analytical capabilities when compared with decision support systems (DSS).

Because the DSS is an outgrowth of the MIS, there are basic similarities between them. They are both computer based and designed to supply information to managers. However, the DSS has an important advantage: it is geared to information manipulation and not essentially to data storage and retrieval, as are many MIS. A DSS is operated directly by its users. When they need access to information, they can immediately consult their own on-line system without having to wait days or weeks for results from the MIS department. Once managers call up the required data through a DSS, they can manipulate it directly, asking questions and reformatting the data to meet their specific needs without having to explain what they want to the EDP/MIS staff. Managers are, therefore, more likely to get the information they need when they need it. In addition, direct manipulation of data has the advantage of greater security for sensitive information.

DSS is an interactive computer-based system designed to help in decisionmaking situations by utilizing data and models to solve unstructured problems. The aim of DSS is to improve and expedite the processes by which management makes and

communicates decisions – in most cases individual and organizational effectiveness.

Another key differences between and MIS and a DSS is that a DSS helps managers make non-routine decisions in unstructured situations. An MIS, on the other hand, emphasizes standard periodical reports and cannot respond well to non-routine, unstructured or ad hoc situations. MIS departments may be unfamiliar with the decisions made in such situations. Because they often have a tremendous backlog of request for data, they may be unable to respond quickly to additional special requests. Conversely, some managers who have no difficulty manipulating the data themselves may have difficulty explaining their information requirements to MIS staff.

	MIS	DSS
Support	Info about performance	Info and modeling to analyze problems
Report Form	Periodic reports or On Demand	Interactive Inquiries
Format	Pre-specified Fixed format	Flexible and Adaptable
Processing	Extract and manipulate data	Analytical modeling of data

MIS & INFORMATION RESOURCES MANAGEMENT

Information is an important resource in the "MIS" and its management is very different from traditional management. Mostly, it involves management of change, time and electronic sources, along with traditional collection management aspects. Information resource management is a philosophical and practical approach to managing information. Because information is a valuable resource to be managed like other resources, IRM contributes directly to accomplishing organizational goals and objectives. It provides an integrated approach to managing the entire life cycle of information—from creation, to dissemination, to archiving or destruction—so as to maximize the overall usefulness of information.

Information resource managers oversee the management of information storage methods and practices. Many are employed by the government, although some work for data storage companies, IT departments within large organizations or as computer consultants. IR Management professionals use computer hardware, software and other technologies to store, secure and search important data. Depending on the client, that data may include tax information, customer sales records, medical charts or any number of important pieces of information. A bachelor's or master's degree in Computer Science, Information Technology, Computer Engineering, Mathematics or a related field is recommended. A business education can be helpful for those interested in managerial positions.

The underlying philosophy behind Information Resource Management (IRM) is to design, inventory and control all of the resources required to produce information. Information is regarded as a valuableresource which should be managed like other resources, and shouldcontribute directly to accomplishing organisational goals andobjectives.

IRM includes the management of (1) the broad range of informationresources, e.g., printed materials, electronic information, andmicroforms, (2) the various technologies and equipment thatmanipulate these resources, and (3) the people who

generate,organise, and disseminate those resources. Overall the intent of IRMis to increase the usefulness of government information both to thegovernment and to the public. by a single user or application.

There are three classes of information resources:

- **BUSINESS RESOURCES** - Enterprises, Business Functions, Positions (Jobs), Human/Machine Resources, Skills, Business Objectives, Projects, and Information Requirements.
- **SYSTEM RESOURCES** - Systems, Sub-Systems (business processes), Administrative Procedures (manual procedures and office automation related), Computer Procedures, Programs, Operational Steps, Modules, and Subroutines.
- **DATA RESOURCES** - Data Elements, Storage Records, Files (computer and manual), Views, Objects, Inputs, Outputs, Panels, Maps, Call Parameters, and Data Bases.
- These three classes of information resources provides the rationale as to why there are three complementary methodologies within "PRIDE".
- **ENTERPRISE ENGINEERING METHODOLOGY (EEM)** - for defining the mission and goals of the business and the development of an Enterprise Information Strategy synchronized with the business.
- **INFORMATION SYSTEMS ENGINEERING METHODOLOGY (ISEM)** - for designing and building enterprise-wide information systems (business processes crossing organizational boundaries). Software Engineering is considered a subset of ISEM.
- **DATA BASE ENGINEERING METHODOLOGY (DBEM)** - to design and develop the corporate data base, both logically and physically.

Each methodology consists of a series of defined phases, activities and operations. Laced throughout the methodologies are defined deliverables and review points to substantiate completeness and to provide an effective dialog between management and developers. The methodologies promote design correctness and the production of a quality product.

END-USER COMPUTING

The widespread use of personal computers and computer-based workstations has brought with it the age of end-user computing. End-user computing is a generic term for any information-processing activity performed by direct end users who actually use terminals or microcomputers to access data and programmes. The manager as end user may be provided with powerful software (like DBMS) for accessing data, developing models, and performing information processing directly. This has brought computing directly under the control of the end users and eliminates their dependence on the information systems specialist and the rigidities of predesigned procedures. They may now make ad hoc queries of information and analyse it in various ways. They may write programmes, or may often use ready-made programmes stored in the computer, using the computing power of a local PC or the mainframe to which it is connected.

Check Your Progress :

1. What is decision support system (DSS) ?
2. What does DBEM stands for.

In computing, **End User Computing** (EUC) refers to systems in which non-programmers can create working applications. EUC is a group of approaches to computing that aim at better integrating end users into the computing environment. These approaches attempt to realize the potential for high-end computing to perform in a trustworthy manner in problem solving of the highest order. With the increasing growth in end user computing, computer professionals are likely to spend more time away from MIS department offices guiding and supporting the end users are learning to use and apply new technology and tools.

With the development of problem solving software that can be easily learned and used, end-user computing the creative use of computers by employees who are not data processing experts is growing at a significant rate. Decision support systems and artificial intelligence techniques are two examples of end user computing that are becoming more useful to managers. Like MIS, DSS and artificial intelligence offer managers the ability to receive filtered, condensed, and analyzed information that can enhance their job performance and, in the case of artificial intelligence, provide them with an information system that can keep pace with own knowledge and sophistication.

Uses of Management Information System in Finance

Management Information Systems (MIS) in Finance have been widely adopted both by corporations as well as governments. They are information systems with capacity to maintain large data bases enabling organizations to store, organize and access financial information easily. These systems are primarily used for accounting operations and generation of financial reports. Increasingly they are also used to support budgetary, planning and decision making processes. These systems are credited with increasing financial transparency, efficiency and accountability.

Financial MIS Provides financial information to all financial managers within an organization. It integrates financial & operational information from multiple sources. Financial MIS eases analysis by providing fast financial data. It enables financial analysis from different aspects; time, product, customer. With Financial MIS, one can analyze historical and current data. Also one can monitor use of funds. Few examples or functions of Financial MIS are Costing, P&L reporting, Auditing, Funds management, etc. Use of MIS in various field of Finance are as follows:

- General Ledger: The main use of a management information System (MIS) in finance is that it automatically updates all the transactions in the General Ledger. The General Ledger is the core component of all financial information systems. Financial transactions are simultaneously posted on the various accounts that comprise the organization's "Chart of Accounts". Simultaneous updating of accounts such as sales, inventory and accounts receivable, reduces errors. It also provides an accurate and permanent record of all historical transactions.
- Cash Management: Cash flow management is an important use of MIS in Finance. Cash Management refers to the control, monitoring and forecasting of cash for financing needs. Use of MIS in Finance helps companies track the flow of cash through accounts receivable and accounts payable accurately. Accurate records also help in monitoring cost of goods sold. This can help pin point areas that eat up cash flow such as inventory costs, high raw material costs or unreliable sales.

- Budget Planning: Financial budget planning uses proforma or projected financial statements that serve as as formal documents of management's expectations regarding sales, expenses and other financial transactions. Thus financial budgets are tools used both for planning as well as control. MIS in finance helps organizations evaluate "what if" scenarios. By modifying the financial ratios, management can foresee the effects of various scenarios on the financial statements. MIS thus serves as a decision making tool, helping in choosing appropriate financial goals.
- Financial Reporting: The use of MIS systems in Finance enables companies to generate multiple financial reports accurately and consistently. Generation of financial statements both for internal reports as well as for shareholder information takes less effort because of the automatic updating of the General Ledger. Compliance with Government regulations as well as auditing requirements is also easier because the records are accurate and provide a permanent historical map of transactions that can be verified.
- Financial Modeling: A financial model is a system that incorporates mathematics, logic and data in the form of a large database. The model is used to manipulate the financial variables that affect earnings thus enabling planners to view the implications of their planning decisions. MIS in Finance enables organizations to store a large amount of data. This helps managers develop accurate models of the external environment and thus incorporate realistic "what if" scenarios into their long-range planning goals.

USES OF MANAGEMENT INFORMATION SYSTEM IN MARKETING

The changes in theory and practice of marketing have been fundamentally reshaping companies. One can see these changes in marketing and management related information systems. More and more, companies are faced with the need to control an ever larger

and rapidly changing marketing environment. The information processing requirements of companies are expanding as their competitive environments become more dynamic and volatile. To handle the increasing external and internal information flow and to improve its quality, companies will need to take advantage of the opportunities offered by modern information technology (IT) and information systems (IS).

Managing marketing information by means of IT has become one of the most vital elements of effective marketing. By collecting and sharing marketing information and by using it to promote corporate and brand image, IS offer new ways of improving internal efficiencies of the firm. Information systems allow dynamic marketing communication between personnel in corporate planning, accounting, advertising and sales promotion, product management, channels of distribution and direct sales. Information technology-based marketing information systems (MkIS) have been with us for many years.

MKIS interacts with information users to assess information. It develops needed information from internal and external sources. It helps users analyze information for marketing decisions. It distributes the marketing information and helps managers use it for decision making. A **Marketing Information System** can be defined as 'a system in which marketing data is formally gathered, stored, analysed and distrib-

uted to managers in accordance with their informational needs on a regular basis' (Jobber, 2007). You can also define it as 'People, equipment and procedures to gather, sort, analyze, evaluate and distribute needed, timely and accurate information to marketing decision makers'. The importance of computers in marketing was highlighted by Kotler. Traditionally, MkIS has been seen as a system to support marketing management in its decision making. In addition to the management perspective, MkIS can be an essential tool for the entire marketing organization. Some researchers have classified IS in marketing by the tasks for which they are customarily used.

MKIS can be classified into two groups based on the organizational position of the users and type of use: the systems for the managers and the systems for operational sales and marketing activities. The users of marketing management and decision-making systems are primarily senior executives, strategic business units (SBUs) and marketing managers, marketing analysts and experts. Often experts use raw data and refine them to information and finally to knowledge needed by managers. In modern marketing thinking, MkIS are not simply systems limited to management. They include also operational, sales and marketing process-oriented systems, which serve in daily marketing operational activities such as direct mailing (database marketing), telemarketing and operational sales management.

FUNCTIONS OF MKIS

1. Classification
2. Measurement and Analysis
3. Decision Models
4. Reporting system
5. Information retrieval system

Components of an MKIS

- Internal Reports System
- Marketing Intelligence System
- Marketing Decision Support System (DSS)
- Marketing Research System

USES OF MANAGEMENT INFORMATION SYSTEM IN MANUFACTURING

Inventory control programs are one component of a manufacturing MIS that relies on the production schedule. Inventory control programs can forecast future production, automatically reorder items when a certain threshold is met, determine manufacturing costs, and develop resource requirements plans from the production schedule.

Manufacturing Requirements Planning (MRP) programs help coordinate thousands of inventory items when demand for one item depends on demand for another. MRP systems determine when finished products are needed, then work backward to determine deadlines and resources needed to complete the final product on schedule.

When high inventory levels are kept, a company's money is tied up in unused inventory. This means higher costs for the company. A Just-in-time (JIT) inventory approach ensures inventory and materials are delivered only when they are needed.

This maintains inventories at their lowest possible level, but insures materials are on-hand in time for production. Although JIT is beneficial, it also makes a business vulnerable to supply chain disruptions – whether internal or external. For example, if a machine breaks down that makes a component another unit needs to assemble the product, assembly may need to stop due to lack on components.

Technologies have been developed to control and streamline the manufacturing process. Computers can directly control manufacturing equipment using computer-assisted manufacturing software. Computer-integrated manufacturing software connects all aspects of production together, including order processing, product design, manufacturing, quality control, and shipping. For example, after an engineer designs a product using CAD software, MRP systems can use information from the design as input to plan and order materials. Production scheduling systems can use the design specifications as an input into the scheduling process. And computer-aided manufacturing systems can use the design specifications as input for setup. This greatly improves manufacturing efficiency.

The role of information in a manufacturing company is summarized in the illustration. Consider the three main flows crossing an enterprise system—material, money and information. It is easy to understand the specific importance of this information. Material flow constrains money flow, that is, no payment until delivery. Information flow constraints material flow, that is, there is no delivery until shipment documentation is issued. Information flow constrains money flow, because there is no payment until an invoice is issued.

A manufacturing information system is therefore an enabler to reaching higher levels of financial performance. Conversely, a poorly designed and tuned information system definitely hurts the plant's ability to serve the company's goal of sustaining and increasing profits.

A flexible manufacturing system allows a facility to quickly and efficiently change from making one product to making another, often using robotics and other automation. Generally the changeover is computer-controlled.

Finally, quality control has become paramount for manufacturing firms. Control charts or sample testing is used to monitor product quality.

The manufacturing MIS subsystems and outputs monitor and control the flow of materials, products, and services through the organization.

Inputs to the Manufacturing MIS

- Strategic plan or corporate policies.
- The TPS:
  - Order processing
  - Inventory data
  - Receiving and inspecting data
  - Personnel data
  - Production process
- External sources

Check Your Progress :

3. What does EUC refers to
4. What are use of MIS in Finance ?
5. What are the use of MIS in Human Resources.

Manufacturing MIS Subsystems and Outputs

- Design and engineering
- Master production scheduling
- Inventory control
- Manufacturing resource planning
- Just-in-time inventory and manufacturing
- Process control
- Computer-assisted manufacturing (CAM)
- Computer-integrated manufacturing (CIM)
- Flexible manufacturing system
- Quality control and testing

Manufacturing MIS

- Material requirements planning (MRP)
  - Determine when finished products are needed
  - Determine deadlines accordingly
- Manufacturing resource planning (MRPII)
  - Network scheduling
  - Improve customer service and productivity
- Just in time (JIT) inventory system
  - Inventory and materials delivered right before usage

INFORMATION SYSTEM FOR HUMAN RESOURCE

The Human Resource Information System (HRIS) is a software or online solution for the data entry, data tracking, and data information needs of the Human Resources, payroll, management, and accounting functions within a business. The Human Resources Information System provides you with a broad range of functions that enable you to perform standard reporting from all Human Resource areas. In addition, it lets you define your own reports quickly and efficiently. Normally packaged as a data base, hundreds of companies sell some form of HRIS and every HRIS has different capabilities. Typically, the better The Human Resource Information Systems (HRIS) provide overall:

- Management of all employee information.
- Reporting and analysis of employee information.
- Company-related documents such as employee handbooks, emergency evacuation procedures, and safety guidelines.
- Benefits administration including enrollment, status changes, and personal information updating.
- Complete integration with payroll and other company financial software and accounting systems.
- Applicant tracking and resume management.

In general, uses of computers in HRM fell into the category of electronic data processing applications, which generally involve the automation of relatively routine tasks (e.g., calculating pay and printing checks).

A number of trends seem to have contributed to a growing reliance on computers as information-processing and decision-aiding tools in HRM. The emergence of the human resource management field (versus personnel administration) gave the human resource function greater credibility within the managerial hierarchy, necessitating more sophisticated use of information, especially as it related to the strategic management function. Firms have experienced increased competitive pressures that have translated into greater cost containment demands from upper management, leading to greater automation of the record-keeping function in the HRM field.

An effective HRIS provides information on just about anything the company needs to track and analyze about employees, former employees, and applicants. With an appropriate HRIS, Human Resources staff enables employees to do their own benefits updates and address changes, thus freeing HR staff for more strategic functions. Additionally, data necessary for employee management, knowledge development, career growth and development, and equal treatment is facilitated. Finally, managers can access the information they need to legally, ethically, and effectively support the success of their reporting employees.

The most significant development in the HRIS area currently is the growing use of organizational intranets as a means of managing many aspects of a firm's HRIS. An intranet is an internal network that makes use of World Wide Web technology (browsers, servers, etc.) to gather and disseminate information within the firm. Intranets may be linked to the external Internet, but are usually secured in a variety of ways so that only authorized users can access the information on the internal components. While it is quite easy to generate static extracts of HRIS data tables, queries, forms, and reports for posting on an intranet, it is also quite feasible to establish live links between an intranet and a firm's HRIS. This allows real-time collection and display of information. Thus employees can complete forms online that enroll them in benefits programs, allow them to bid on job openings, let them submit suggestions, and facilitate filing of various claims. In addition, intranet displays can be tailored to the needs of specific users. The user may check on the current status of his or her fringe benefits, vacation time, training program enrollment, or pension fund. Intranets obviously require extensive security measures to prevent inappropriate changing or accessing of data.

Another variant is the extranet. Again, relying on World Wide Web technology, such systems allow organizations to interact with clients in a secure environment that mimics the Internet.

Answer of the Check Your Progress

1. A decision support system (DSS) is a computer-based information system that supports business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization and help to make decisions, which may be rapidly changing and not easily specified in advance.

2. At stand for Data base Engineering Methodology (DBEM) use is to design and develop and corporate data base, both logically and physically.

3. In computing, End User Computing (EUC) refers to systems in which non-programmers can create working applications. EUC is a group of approaches to computing that aim at better integrating end users into the computing environment.

4. They are information systems with capacity to maintain large data bases enabling organizations to store, organize and access financial information easily. These systems are primarily used for accounting operations and generation of financial reports. Increasingly they are also used to support budgetary, planning and decision making processes.

5. The Human Resource Information System (HRIS) is a software or online solution for the data entry, data tracking, and data information needs of the Human Resources, payroll, management, and accounting functions within a business.

EXERCISE

1. Explain difference between Management information system and data processing.
2. Explain relation between DSS and Management information system.
3. How can you relate MIS with Information resource management?
4. Explain end user computing.
5. Write notes on following:
   (i) Use of MIS in Finance
   (ii) Use of MIS in marketing
   (iii) Use of MIS in manufacturing
   (iv) Information system for human resource

4 System Approach to Problem Solving

The Chapter Covers :

- Definition of problem
- Terminology of Problem Solving
- Thinking patterns
- System approach to problem Solving

Problem Solving is very important. Problem-solving is a mental process that involves discovering, analyzing and solving problems. The ultimate goal of problem-solving is to overcome obstacles and find a solution that best resolves the issue.

The way in which people solve problems best depends largely on the unique situation. In some cases, people are better off learning everything they can about the issue and then using factual knowledge to come up with a solution. In other cases, creativity and insight are the best options. Problem solving is a natural part of life. In any business or industry, the ability of an employee to solve problems can mean the difference between success and failure. Lacking the ability to solve problems effectively can be a source of anxiety and stress for any individual. Problem solving is not an exact science, although there are guidelines that a person can follow to become a successful problem-solver.

Flexibility and open-mindedness is an essential part of being able to solve problems, whether it is in your personal life or on-the-job. Possessing advantageous problem solving skills requires a person to understand the problem, create a plan to solve

the problem, seeing the plan through and reviewing the plan to ensure that the problem is solved and is not repeated. When a person has difficulty imagining a solution to a problem, it is because he is overwhelmed with the details of the problem and lacks the ability to break down the problem or see the big picture.

This chapter provides the definition of problems, terminology for Problem Solving and useful Problem Solving patterns. In order to define steps of Problem Solving we should first define definition of problem.

Further, we should recognize common terminology such as Purpose, Situation, Problem, Cause, Solvable Cause, Issue, and Solution. There are several useful thinking patterns such as strategic thinking, emotional thinking, realistic thinking, empirical thinking and so on. The thinking pattern means how we think. This chapter will explain you about three points such as the definition of problems, the terminology of Problem Solving, and useful thinking patterns.

DEFINITION OF PROBLEM

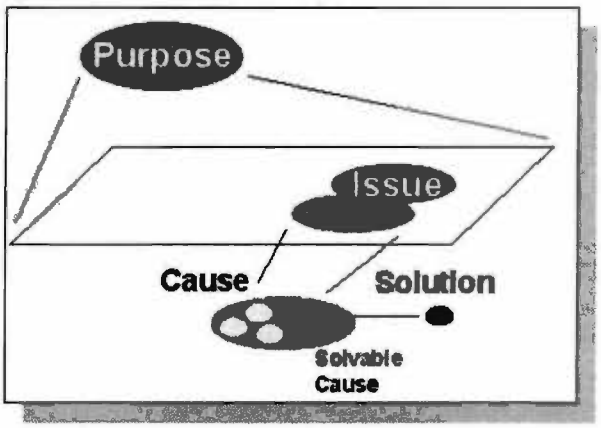
A **problem** is an obstacle, difficulty or challenge, or any situation that invites resolution; the resolution of which is recognized as a solution or contribution toward a known purpose or goal. A problem implies a desired outcome coupled with an apparent deficiency, doubt or inconsistency that prevents the outcome from taking place. A problem is decided by purposes. If someone wants money and when he or she has little money, he or she has a problem. But if someone does not want money, little money is not a problem.

For example, manufacturing managers are usually evaluated with line-operation rate, which is shown as a percentage of operated hours to potential total operation hours. Therefore manufacturing managers sometimes operate lines without orders from their sales division. This operation may produce more than demand and make excessive inventories. The excessive inventories may be a problem for general managers. But for the manufacturing managers, the excessive inventories may not be a problem.

If a purpose is different between managers, they see the identical situation in different ways. One may see a problem but the others may not see the problem. Therefore, in order to identify a problem, problem solvers such as consultants must clarify the differences of purposes. But oftentimes, problem solvers frequently forget to clarify the differences of purposes and incur confusion among their problem solving projects. Therefore problem solvers should start their problem solving projects from the definition of purposes and problems

TERMINOLOGY OF PROBLEM SOLVING

Problem solving is a systematic approach to define the problem and create a vast number of possible solutions without judging these solutions. We should know the basic terminology for Problem Solving. This chapter proposes seven terms such as Purpose, Situation, Problem, Cause, Solvable Cause, Issue, and Solution.



Purpose

Purpose means determination that is what we want to do or what we want to be. Purpose is an easy term to understand. Purpose is the first step of Problem Solving. We cannot think about problem until our purpose is clear.

Situation

Situation is just what a circumstance is. Situation is neither good nor bad. We should recognize situations objectively as much as we can. Usually almost all situations are not problems. But some problem solvers think of all situations as problems. Before we recognize a problem, we should capture situations clearly without recognizing them as problems or non-problems.

Problem

Problem is some portions of a situation, which cannot realize purposes. Since problem solvers often neglect the differences of purposes, they cannot capture the true problems. If the purpose is different, the identical situation may be a problem or may not be a problem.

Cause

Cause is what brings about a problem. Some problem solvers do not distinguish causes from problems. But since problems are some portions of a situation, problems are more general than causes are. In other words causes are more specific facts, which bring about problems. Without distinguishing causes from problems, Problem Solving cannot be specific. Finding specific facts which causes problems is the essential step in Problem Solving.

Solvable Cause

Solvable cause is some portions of causes. When we solve a problem, we should focus on solvable causes. Finding solvable causes is another essential step in Problem Solving. But problem solvers frequently do not extract solvable causes among causes. If we try to solve unsolvable causes, we waste time. Extracting solvable causes is a useful step to make Problem Solving efficient.

Issue

Issue is the opposite expression of a problem. If a problem is that we do not have money, the issue is that we get money. Some problem solvers do not know what

Check Your Progress :

1. Define problem.
2. What is problem solving ?
3. What are basic terminology for problem solving.

Issue is. They may think of "we do not have money" as an issue. At the worst case, they may mix the problems, which should be negative expressions, and the issues, which should be positive expressions.

Solution

Solution is a specific action to solve a problem, which is equal to a specific action to realize an issue. Some problem solvers do not break down issues into more specific actions. Issues are not solutions. Problem solvers must break down issues into specific action.

THINKING PATTERNS

This section lists fourteen thinking patters. Problem solvers should choose appropriate patterns, responding to situations. This report categorized these fourteen patterns into three more general groups such as thinking patterns for judgements, thinking patterns for thinking processes and thinking patterns for efficient thinking. Let's see these thinking patterns:

- ***Thinking patterns for judgements***

  In order to create a value through thinking we need to judge whether what we think is right or wrong. Four judging patterns are:

  - strategic thinking
  - realistic thinking
  - emotional thinking
  - empirical thinking.

  - ***Strategic thinking:*** Focus, or bias, is the criterion for strategic thinking. If you judge whether a situation is right or wrong based on whether the situation is focused or not, your judgement is strategic. A strategy is not necessarily strategic

  - ***Emotional thinking:*** In organizations, an emotional aspect is essential. Tactical leaders judge whether a situation is right or wrong. They think that if participants can be positive to a situation, the situation is right.

  - ***Realistic thinking :*** In realistic thinking we assume two criteria.

    - Start from what we can do
    - Fix the essential problem first

    These two criteria are very useful. For every task "Starting" is very important, even if we do very little. It is not necessary to start from the essential part. Even if we start from an easier part, then in terms of the first part of realistic thinking starting is a better judgement than a judgement of not-starting. Further, in order to make the Problem Solving more efficient we should search key factors after starting. Usually, 80 % of the problems are caused by only 20 % of the causes. So, if we can find the essential 20 % of the causes, we can fix 80 % of problems very efficiently. Then if we try to find the essential problem, what we are doing is right in terms of the second part of realistic thinking.

  - ***Empirical thinking :*** When we use empirical thinking, we judge whether the situation is right or wrong based on our past experiences. Sometimes, this thinking pattern persists on the past criteria too much,

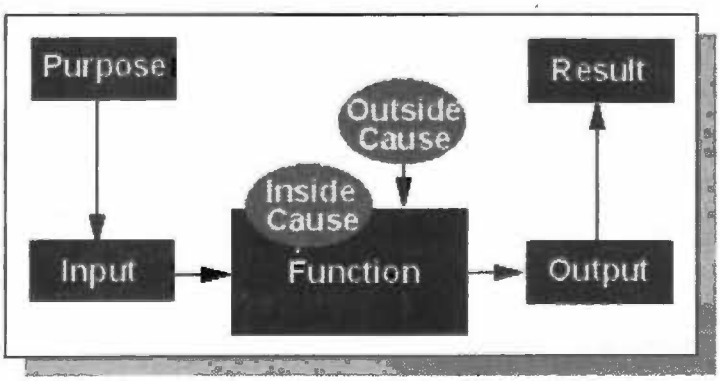
even if a situation has changed. But when it comes to our daily lives, situations do not change frequently. Further, if we have the experience of the identical situation before, we can utilize the experience as a reliable knowledge data base.

❑ ***Thinking patterns for thinking processes***

If we can think about anything systematically then we do not have to be frustrated when we think. While if we don't have any systematic method then Problem Solving frustrate us. This section lists five systematic thinking processes:

- rational thinking
- systems thinking
- cause & effect thinking
- contingent thinking
- Toyota fs five times WHYs method
- ***Rational thinking :*** Rational thinking is one of the most common Problem Solving methods. Steps of this Problem Solving method are given below:.
  1. First of all, set the ideal situation
  2. Identify a current situation
  3. Compare the ideal situation and the current situation, and identify the problem situation
  4. Break down the problem to its causes
  5. Conceive the solution alternatives to the causes
  6. Evaluate and choose the reasonable solution alternatives
  7. Implement the solutions

  We can use this type of thinking as a Problem Solving method for almost all problems.
- ***Systems thinking :*** Systems thinking is a more scientific Problem Solving approach as compared to rational thinking approach. In this approach, first of all we set the system, which causes problems and then analyze them on the basis of systems functions. Following figure shows you components of system and how the system works.



Here, System comprise of:

- ✓ Purpose
- ✓ Input
- ✓ Output
- ✓ Function

- ✓ Inside cause (Solvable cause)
- ✓ Outside cause (Unsolvable cause)
- ✓ Result

In order to realize Purpose, first of all we prepare Input and then we can get Output through Function. But it is not necessary that Output does not realize Purpose. It might be possible that result of the Function may be different from Purpose. This difference is created by Outside Cause and Inside Cause. We cannot solve Outside Cause but we can solve Inside Cause. For example, when we want to play cricket then Purpose is to play cricket. If we cannot play cricket, this situation is Output. If we cannot play cricket because of a bad weather, the bad weather is Outside Cause, because we cannot change the weather. In contrast, if we cannot play cricket because one player is absent, this cause is solvable as we can call extra player of our team. Then, one player is absent is an Inside Cause.

Thus, we can say Systems thinking is a very clear and useful method to solve problems.

- ***Cause & effect thinking :***

  Traditionally, we like to clarify cause and effect relations. We usually think of finding causes as solving problems. Finding a cause and effect relation is a conventional basic Problem Solving method.

- ***Contingent thinking :***

  Game Theory is a typical contingent thinking method. Let's understand this type of approach with the help of an example. If we think about as many situations as possible, which may happen, and prepare solutions for each situation, this process is a contingent thinking approach.

- ***Toyota fs five times WHYs :***

  At Toyota, employees are taught to think WHY consecutively five times. This is an adaptation of cause and effect thinking. If employees think WHY and find a cause, they try to ask themselves WHY again. They continue this process for five times. Through these five WHYS, they can break down causes into a very specific level. This five times WHYs approach is very useful to solve problems.

❑ ***Thinking patterns for efficient thinking***

In order to think efficiently, there are several useful thinking patterns. This section lists five patterns for efficient thinking as given below:

- hypothesis thinking
- conception thinking
- structure thinking
- convergence & divergence thinking
- time order thinking.

- ***Hypothesis thinking :***

If we can collect all information quickly and easily, you can solve problems very efficiently. But in reality it's not possible to collect all information. If we try to collect all information, we need a large amount of time. Hypothesis thinking does not require collecting all information. We develop a hypothesis based on available information. After we developed a hypothesis, we collect minimum information to prove the hypothesis. If the first hypothesis is right, you do not have to collect any more information. If the first hypothesis is wrong, we will develop the next hypothesis based on available information. Hypothesis thinking is a very efficient problem-solving method, because we do not have to waste time to collect unnecessary information.

- ***Conception thinking :***

  It's not necessary that Problem Solving is logical or rational. Creativity and flexibility are other important aspects for Problem Solving. We cannot recognize these aspects clearly. Following tips are useful for creative and flexible conception:

  ✓ You should be visual.

  ✓ Write down everything what you think.

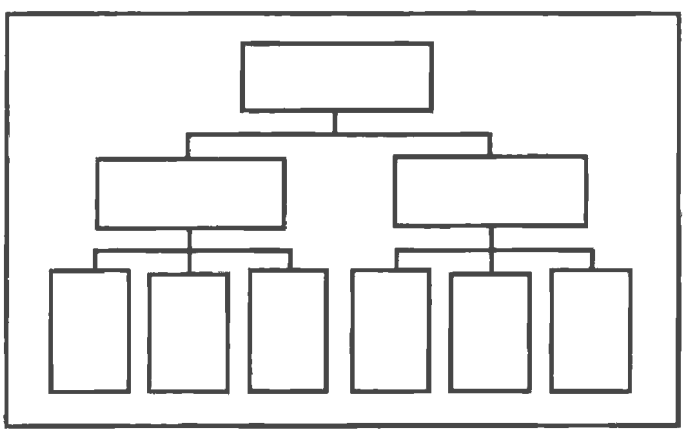
  ✓ Use cards to draw, write and arrange ideas in many ways.

  ✓ Change positions, forms, and viewpoints, physically and mentally.

  We can imagine without words and logic, but if we want to communicate our ideas to others, we must explain by words and logic. Therefore after we create ideas, we must explain them literally. Creative conception must be translated into reasonable explanations. Without explanations, conception does not make sense.

- ***Structure thinking :***

  In order to understand a complex situation more clearly we can make a structure like a tree. This helps us to grasp the situation very clearly.



Upper level should be more abstract and lower level should be more concrete. Dividing abstract situations from concrete situations is helpful to clarify the complex situations. Very frequently, problem solvers cannot arrange a situation clearly. A clear recognition of a complex situation increases efficiency of Problem Solving.

- ***Convergence & divergence thinking :*** When we should be creative we do not have to consider convergence of ideas. In contrast, when we should summarize ideas we must focus on convergence. If we do convergence and divergence simultaneously, Problem Solving becomes inefficient.
- ***Time order thinking :*** When we are confused with Problem Solving then thinking based on a time order is very convenient. We can think based on a time order from the past to the future and make a complex situation clear.

SYSTEM APPROACH TO PROBLEM SOLVING

The systems approach to problem solving used a systems orientation to define problems and opportunities and develop solutions. Studying a problem and formulating a solution involves following activities:

1. Recognize and define a problem or opportunity using systems thinking.
2. Develop and evaluate alternative system solutions.
3. Select the system solution that best meets your requirements.
4. Design the selected system solution.
5. Implement and evaluate the success of the designed system.

1) Defining problems and opportunities:

In the first step of the systems approach Problems and opportunities are identified. A problem can be defined as a basic condition that is causing undesirable results. An opportunity is a basic condition that presents the potential for desirable results. Symptoms must be separated from problems. Symptoms are merely signals of an underlying cause or problem.

Example:

Symptom: Production of a company's products is declining.

Problem: Company is unable to produce required quantity because they do not have sufficient raw material.

Opportunity: We could increase production significantly if quantity of raw materials is increased as per production requirement.

2) Systems thinking

Systems thinking is to try to find systems, subsystems, and components of systems in any situation you are studying. This viewpoint ensures that important factors and their interrelationships are considered. This is also known as using a systems context, or having a systemic view of a situation. The business organization or business process in which a problem or opportunity arises could be viewed as a system of input, processing, output, feedback, and control components. Then to understand a problem and save it, you would determine if these basic system functions are being properly performed.

Example:

The production function of a business can be viewed as a system. You could then ask: Is poor production (output) caused by inadequate raw materials (input), Less work done by workers (processing), incorrect production requirement information (feedback), or inadequate production management (control)?

3) Developing alternate solutions

There are usually several different ways to solve any problem or pursue any opportunity. Jumping immediately from problem definition to a single solution is not a good idea. It limits your options and you lose a chance to consider the

advantages and disadvantages of several other alternatives. You also lose the chance to combine the best points of several alternative solutions.

Experience is good source for developing solutions. The solutions that have worked, or at least been considered in the past, should be considered again. Another good source of solutions is the advice of others, including the recommendations of consultants and the suggestions of expert systems. You should also use your intuition and ingenuity to develop a number of creative solutions. These could include what you think is an ideal solution. One should try to develop more realistic alternatives that recognize the limited financial, personnel, and other resources of most organizations. Also, you can use decision support software packages to develop and manipulate financial, marketing, and other business operations. This simulation process can help you generate a variety of alternative solutions.

4) Evaluating alternate solutions

Once alternative solutions have been developed, these solutions must be evaluated so that you can identify best solution. The goal of evaluation is to determine how well each alternative solution meets your business and personal requirements. These requirements are key characteristics and capabilities that you feed are necessary for your personal or business success.

5) Selecting the best solution

Once all alternative solutions have been evaluated, you can begin the process of selecting the best solution. You can compare alternative solutions because they have been evaluated using the same criteria.

6) Designing and implementing solution

Once a solution has been selected, it must be designed and implemented. You may have to depend on other business end users technical staff to help you develop design specifications and an implementation plan. Typically, design specifications might describe the detailed characteristics and capabilities of the people, hardware, software, and data resources and information system activities needed by a new system. An implementation plan specifies the resources, activities, and timing needed for proper implementation. For example, the following items might be included in the design specifications and implementation plan for a computer-based sales support system:

- ✓ Types and sources of computer hardware, and software to be acquired for the sales reps.
- ✓ Operating procedures for the new sales support system.
- ✓ Training of sales reps and other personnel.
- ✓ Conversion procedures and timetable for final implementation.

7) Post implementation review

The final step of the systems approach recognizes that whether an implemented solution will fail to solve the problem for which it was developed or not. The real world has a way of confounding even the most well-designed solutions. Therefore, the results of implementing a solution should be monitored and evaluated. This is called a post-implementation review. The focus of this step is to determine if the implemented solution has indeed helped the firm and selected subsystems meet their system objectives. If not, the systems approach assumes you should go back to a previous step and make another attempt to find a workable solution.

Check Your Progress :

4. What are judging patterns are, name it.
5. What criteria we assume in realistic thinking.
6. What convergence & divergence thinking?
7. What do you understand by time order thinking.

Answer of the Check Your Progress

1. A problem is an obstacle, difficulty or challenge, or any situation that invites resolution; the resolution of which is recognized as a solution or contribution toward a known purpose or goal. A problem implies a desired outcome coupled with an apparent deficiency, doubt or inconsistency that prevents the outcome from taking place.
2. Problem solving is a systematic approach to define the problem and create a vast number of possible solutions without judging these solutions.
3. Thre are seven basic terms such as Purpose, Situation, Problem, Cuse, Solvable cause, Issue and Solution.
4. In order to create a value through thinking we need to judge whether what we think is right or wrong. Four judging patterns are:
   - strategic thinking
   - emotional thinking
   - realistic thinking
   - empirical thinking.
5. In realistic thinking we assume two criteria.
   - Start from what we can do
   - Fix the essential problem first
6. When we should be creative we do not have to consider convergence of ideas. In contrast, when we should summarize ideas we must focus on convergence. If we do convergence and divergence simultaneously, Problem Solving becomes inefficient.
7. When we are confused with Problem Solving then thinking based on a time order is very convenient. We can think based on a time order from the past to the future and make a complex situation clear.

EXERCISE

1. What do you understand by problem.
2. Explain terminology of problem solving.
3. Explain different types of thinking patterns.
4. Explain thinking patterns for efficient thinking
5. Explain different approaches to problem solving.

5 Information

The Chapter Covers :

- Introduction
- What is Information
- Nature of information
- Need of Information
- Information and Communication
- Information Process
- Quality of Information
- Sources of Information
- Information Gathering Technique
- Levels of Management
- Levels of Information
- Management and Need for Information Systems
- Marketing Management
- Material Management
- Finance Management
- Human Resource Management

INTRODUCTION

Since the drawn of the civilization, information has been one of the major requirements of the human being. One gathers many types of information related to the current system during system development. While gathering information we decide which sort of information we have to collect it means whether the information is relevant for the system or not. After this what are sources of information? And how those sources can be brought to maximum use ? The principal sources of information are- authorities, personnel, input and output processes for while many sorts of formats such as - interview, questionnaire etc. are framed. We also supervise system site for information gathering. All of these aspects will be discussed in this chapter.

WHAT IS INFORMATION

The meaningful conclusion derived out when data is processed is called information or in other words the meaningful rearrangement of data after processing is called

information. Information is derived from data. We can define information as data that is collected, collated, processed, logically organized and analyzed so as to be of use to the decision maker. For example, the marks obtained in the subjects by a student is called data, and marks obtained in all subjects is aggregate, average of the marks on which result is to be declared is information. Marks obtained by students in class is data for class teacher so that he can calculate the average of the whole class in aggregate which will be a piece of information for that class teacher.

NATURE OF INFORMATION

We try to know about the relevance of information before submitting the information. For example, if we are gathering information related to the firm or institution, it should be relevant. It has to be paid serious attention. To know about the firm we have to gather information like the whole turn-over of the firm, the function of the institution, the goals of the institution etc. For instance, how many acres of land our institution covers, is in no way important or relevant, instead we should try to know in which states of India this institution is working and that can be meaningful. In this context we have to gather information about the firm/institution, the personnel of the firms, functions and products of the firm.

NEED OF INFORMATION

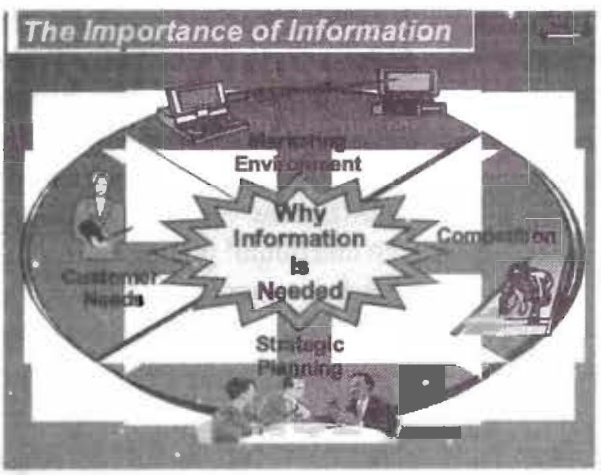
Information has a quality that is the suitability to various requirements. Information has become a valuable resource, just as much as capital infrastructure and people. Information is collected on any amount of different items and used by managers to make strategic decisions concerning the organisation. Information technology is fundamental to the success of any business.

for instance, to know the arrival or departure of an airplane flight may not be a concern to a common man but it may be a vital requirement of the pilot of a landing plane. He must know the time of arrival and departure of other flights before landing so that no accident or collision between two planes may occur. Here, information is a matter of life and death of many passengers. The information is essential because:

1 It enhances knowledge.

2 It helps in making decisions for current scenario and making projections for future.

3 It also helps in evaluating future issues.



The information that is collected and/or assembled in any business is as valuable resource as capital or people. Information may cover:

- Market trends
- Buying preferences
- Customer profiles

It may be processed, summarised, and analysed by computers before being used by managers as the basis for decision-making. Information must be accurate, complete, Up-to-date. When developing an information management strategy within an organisation, it is useful to consider information needs on three levels:

- corporate
- team, division, business unit, etc
- individual

The needs of each of these three levels must be met if a coordinated and effective solution is to be maintained in the long-term.

Failure to address any one of the levels will lead to areas of the business or individuals finding their own solution, which may not fit well within the strategic goals of the organisation. These are not new ideas, but they will be explored in the context of intranets and other corporate information systems.

Corporate

At the top is the corporate information that is useful for the whole organisation. This 'global' information is generally fairly well addressed by the corporate intranet (even if the intranet itself needs improvement).

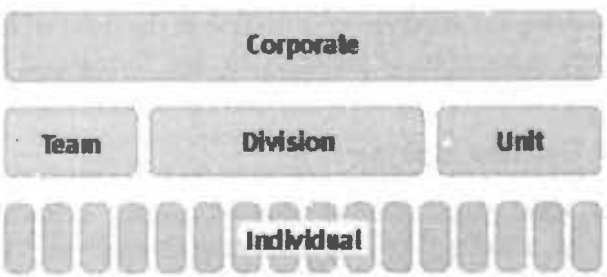
Examples of corporate information include policies and procedures, HR information, online forms, phone directory, etc. Interestingly, there may be a limited amount of truly global information, and it may not deliver the greatest (measurable) business benefits.

Team, Division and Business unit

The middle level is perhaps the most interesting, as it covers all the information shared within teams, divisions, business units, etc. This information may be critical to the day-to-day activities of the group, but of little interest to the rest of the organisation.

Examples include project documentation, business unit specific content, meeting minutes, etc.

This level is generally poorly-served within organisations, although collaboration tools are increasingly being used to address team information needs. It is also being recognised that it is this 'local' information that may be the most valuable, in terms of driving the day-to-day activity of the organisation.



Individual

At the lowest level is the personal information needs of staff throughout the organisation. Examples include correspondence (both internal and external), reports and spreadsheets.

In most organisations, staff must struggle with using e-mail to meet their information management needs. While staff generally recognise the inadequacy of e-mail, they have few other approaches or technologies at their disposal.

Note that some organisations (such as consulting firms) are heavily dependent on personal information management amongst their staff.

Managing the levels

When managing the information within each of the three levels, consider the following:

- An information management solution must be provided for staff at each of the three levels.
- If corporate solutions aren't provided, then staff will find their own solutions. This is the source of poor-quality intranet sub-sites, and other undesirable approaches.
- A clear policy must be developed, outlining when each of the three levels applies, and how information should be managed within each level.
- Processes must be put in place to 'bubble up' or 'promote' information from lower levels up to higher levels. For example, some team-generated information will be critical for the whole organisation.
- As much as possible, a seamless information management environment should be delivered that covers all three levels.

INFORMATION AND COMMUNICATION

Information is vital to communication, and a critical resource for performing work in organizations. Business managers spend most of their day in meetings, reading, writing, and communicating with other managers, subordinates, customers, vendors, and other constituents via telephone, in person, or by e-mail. Indeed, management itself is information processing. It involves gathering, processing, and disseminating information. Managing information involves coping with a myriad of information sources and ultimately making decisions about what to do with it.

A manager must track and/or react to information flowing from sources inside and outside the organization. The manager processes this river of information and disseminates it in one of four ways: stores it, uses it, passes it on, and/or discards it. For example, during the course of a normal business day, a marketing manager for a high-technology company receives information in the form of e-mail, telephone calls, letters, reports, memos, trade publications, and formal and informal conversations.

Information and Decision Making

Every job, project, and/or task involves decision making. Decision making is the process of identifying, selecting, and implementing alternatives. The right informa-

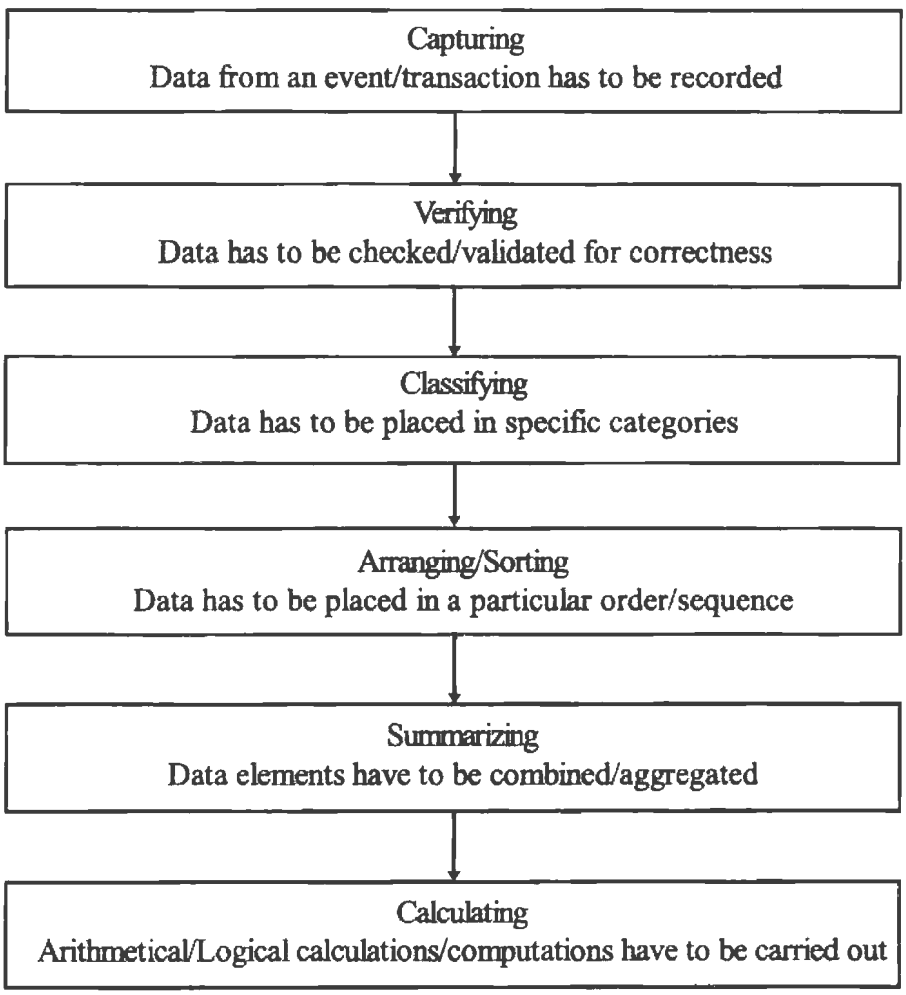
tion, in the right form, at the right time is needed to make correct decisions. For example, based on information about customers, competitors, and production capabilities, a manager may decide to alert top executives that a strategic decision needs to be made. Top executives would use the information received to identify alternatives for consideration. Each alternative would then be evaluated based on feasibility, cost, time to implement, consistency with corporate strategy, and other criteria.

On the basis of their assessment, top executives would select the alternative that makes the most business sense and begin implementation. Finally, information would be gathered to assess the quality of the decisions that were made.

INFORMATION PROCESS

As we all know, in order to get information data has to be processed. Hence, various operations have to be carried out in converting data into meaningful information.

Information Process



Quality of information

Just as raw materials can be turned into a good product or a sub-standard one, so raw data can be processed or analysed into good or bad information. Good information is information that has value to the user. Good Information is useful to the

recipient, can be relied upon and helps in the decision making process. Information is of value to decision makers if it is accurate, timely, complete, and relevant. Here are the key criteria used to determine the value of career information:

- **ACCURATE** - **Accurate** information provides a reliable and valid representation of reality. The cost of inaccurate or distorted information can be extremely high. The information must be true, verifiable, and not deceptive. Accurate career information is based on empirical data and can be validated by comparing sources or checking for internal consistency.
- **TIMELINESS: Timely** information is information that is available when it is needed. When information is needed almost always depends on the situation. To initiate a work or to rectify any deviation in any activity a timely information is required. If a doctor receives the reports of the seriousness of the ailments after the death of the patient. If a manager receives the report of zero inventory after the production has stopped, it would solve no purpose. Timeliness should be maintained.
- **CURRENT** - The information must be applicable to the present time. Keeping information current requires a process of eliminating the old and adding the new. While some types of information are more perishable than others, it is generally accepted that occupation and education information should be reviewed and updated at least annually to be current.
- **RELEVANT** - Information is **relevant** if it has significance or can be applied to a specific situation, problem, or issue of interest. Relevant information applies to the interests of the individuals who use it for the decisions they are facing. It should reduce a person's uncertainties about work and education while facilitating choice and planning. Since we live and work in local labor markets rather than in national ones, the better the description of local conditions, the more relevant it is to us. State and local information is usually more valuable than national. Here are some examples of relevant information. Human resource managers need information on hiring and employee turnover; operations managers need information on costs and productivity; marketing managers need information on sales projections and advertising rates; top executives need information on the strategic actions of their competitors. In contrast, product inventory information is not very relevant to a computer programmer.
- **COMPLETE: Complete** information tends to be comprehensive in covering the issue or topic of interest. Complete information tells a complete story. Without complete information, a decision maker will get a distorted view of reality. Incomplete market information can lead businesses to introduce products and services that customers don't want.
- **SPECIFIC** - For information to be specific, it must contain concrete facts. General observations are often interesting and can provide a background for further analysis, but specific facts are essential to realistic planning and decision making.
- **UNDERSTANDABLE** - People using information must be able to comprehend it before they can use it. Data must be analyzed and converted into

words. The content of the message should avoid ambiguities and be informative to the intended audiences.

- **COMPREHENSIVE** - The information should include all the important categories within its scope of coverage. In CIS that includes the full range of occupational opportunities, their related educational programs of study and training, and the schools that offer them as the core. Related to that is information about money for school, looking for work, employers and industries, working for yourself, and so on.
- **UNBIASED** - This characteristic is about the motivation or purpose for which the information is being produced and delivered. It is unbiased when the individual or organization delivering the information has no vested interest in the decisions or plans of the people who are receiving the information.
- **COMPARABLE** - The information presented should be of uniform collection, analysis, content, and format so that you can compare and contrast the various occupations, programs of study, and schools.

These are some of the most important qualities that quality resources strive to achieve in making information useful for planning and decision-making.

SOURCES OF INFORMATION

After determining which sort of information it is, we have to determine the source of information. Source" means the origin of something. An **information source** is a source of information for somebody, i.e. anything that might inform a person about something or provide knowledge to somebody. Information sources may be observations, people, speeches, documents, pictures, organizations etc. They may be primary sources, secondary sources, tertiary sources and so on. Empiricism regards sense data as the ultimate information sources, while other epistemologies have different views (cf., source criticism).

Primary and Secondary Sources of Information

Primary sources of information allow the learner to access original and unedited information. A primary source requires the learner to interact with the source and extract information. Secondary sources are edited primary sources, second-hand versions. They represent someone else's thinking.

Primary Sources

- Person
- E-Mail contact
- Discussion
- Community Meeting
- Artifact
- Interview
- Event
- Debate
- Survey
- Observation of object (animate and inanimate)

Secondary Sources

- Reference Material
- CD Rom
- Magazine
- Book
- Encyclopedia
- Newspaper

Check Your Progress :

1. What is information.
2. What do you understand by corporate information.
3. Give examples of team, division and business unit information.
4. What are the key criteria used to determine the value of career information.

NOTES

- TV

Primary or Secondary

- Internet Web Site
- Graph, chart, diagram, table

INFORMATION GATHERING TECHNIQUE

Generally the system analysts use some standard techniques for gathering information. These are the following -

- Already available documents, samples of documents form and database.
- Research and Site Inspection
- Observation of working environment
- Questionnaires
- Interviews

The success of system development depends upon each of the above mentioned techniques. A system analyst uses several of the above given techniques. To apply the best of the above mentioned techniques, one must be aware of the loss and benefits of each technique. In the sections given further, we will present a detailed description of each of them :

Samples of Existing Documents, Forms and Databases

To understand a system the study of the documents, forms and database related to it is important. Good system analysts give it more importance than the users.

A system analyst first of all sees the organizational chart as a document. After this, the system analyst studies such documents which provide the account of the problem.

These mainly contain documents like interoffice memoranda, customer complaints, reports, accounting records etc.

Besides the documents which display the problems, there are some more documents which present the account of the business work. These documents contain the answer to the following questions-

- Company's mission and strategic plan
- Formal objectives for the organizational sub units.
- Policy manual that may place constraints on any proposed system.
- Standard Operating Procedure (SOPs), Job outlines, or Task operations for specific day-to-day operations.
- Completed forms that represent actual transactions at various points in the processing cycle.
- Samples of manual and computerized databases.
- Samples of manual and computerized screens and reports.

In addition to the above mentioned documents, the documents prepared by earlier analysts are also helpful in system development. These documents are the following-

- Various types of flowcharts and diagrams
- Project dictionaries or repositories
- Design documentation such as inputs, outputs and databases
- Program documentation
- Computer operations manuals and training manuals.

Research and Site Inspection

The second information gathering technique for system development is research and site inspection. System analysts do extensive research on application and problem. Good computer magazines and reference books assist in the research. Magazines and reference books are good sources for such type of information. By it, two types of information, which are very important, can be available- (i) The suggestion related to a system based on only one sort of problem which has earlier been developed or the experience of different sorts of system analysts. (ii) The information related to the availability of various software packages for developing the system. Now a days, besides different magazines and reference books, Internet has proved a special boon for the system analysts. Internet can help you get the following facilities-

- You can access the magazines and books related to system development at a very low price in any part of the world.
- Can obtain significant information from sites related to system development.
- Can strengthen your information related to system development from the newsgroup based on it.
- Can obtain suggestions from system development experts.
- Can obtain information related to different types of products available for system development. You can use diffrent types of freeware and shareware with the help of world wide web and FTP. Freewares are such softwares available on internet which the users can use without paying any price and sharewares are such softwares available on Internet which the users can use free for trial and if satisfied after the trial, they can be purchased after paying a fixed price.

For information gathering in direction of the research, the system analysts can visit different companies and departments based on same types of problems. The membership of many trade unions such as data processing management association and association for information systems is helpful for system analysis in this direction.

Site Observation

To understand the system well, site observation is one of the most important data collection techniques. Observation is a technique, where the system analyst himself participates in a system or sees the activities done by the user happen on the system.

This technique is mainly used when the data collected through other methods is doubtful or some aspects of the system are not clear.

Site observation is a very delicate technique of information collection. It has many benefits as well as some negative aspects. But the question is, can the observation be complete by standing before the system and observing it carefully. Are there no rules for it ? Can the system analyst be thoroughly benefitted by observation without any preparation ? All these questions will have answer in No. Site observation is a very tender case because it may hurt the self respect of the high authority to the system operator. Besides this, several more aspects are paid attention, such as observation time, the account of the facts collected by observation etc. The observation must be done with the permission of the system operator, and there should be different time for observation.

For instance, it is not necessary that for knowing some basic facts it be observed at the time of the process, it can be observed at normal times. Likewise, a time for observation is when the system is very busy means when it is work season. A time for it might be when report is being prepared at the system which is generally the week closing or the month closing time.

Accurate planning and some experience are important for observation. The following instructions to some extent can help you, make your observation skill somewhat better-

- For observation determine all wh-questions means who, what, where, when, why and how. For instance, What sort of is the system ? What does it do ? Who operates it ? what is its history ? Seek permission from the high authority of the system and take the consent of its operator. And for it, you need to be a good diplomat.
- Put all the facts on plain paper during the course of observation and to avoid some mistake better reexamine it.
- Don't obstruct anyone during the work.
- Avoid small and less important activities.
- Don't be prejudiced to anybody.

Questionnaires

Questionnaires are standard documents for specific purposes which the analyst uses for taking the advice of the respondents and collecting information.

The questionnaire is another technique of information gathering which having been prepared on large scale is distributed among respondents- and the respondents with their suitable answers submit it after a certain period. A questionnaire helps the analyst know the opinion of the people in large number and it is then easier for him to take decision on some important aspects on that basis. There is possibly no other technique by which we know other people's opinion in such a large scale.

Just like observation, it has some positive as well as some negative aspects owing to which some analyst criticise the use of questionnaires and some don't think it necessary to make it a means of information gathering, But the general opinion is that it is a very important information gathering technique and the fault lies not in the technique but in the way it is used by the system analyst, but to understand the questionnaire it is necessary that both of its aspects should be studied well.

The questionnaires are found in two formats. These formats are called free format and fixed format.

The free-format provides more liberality in the answer to the questionnaire respondent. In such format, the questions are provided with blank space in which the respondent records his answer.

The following question is the example of free-format questionnaire -

➪ How many types of reports do you prepare in a financial year ?

The answers to this question might be different for different respondents and it is difficult for all the respondents to give the correct answer. It is why it gets difficult to tabulate all these answers.

The second format for questionnaire is fixed format questionnaire. The fixed format questionnaire has such sorts of questions in which some specific answers are wanted.

This questionnaire has three types :

- Multiple choice questions
- Rating questions
- Ranking questions.

For the multiple choice questions, the respondents are provided with several answers. The respondents are also informed whether more than one answers can be chosen or not, for, several questions might have more than one probable answers. In response to such questions the respondent can't submit his own answers. The following questions are the examples of multiple choice questions :

- What among the following do you use excluding computer to perform the operation ?

  (a) printer (b) fax

  (c) modem (d) scanner

  In the question given above, four alternatives have been given for the probable answer amidst which more than one alternatives can be appropriate.

  similarly, look at this question :

- Among these which reports do you generate?

  (a) fortnightly (b) weekly

  (c) monthly (d) all of the above

The question given above also have four alternatives as answer amidst which there is only one appropriate answer. For the rating questions the respondent is provided with a statement and a unanimous opinion is determined with the help of the given responses. It is, usually, of the following type -

Cash discount expedites sales for cash.

- strongly agree
- agree
- can't say

- disagree
- strongly disagree

In the ranking questions, the respondents are given several probable answers, which are put in the order of priority or experience.

The following is an example of the ranking fixed format question -

Write orders taken daily on the basis of the types of products

- health products
- food products
- cosmetic products

It is essential to design a good questionnaire well. If you don't think it important to design a questionnaire well with a complete plan, your questionnaire will work but with limited success.

The following processes are appropriate for designing a questionnaire -

- ➪ Determine what sort of facts and opinions should be there and from where it would be obtained. If the number of respondents is large, think randomly of a small group of respondents.
- ➪ Determine on the basis of necessary facts and opinions which format- free or fixed - can generate better result.
- ➪ Set the questions in black and white and check them well to free them from construction errors and interpretation. Must mind that the questions do not reflect any prejudice or personal opinions.
- ➪ Test the questions on some people as models. If the respondent feels any difficulty in answering them or the responses obtained from them are not useful to you, change the questions.

Make many copies of the questionnaire and distribute them among people

Interviews

Personal interview is considered the most important and the most general process of information gathering.

Interview is such a data collection technique through which the analyst collects information from the people face to face.

The purpose of an interview can be different in context of information gathering. Its purpose includes, fact finding, verifying the truth, generating enthusiasm, including the user, identifying the requirements and seeking for opinions or ideas. Two people have important rules in an interview. The system analyst is the interviewer, whose task is to conduct the interview. The system user and the system owner are the interviewees who answer the questions of the inter viewer. Generally, the system analysts are not good interviewers. This section deals with how you can become a good interviewer.

A person is the most important element of the information system. No other information gathering technique except interview lays so much emphasis on people.

Different people have different values, priorities, opinions, motivations and personalities. Therefore, to interview different people you should have a better understanding of human relations and you should be skilled enough to deal with them. For instance, I once got an opportunity to sit in an interview as an interviewer. Several sorts of people came to appear at it. Among them two persons were divorcees. Both were treated with the same type of question. The question was, "Why did you get divorced ?" It was a normal question served to two men in the same manner. The first man gave an ordinary answer to it while the second man's answer was full of resentment. Therefore you should possess this interviewing skill. However the interview is not the perfect technique of information gathering, it means one cannot gather data only by an interview.

This chart may help you decide which type of tool to choose for your information need.

If you Need...	Try this type of source...
up-to-the-minute news	World Wide Web, broadcast media
current daily information	newspapers, web-based news, broadcast media
local information	newspapers, web-based news, broadcast media
in-depth, thorough treatments of a topic or subject	Books
background information	Subject encyclopedias
statistics and data	Statistics reference books, online statistical sources
research on a focused topic	scholarly journals
historical information	books
popular events	magazines, broadcast media
primary research	scholarly journals
editorials and expert	newspapers
current data from government agencies	World Wide Web
reliable, broad overview of topics	subject encyclopedias

LEVELS OF MANAGEMENT

The term **'Levels of Management'** refers to a line of demarcation between various managerial positions in an organization. It differentiates different managerial positions in an organization. When the organization grows in size and when the employees also increase in number, it leads to increase in the number of levels of the organization and vice versa. The level of management determines a chain of command, the amount of authority & status enjoyed by any managerial position.

Managers at different levels of the organization engage in different amounts of time on the four managerial functions of planning, organizing, leading, and controlling.

Planning is choosing appropriate organizational goals and the correct directions to achieve those goals. Organizing involves determining the tasks and the relationships

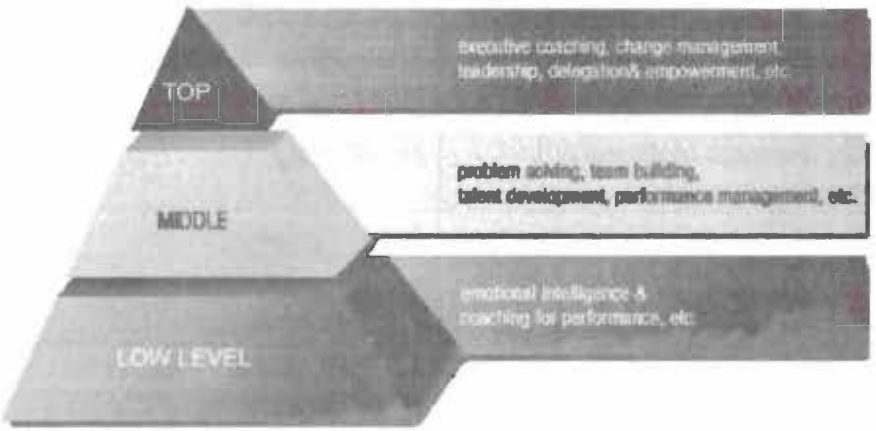
that allow employees to work together to achieve the planned goals. With leading, managers motivate and coordinate employees to work together to achieve organizational goals. When controlling, managers monitor and measure the degree to which the organization has reached its goals.

Top managers do considerably more planning, organizing, and controlling than do managers at any other level. However, they do much less leading. Most of the leading is done by first-line managers. The amount of planning, organizing, and controlling decreases down the hierarchy of management; leading increases as you move down the hierarchy of management.

The levels of management can be classified in three broad categories: -

1. Top level / Administrative level
2. Middle level / Executory
3. Low level / Supervisory / Operative / First-line managers

Managers at all these levels perform different functions. The role of managers at all the three levels is discussed below:



1. Top Level of Management

It consists of board of directors, chief executive or managing director. The General Manager, Managing Director, Chief Executive, Board of Directors all belong to this category. Authority mainly lies with this level of management. The top management is the ultimate source of authority and it manages goals and policies for an enterprise. It devotes more time on planning and coordinating functions.

The top level management generally performs planning and co- ordination function. It lays down the broad policies and goals of the organization. It is also answerable to the shareholders for functioning of the organization. The middle level managers are also appointed by the top level management. It also maintains links with society at large.

Top level management is responsible for framing policies of the business. All important decisions are also made at this level. This level of management is concerned to the various administrative functions. Top level management is administrative in nature.

1. They determine objectives of the business enterprise.
2. Top level management formulating abroad policies of the business.
3. Taking important business decisions.
4. Deciding future course of action taking into considering economic policies, public opening and other social, national and international factors
5. Assembling the resources needed to making plans into operation, and
6. Issuing guidelines to medium level managers.

- Top management lays down the objectives and broad policies of the enterprise.
- It issues necessary instructions for preparation of department budgets, procedures, schedules etc.
- It prepares strategic plans & policies for the enterprise.
- It appoints the executive for middle level i.e. departmental managers.
- It controls & coordinates the activities of all the departments.
- It is also responsible for maintaining a contact with the outside world.
- It provides guidance and direction.
- The top management is also responsible towards the shareholders for the performance of the enterprise.

2. *Middle Level of Management*

The branch managers and departmental managers constitute middle level. They are responsible to the top management for the functioning of their department. They devote more time to organizational and directional functions. The Middle level management is answerable to the top level management for functioning of their departments. The middle level management generally performs organizing and directing functions. It implements the organizational goals and plans according to the directions of the top management. They act as mediator between top and lower level management by clarifying and explaining policies from top to lower level. Also the middle level has to communicate significant data and reports from lower level to the top level management. It also boosts the lower level managers for better performance. It even has to train the low level managers.

In small organization, there is only one layer of middle level of management but in big enterprises, there may be senior and junior middle level management. Middle level management is the link between top level and low level management and executory by nature. The heads of the various departmental heads receive orders and instruct from the top level management or managers and pass it to their subordinates (lower level managers). These managers supervise, direct and control the activities of foremen, inspectors and supervisors. They receive reports of actual performance from their low level managers. They study reports and issue necessary instructions. Middle level managers bridge the gap between two. It helps in removing misunderstanding and create cordial relationship among the levels of management

NOTES

Check Your Progress :

5. How does primary and secondary sources of information are differ to each other.
6. What are the techniques use for gathering information.
7. Define interview.
8. The five of management can be classified in which categories.

Important functions performed by the middle level management are as follows:

1. Managers are held responsible for interpreting and communicating the policies of the top level management.
2. They execute the plans of the organization in accordance with the policies and directives of the top management.
3. They make plans for the sub-units of the organization.
4. They participate in employment & training of lower level management.
5. They interpret and explain policies from top level management to lower level.
6. They are responsible for coordinating the activities within the division or department.
7. It also sends important reports and other important data to top level management.
8. They evaluate performance of junior managers.
9. They are also responsible for inspiring lower level managers towards better performance.
10. They determine organizational set up of their departments.
11. They issue instructions to low level managers which they are received from the top level management.
12. They also perform in motivating subordinates for higher productivity and awarding them for their outstanding performance.
13. Their duty is to compiling statistical reports for top level management and preparing records of their department.
14. They also recommend revised and amended policies of their respective departments.

3. *Lower Level of Management*

Lower level is also known as supervisory / operative level of management. It consists of supervisors, foreman, section officers, superintendent etc. They generally have to personally oversee and direct the lower level employees. This level of management generally performs directing and controlling functions. They train and boost up the workers. They look after the problems and grievances of the workers and try to solve them. Low level management is line between middle level management and workers. They are also help building image of the enterprise before workers and also help in creating the sense of belongingness among them towards the enterprise. Low level management is also known as bottom level or first line supervisory level of management. It is also called as operation all level management. Managers of this level are directly related with the routine functions of the firm.

Following are important functions performed by the low level management:

1. Management concerned with operative working force of the enterprise. i.e., working force is link between middle level management and workers.

3. They guide and instruct workers for day to day activities.
4. They are responsible for the quality as well as quantity of production.
5. They are also entrusted with the responsibility of maintaining good relation in the organization.
6. They communicate workers problems, suggestions, and recommendatory appeals etc to the higher level and higher level goals and objectives to the workers.
7. They help to solve the grievances of the workers.
8. They supervise & guide the sub-ordinates.
9. They are responsible for providing training to the workers.
10. They arrange necessary materials, machines, tools etc for getting the things done.
11. They prepare periodical reports about the performance of the workers.
12. They ensure discipline in the enterprise.
13. They motivate workers.
14. They are the image builders of the enterprise because they are in direct contact with the workers.
15. They assigning duties to individual workers inspecting and supervising workers under command at work. They attend workers' problem and helps in solving by removing doubts in their mind and inspiring them for maximum productivity.
16. Receiving instructions from middle level management and implementing them in the day-to-day affair of the business.
17. They ensuring safety of workers tools and machines and equipments etc.
18. They help in creating sense of belongingness among workers which helps in building the image of the enterprise. These low level bosses have to work in real situations of the work and thus, they are known as operational managers. This level of management consists of supervisors, inspectors, foremen and superintendents.

Top level management can be said to be determinative, middle level management as executory management and low level as operational management. Without combination, and coordination among these three levels of management an enterprise cannot prosper or progress. So, every managers at each level shall responsible in performing their duties efficiently to make maximum productivity of the firm / enterprise as a whole.

LEVELS OF INFORMATION

Information within an organisation (as distinct from information provided by an organisation to external users, such as shareholders, the general public, pressure groups, competitors, suppliers, customers etc) can be analysed into three levels.

Strategic informatio

- **It** is used by senior management for decision-making described as strategic planning,
- Strategic planning means planning the objectives of their organisation and assessing whether the objectives are being met in practice.

  Strategic information includes profitability, the profitability of different segments of the business, future market prospects, the availability and cost of raising new funds, total cash needs, total manning levels and capital equipment needs

  Much of the strategic information must come from environmental sources, although internally generated information is also used.

Tactical information

Middle management uses tactical information. Tactical information includes productivity measurements, budgetary control or variance analysis reports, cash flow forecast, short term purchasing requirements, manning levels and profit results within a department. A large proportion of tactical information will is generated from internal sources and is likely to have accounting emphasis.

Tactical information is usually prepared regularly, perhaps weekly or monthly (whereas strategic information is communicated irregularly) and is used for the decision-making known as 'management control'.

Operational information

- Operational information is used by front-line managers such as supervisors and foremen, to ensure that specific tasks are planned and carried, out properly within the office or factory

For example,

In the payroll office:

Operational information relating to day-rate labour will include The hours worked each week by employees, the rate of pay per hour, details of deductions, and for the purpose of wage analysis, details of the time each person spent on individual jobs during the week. The amount of detail provided in information is likely to vary with the purpose for which it is needed.

Operational information is likely to go into much more detail than tactical information, which in turn will be more detailed than strategic information. What is information to one level of management may be the raw data, which needs to be further analysed, for another.

MANAGEMENT ANDNEED FOR INFORMATION SYSTEMS

Information systems are needed when timely processing for fast action is needed, same data has to be processed in different ways and when organizations require innovative processing. Functional areas of management are as follows:

1 PRODUCTION

2 MARKETING

3 MATERIALS

4 FINANCE –Accounts

5 HUMAN RESOURCE DEVELOPMENT(HRD)

6 RESEARCH AND DEVELOPMENT (R&D)

Production Management

The following type of information is needed in production management:

Strategic Information:

1. Yearly and monthly production quotas and alternate schedules
2. Policies on machine replacement, augmentation and modernization.
3. Identifying best product mix.

Tactical Information

1. Identifying and controlling areas of high cost.
2. Identifying critical bottlenecks in production.
3. Identifying alternate production schedules based on tools, machines etc.
4. Performance measures of machines to decide replacement.

Operational Information

1. Monitoring up to date production information by examining assemblies, detecting likely shortages and giving early warning.
2. Scheduling better production dynamically.
3. Preventive maintenance schedules.
4. Monitoring tool, machine and personnel availability

MARKETING MANAGEMENT

Strategic Information:

1) Search for new markets and marketing strategies.
2) Analysis of competitors strategy
3) Technology and demographic forecasts and product changes

Tactical Information:

1) Advertising techniques and analysis of their impact.
2) Customer preference surveys.
3) Correlation of prices and sales.
4) Sales force deployment and targets.
5) Exploring alternate marketing channels.
6) Timing of special sales campaigns.

Operational Information:

1) Sales analysis by regions, customer class, sales person.
2) Sales target versus achievement.

3) Market share and trends.
4) Seasonal variations.
5) Effect of model changes.
6) Performance of sales outlets
7) Costs of campaigns and benefit.

MATERIAL MANAGEMENT

Strategic Information:

1) Developing vendors for critical items
2) Determining optimal levels of inventory
3) Determining proportion of material needed
4) Reducing varieties of inventory

Tactical Information:

1) Developing vendor performance measures.
2) Determining optimal reorder levels.
3) Determining issues of items to shops versus
4) standard needs.
5) Controlling high value of inventory.
6) Determining impact on material cost and
7) procurement with design changes and new
8) product introduction.

Operational Information:

1) List of excess & deficient items received.
2) List of items rejected.
3) Critical items received.
4) Stores in transit and in inspection.
5) Value of inventory in hand.
6) Goods received, rejected and issued.

FINANCE MANAGEMENT

Strategic Information:

1) Methods of financing.
2) Pricing policies
3) Tax planning.

Tactical Information:

1) Variations between budget and expenses.
2) Large outstanding payments/Receipts.

3) Credit and payment status.

4) Cost increases and pricing.

5) Impact of taxation on pricing

Operational Information:

1) Periodic financial report.

2) Budget status to all functional managers.

3) Tax returns.

4) Share transfers.

5) Profit and loss account.

6) Payments and receipts.

7) Payroll,provident fund accounts.

HUMAN RESOURCE MANAGEMENT

Strategic Information:

1) Long range human resource requirements at different levels.

2) Policies on human resource development and training

3) Policies on personnel welfare and facilities

Tactical Information:

1) Performance appraisal.

2) Demographic make-up of personnel and its impact on retirement.

3) Production incentives.

4) Morale of personnel.

5) Absentee reduction.

6) Leave and overtime policies.

7) Personnel deployment policies.

Operational Information:

1) Routine assessment.

2) Skills inventory.

3) Loan/advances and recoveries.

4) Leave record.

Answer of the Check Your Progress

1. We can define information as data that is collected, collated, processed, logically organized and analyzed so as to be of use to the decision maker.

2. At the top is the corporate information that is useful for the whole organisation. This 'global' information is generally fairly well addressed by the corporate intranet (even if the intranet itself needs improvement).

   Examples of corporate information include policies and procedures, HR information, online forms, phone directory, etc.

3. Examples include project documentation, business unit specific content, meeting minutes, etc.

4. Quality of information :—
   - Accurate
   - Timeliness
   - Current
   - Relevant
   - Complete
   - Specific
   - Understandable
   - Comprehensive
   - Unbiased
   - Comparable
5. Primary sources of information allow the learner to access original and unedited information. A primary source requires the learner to interact with the source and extract information. Secondary sources are edited primary sources, second-hand versions. They represent someone else's thinking.
6. These are the following :—
   - Already available documents, samples of documents form and database.
   - Research and Site Inspection
   - Observation of working environment
   - Questionnaires
   - Interviews
7. Interview is such a data collection technique through which the analyst collects information from the people face to face.
8. The levels of management can be classified in three broad categories :—
   (i) Top level / Administrative level (ii) Middle level / Executory
   (iii) Low level / Supervisory / Operative / First-line managers

EXERCISE

1. What is information? Why information is needed?
2. Explain information process.
3. What do you mean by quality of information?
4. Explain sources of information.
5. Write different types of information gathering techniques.
6. Write down processes that are appropriate for designing a questionnaire.
7. Elaborate levels of management.
8. Write down functions of low level management.
9. Write down a note on levels of information.
10. What type of information is needed in different areas of management?

6 System Development Life Cycle

The Chapter Covers :

- Introduction
- System Development Life Cycle
- The problems of a System Mean
- Different Phases of System Development Life Cycle
- Considerations for Candidate Systems
- Political Consideration
- Prototyping

INTRODUCTION

In the last chapters we have discussed the definition of system, its types, its elements etc. We have also come to know how important a system is in the development of a trade organisation and how the trade activities are affected without it. In this chapter, we'll study about its development cycle.

SYSTEM DEVELOPMENT LIFE CYCLE

System development cycle or system development life cycle is an orderly and well-arranged approach for solving the problems of a system.

THE PROBLEMS OF A SYSTEM MEAN

- The conditions which are either real or anticipated and which need to be rectified.
- There are chances available to improve the condition without complaints.
- The directives to change the conditions despite no complaints from anyone about the present/current conditions.

DIFFERENT PHASES OF SYSTEM DEVELOPMENT LIFE CYCLE

The different steps or phases of the System Development Life Cycle where we do the work of system development step-by-step are the following :

- Study of the problems
- Making Plans
- System Analysis
- System Design
- Programs Development
- Programs Testing
- System Implementation
- Maintenance

Study of the Problems

It is necessary to know and understand a problem before solving it. The basis of a candidate system is to identify the needs so that the information system can be improved.

For example, a supervisor inspects the purchasing department. With the help of this inspection, he can remove the drawbacks of the departments or can further improve it.

If the problem is complicated, the management can take the help of the analyst. This analyst can be called from outside.

In a large organisation, the analyst defines the problems, then he tries to solve it. In this phase the anlayst finds himself unable to reckon the cost involved in the development of a certain project. He can reckon it only in the next phase.

Making Plans

By extending the survey on the basis of the primary survey, the feasibility of the system is studied. At the time of the study of feasibility, it is specifically observed that what the requirements of a user are and if the system is capable enough to fulfil the requirements of the user. Which resources are available for the system and how difficult it is to solve the problems with the help of these resources ? In addition, what effect this system would cast upon the organisation ? How will it cope with the principal project of the organisation ?

The system analyst needn't solve the problems in this phase but he tries to look for its scope only. He in this whole study, determines those aspects of the system which are to be included in the system, and prepare an anticipated but accurate calculation of the cost and benefits of the system is made.

The report which we prepare after this study, includes the following points-

- The statement of the problem which compelled for the analysis.
- The extract of the findings drawn and recommendations made by the study.

- The description of the findings in which the complete method of the current system is discussed and a comparative description of the objectives and method of the new system is presented.
- The recommendations which include system cost and the time it will consume, are accounted.

This is the most important phase of the system development life cycle where the feasibility of the system as well as the system analyst has to be practical. Your proposal either may be cancelled or may be put off because of the following reasons.

- **System cost** - The system cost should be in proportion to the capacity of the company. It should not be that the whole turnover of your company is Rs. 1 crore and your system itself costs Rs fifty lakhs.
- **The Time consumed by the system** - The time consumed in completing the system is also important. It should come in accordance with the requirements of the company. For instance, the company needs the system within six months. If you decide a time limit of one or two years for it, it could be cancelled.

System Analysis

In this phase of system development life cycle, the different processes to be completed by the system and a wide study of the relations of those processes inside and outside those systems is made. In this phase principally the possibilities of an excellent solution to the problem is worked out. There is a question in the mind of the analyst regarding what should be done to solve the problem. In it, he has to make a serious study of the environment of the system and its boundary. For it, data are collected from different media. Chiefly these different media are questionnaires, interviews, interaction, currently available data and the records. The questionnaires or the questions to be asked during the interview are the following –

- What sort of functions are disposed in the specific organisation for which you are creating the system ?
- What is its complete process ?
- What is the method of collecting and storing the data ?
- How much possibility is there of the data being damaged and the most important question is what is the chief reason behind changing this system ?
- How are reports prepared in the current system ? How often and after how many days? If the reports are sent elsewhere what is its medium - internet, floppy or C.D. or printed?

To get a satisfactory answer to all these queries the analyst needs private meetings with many persons such as the manager, the auditor, the computer operator and other users.

After collecting information on all such points the designing of the system is begun.

Check Your Progress :

1. What are different steps or phases of the SDLC.
2. What do you understand by system testing.

System Design

In system development life cycle this phase is the most challenging. In this system the ability of the system analyst is rightly used and the creative ability of the system analyst is also revealed. As the architect first draws the map of a building before its construction begins, the system analyst prepares the outline of the whole system.

The outline of the system is put in black and white, on the other hand the modern system analysts can design it with the help of the computers. The system analyst does the following things in system design-

- He decides how the output should be obtained. It means how many modes there will be of the output.
- He prepares the whole format of the input and output.
- He designs the database. It means, he decides what will be the method of data collection and designs its database.
- He develops the format of the programs development and decides their testing methods.
- Prepares the list of such softwares which are helpful in the implementation of the system.
- He prepares the flowchart, the outline of the records as well as the whole planning of the execution of the system.
- In this phase, the system analyst presents the whole account of the requirement of human resources, the requirement of hardware and its cost, its speed, and its capacity.

In addition to all the above said tasks, if he is a good programmer (as it normally happens), he undertakes his own share of the programming task and distributes the tasks to his programmers as per the design.

Program Development

In this phase, seeing the size of the system and the demand of the company, the system analyst himself creates the programmes or gives it to other programmers. In it, generally, the system analyst doesn't himself do the programming but get it done by his programmers. In some cases, the system analyst writes the program himself. The system analyst asks the programmers to create the programs as per their own capacity. For instance, suppose a system contains inventory and finance, he will give finance to only that programmer who has some knowledge of accounts or finance. Though it is not mandatory, it is given priority.

Programs Testing

After the creation of the programs it has to pass through individual testing and if several programmers have created different programs they are collected into an integrated software and then the whole system is tested.

For system testing, we for many days input our favourite data into it and obtain output. This system is put on test for many days and it is tested on its different aspects. If the system is found successful for all aspects, it is forwarded to its next phase means implementation.

System Implementation

System implementation is the last phase of system development life cycle. In this phase the users start working on the new system. Before the beginning of the task, to run it smoothly, all the requirements of the hardware and software are fulfilled. The most crucial task of this phase is to train the users. The more complicated the system is the more exhaustive training the user needs to undergo. In addition to it, the system having implemented the old system is set up. The old system is run along with the new one till the new system starts functioning completely. The new system having implemented the comments from the users of all the classes are sought and it is only on the basis of the comments from all these people that the degree of the success is determined. The process is called system evaluation.

Maintenance

After the successful implementation of the system, starts the period of maintenance of the system. This phase has no limit. This phase goes on until there is the need of the new system. In this system, both the software as well as the hardware are maintained. For instance if more than a normal limit of data is collected, the hardware needs to be upgraded. For example, in the light of the arrival of Vat (Value Added Tax) the old system needs to be upgraded. All these tasks come under maintenance.

CONSIDERATIONS FOR CANDIDATE SYSTEMS

In today's commercial environment the use and demand of computer services is on high. These demands are of the following types :

- To run the available system
- Of maintenance
- Of enhancement, which includes changes in the program structures.
- The creation of new systems

All these demands can't be fulfilled without resources. Generally, these resources are men, technologies and capital. The computer department provides the following things in the name of human resources.

- Computer Operator
- Data Entry Operator
- Application Programmer
- Maintenance Programmer or Debugger
- Supervisor, Project Leader, Manager etc.

The main problem a project faces is that demands outpass the availability of resources. At the time of construction of a project, there are three factors which are attached to it.

- Technical factor
- Behavioural factor
- Economical factor

Technical Factor

Technical factors show the ability of running the factor. These factors are also based on the efficiency of the analyst designers and programmers.

Behavioural Factor

Behavioural factors are linked with the following things :

- The old experience of the user with the available system.
- The successful record of the analyst.
- The pressure laid by the user on the higher management to provide finance for the new system.

In addition, the political reasons, the status of the department come under this.

Economical Factor

The principal factor behind selecting a project is economical. These are based not on the system cost but on the income ratio. Generally, the system advisers advise to keep the annual profit rate more than twenty percent.

POLITICAL CONSIDERATION

To the above said factors, can be added one more political factor, but it is considered as a part of the behavioural factor. Politics is an art. When the traditional methods are not giving the expected results, they can be obtained with the help of politics. When the system is developed, a mutual relation is built up during the whole phase with the user so that when the system is developed, it cannot be criticised by the user. For this, the user's cooperation is sought.

It is a kind of politics which turns the user's resistance into his cooperation.

Better Perception : Advantages and Disadvantages of Prototyping

There are various prominent advantages of protyping. The first advantage is that there is major probability to change the system in the beginning of the development. Second is that you can stop the development if it does not function properly. The third big advantage of prototyping if the possibility off developing a system that more closely addresses users' needs and expectations.

However there are very clear disadvantages of prototyping as well. The first is that it can be quite difficult to manage prototyping as a project in the larger systems effort. The second disadvantage is that users and analysts may adopt a prototype as a completed system when it is in fact adequate and was never intended to serve as a finished system.

PROTOTYPING

Prototyping is the most important technology which is used for rapid completion of the development of information systems based on large computers. As the word prototyping suggests it is the original model on the basis of which the final design of some other system is created. Thus the objective of prototyping is preparing the working model of the system, implementing it on full scale.

The concept of prototyping is very easy. The sooner a user visualizes a system, gets down to its development and starts experimenting on its models the sooner the system can be implemented. But prototyping too is not a rapid ungentle approach of urgent system troubles. Prototyping is a planned process. To create a meaningful model of the proposed information system in it, well defined steps are required. The prototype should display all the important features of the system. The necessary steps to develop the prototype of an information system are displayed in the figure 2.1. These terms are not much different from those ones used in System Development Life Cycle.

It includes identifying the problem and defining it, analysing the present system, feasibility analysis and preparing an exhaustive data dictionary. The system analyst has a major role in it too. A prototype design should have a realistic data-entry screen, report screen and output screen displays.

Unlike the standard and wider System Development Life Cycle, the probable features of prototyping are the following -

- Standard method which the System Development Life Cycle is meant to be is sequential and this system has costly and difficult changes, especially in the steps of design and development occur some unidentified troubles. The standard method is a defined milestone and is based on the combination of a set of dates which comes to an end with the approval of the user. While prototyping is a cycle of activities and many iterations can be made in relatively less time period. The cyclic nature of prototyping can affect the design and development efficiency because life cycle activities which are sequential in the standard process of the system life cycle method can be overlapped and done together.
- The system is not defined initially in prototyping when on this very level the exhausting analysis and documentation of data flows and user requirements is done in accordance with the standard System Development Life Cycle. In return the analyst can continuously edit the model using the test database until the user can be satisfied with the output. As a result, from the very beginning the user is indulged in the acceptance testing of the system.
- Prototyping can reduce the cost and time involved in the test of the real system unexpectedly because the continuous refinement done for the model can be completed very easily. One more especiality of prototyping is that, if the system is not useful/task worthy then, in such a condition one can do away with the system without much loss of time and money.

Suppose, the prototype was not stopped earlier, in this case, there are two normal uses of the completed model, which are the following -

- It can be used as interim executive version of the new system. This executive model is developed as a new system or can be integrated with other corporate systems sharing the same database.
- It can be used as the design specification of a more efficiently programmed system. After the creation of the improved version of the system, this prototype is removed. It is why the prototype system is called the throw-away system.

Check Your Progress :

3. What factor should be consider at the time of construction of a project.
4. What is prototyping ?

In long and short, prototyping is a powerful system development tool, which reduces the time involved in designing, developing and implementing the computer information system. Though it is not for all sorts of system development schemes, but it has a wide utility area.

Specially, it is a means to design such an information system which contains a big portion of user interaction such as on-line enquiry and decision supprot system.

- System development cycle or system development life cycle is an orderly and well-arranged approach for solving the problems of a system.
- It is necessary to know and understand a problem before solving it. The basis of a candidate system is to identify the needs so that the information system can be improved.
- If the problem is complicated, the management can take the help of the analyst. This analyst can be called from outside.
- In a large organisation, the analyst defines the problems, then he tries to solve it.
- By extending the survey on the basis of the primary survey, the feasibility of the system is studied. At the time of the study of feasibility, it is specifically observed that what the requirements of a user are and if the system is capable enough to fulfil the requirements of the user.
- The system analyst needn't solve the problems in this phase but he tries to look for its scope only. He in this whole study, determines those aspects of the system which are to be included in the system, and prepare an anticipated but accurate calculation of the cost and benefits of the system is made.
- This is the most important phase of the system development life cycle where the feasibility of the system as well as the system analyst has to be practical.
- The system cost should be in proportion to the capacity of the company.
- The time consumed in completing the system is also important. It should come in accordance with the requirements of the company.
- In this phase of system development life cycle, the different processes to be completed by the system and a wide study of the relations of those processes inside and outside those systems is made.
- In system development life cycle the system design phase is the most challenging. In this system the ability of the system analyst is rightly used and the creative ability of the system analyst is also revealed.
- In the phase of Program Development, seeing the size of the system and the demand of the company, the system analyst himself creates the programmes or gives it to other programmers.
- For system testing, we for many days input our favourite data into it and obtain output.

- System implementation is the last phase of system development life cycle.
- After the successful implementation of the system, starts the period of maintenance of the system.
- In today's commercial environment the use and demand of computer services is on high.
- Technical factors show the ability of running the factor. These factors are also based on the efficiency of the analyst designers and programmers.
- The principal factor behind selecting a project is economical. These are based not on the system cost but on the income ratio.
- Politics is an art. When the traditional methods are not giving the expected results, they can be obtained with the help of politics.
- Prototyping is the most important technology which is used for rapid completion of the development of information systems based on large computers.
- Standard method which the System Development Life Cycle is meant to be is sequential and this system has costly and difficult changes, especially in the steps of design and development occur some unidentified troubles.
- The system is not defined initially in prototyping when on this very level the exhausting analysis and documentation of data flows and user requirements is done in accordance with the standard System Development Life Cycle.
- Prototyping can reduce the cost and time involved in the test of the real system unexpectedly because the continuous refinement done for the model can be completed very easily.
- In long and short, prototyping is a powerful system development tool, which reduces the time involved in designing, developing and implementing the computer information system.

Answer of the Check Your Progress

1. Different Phases of System Development Life Cycle are the following :
   - Study of the problems
   - Making plans
   - System analysis
   - System Design
   - Programs development
   - Programs Testing
   - System Implementation
   - Maintenance
2. After the creation of the programs it has to pass through individual testing and if several programmers have created different programs they are collected into an integrated software and then the whole system is tested.

For system testing, we for many days input our favourite data into it and obtain output.

3. At the time of construction of a project, there are three factors which are attached to it.
   - Technical factor
   - Behavioural factor
   - Economical factor
4. Prototyping is the most important technology which is used for rapid completion of the development of information systems based on large computers. As the word prototyping suggests it is the original model on the basis of which the final design of some other system is created. Thus the objective of prototyping is preparing the working model of the system, implementing it on full scale.

EXERCISE

1. Explain the meaning of term system development life cycle.
2. What do understand with the problems of the system?
3. Write down phases of the System Development Life Cycle.
4. Write down points that are included in report.
5. Explain the concept of system analysis.
6. Explain prototyping.
7. Write down advantages and disadvantages of prototyping.

7 Planning

NOTES

The Chapter Covers :

- Introduction
- Meaning and Definition of Planning
- Nature / Features of Planning
- Objective of Planning
- Importance of Planning
- Levels of Planning
- Planning Process
- Six P's of Planning
- Types of Plans
- Types of planning
- Advantages of Planning
- Limitations of Planning

INTRODUCTION

Planning is a preparatory step in any task of the organization. It is a systematic activity which determines when, how and who is going to perform a specific job. Planning is a detailed programme regarding future courses of action. It is rightly said **"Well plan is half done"**. Therefore planning takes into consideration in available & prospective human and physical resources of the organization so as to get effective co-ordination, contribution & perfect adjustment. It is the basic management function which includes formulation of one or more detailed plans to achieve optimum balance of needs or demands with the available resources.

Planning involves selecting enterprise's objectives and departments' goals, programmes, determining ways of reaching them. Planning is deciding in advance what is to be done in future, how it is to be done when and by whom it is to be done. Planning involves selecting of a course of action from all available alternatives for accomplishing the desired goals of the enterprise.

Planning is an intellectual process; it facilitates the best utilization of all available limited resources in a systematic manner, so that the desired outcome may be attained. Planning attempts to achieve a consistent & co-ordinated structure of operations focused on desired results. Planning sketches an efficient sequence of action that transforms an organization from a given starting state to the goal state. In short, planning is the management of the organization's future in an uncertain environment.

Normally, the information provided by an MIS helps the managers to make planning and control decisions. Now, we will see, what is planning and control. Every organization in order to function must perform, certain operations. For Example, a car manufacturer has to perform certain manufacturing activities, a wholesaler has to provide water to its area of jurisdiction. All these are operations that need to be done. Besides, these operations, an organization must make plans for them. In other words it must decide on how many and what type of cars to make next month or what commissions to offer retailers or what pumping stations to install in the next five years.

Also an organization must control the operations in the light of the plans and targets developed in the planning process. The car manufacturer must know if manufacturing operations are in line with the targets and if not, he must make decisions to correct the deviation or revise his plans. Similarly the wholesaler will want to know the impacts that his commissions have had on sales and make decisions to correct adverse trends. The municipal corporation will need to control the tendering process and contractors who will execute the pumping station plans.

Generally, MIS is concerned with planning and control. Often there are elaborate systems for information that assists operations. For example, the car manufacturer will have a system for providing information to the workers on the shop floor about the job that needs to be done on a particular batch of material. There may be route sheets, which accompany the rate materials and components in their movement through various machines. This system provides only information to support operation. It has no managerial decision-making significance. It is not part of an MIS. If, however, the system does provide information on productivity, machine utilization or rejection rates, then we would say that the system is part of an MIS.

Generally MIS has all the ingredients that are employed in providing information support to manager to making planning and control decisions. Managers often use historical data on an organization's activities as well as current status data make planning and control decisions. Such data comes from a data base which is contained in files maintained by the organization. This data base is an essential component of an MIS. Manual procedures that are used to collect and process information and computer hardware are obvious ingredients of an MIS. These also form part of the MIS. In summary, when we say that " an MIS is an integrated man – machine systems that provided information to supports the planning and control function of managers in an origination. It does the following function.

- sub serves managerial function
- collects stores , evaluates information systematically and routinely
- supports planning and control decisions
- Includes files , hardware , software , software and operations research models.

Effective management information systems are needed by all business organization because of the increased complexity and rate of change of today's business environment . For Example, Marketing manager need information about sales performance and trends, financial manger returns, production managers needs information analyzing resources requirement and worker productivity and personnel manager require information concerning employee compensation and professional development. Thus, effective management information systems must be developed to provide modern managers with the specific marketing , financial, production and personnel information products they required to support their decision making responsibilities .

Differentiate between goals and plans.

Goals are desired outcomes for individuals, groups, or entire organizations. Plans are documents that outline how goals are going to be met and that typically describe resource allocations, schedules, and other necessary actions to accomplish the goals.

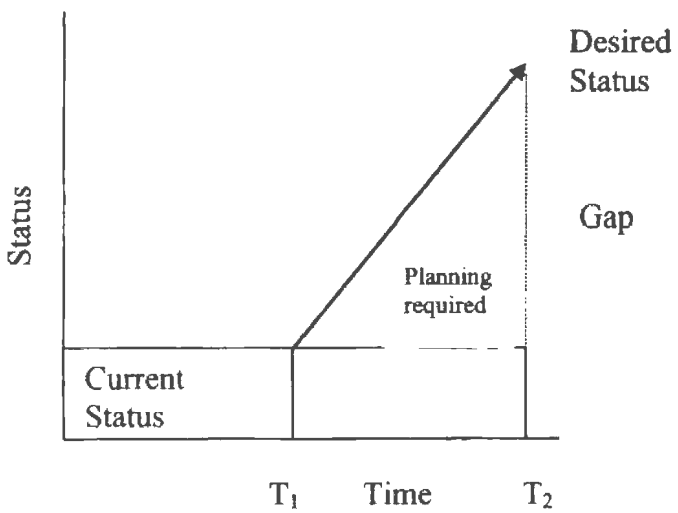
MEANING AND DEFINITION OF PLANNING

Planning may be defined as the process of setting goals, developing strategies, and outlining tasks and schedules to accomplish the goals. Planning involves defining the organization's goals, establishing an overall strategy for achieving these goals, and developing a comprehensive set of plans to integrate and coordinate organizational work.

Planning is forecasting which decides the things to be done in future. It is a function of anticipating the future and determining the course of action to achieve the predetermined objectives of an organization. Planning is a process which selects the best alternative from the various alternatives for the solution of a problem to make future certain and definite.

According to Koontz and O' Donnel, "Planning is deciding in advance what to do, how to do it, when to do it, and who is to do it. Planning bridge the gap from where we are to where we want to go. It makes it possible for things to occur which would not otherwise happen".

It can be defined in the fig below:



According of Henry Fayol , "Planning is deciding the best alternatives among others to perform different managerial operations in order to achieve the pre-determined goals."

According to George R. Terry, "Planning is selecting and relating of facts and making and using of assumptions regarding the future in the visualization and formulation of proposed activities believed necessary to achieve desired results."

According to James Lundy, "Planning means the determination of what is to be done, how and where it is to be done, who is to do it and how results are to be evaluated."

According to Urwick, "Planning is a mental predisposition to do things in orderly way, to think before acting and to act in the light of facts rather than guesses". Planning is deciding best alternative among others to perform different managerial functions in order to achieve predetermined goals.

Planning is a process, which involves anticipation of future course of events and deciding the best course of action. It is a process of thinking before doing. It is deliberate attempt to influence, exploit, bring about, and controls the nature, direction, extent, speed and effects of change. It may even attempt deliberately to create change, remembering always that change (like decision) in any one sector will in the same way affect other sectors". Planning is a deliberate and conscious effort done to formulate the design and orderly sequence actions through which it is expected to reach the objectives. Planning is a systematic attempt to decide a particular course of action for the future; it leads to determination of objectives of the group activity and the steps necessary to achieve them. Thus, it can be concluded that "planning is the selecting and relating of facts and the making and using of assumptions regarding the future in the visualization and formulation of proposed activities believed necessary to achieve desired results.

In other words we can say that planning is a process of thinking before doing. It involves determinations of goals and the activities required to be performed to achieve the goals. It consists:

1. What is to be done?
2. How it is to be done?
3. Where it is to be done?
4. When it is to be done?
5. By whom it is to be done?

So planning is a process of shorting out the path for attaining the determined objective of the business. Overall planning is deciding that in present, what is to do in future.

Thus, planning is the managerial function of determining in advance what workers are to accomplish and how they are to accomplish, desired goals and projects. It is the most basic function of management. It can be demonstrated as follows -

NATURE / FEATURES OF PLANNING

Planning is the beginning of the process of management. Planning sets all other functions into action. Planning is thinking and deciding future course of action in advance. The nature of planning can be understood with the following points –

1) **Planning is a primary function:** Planning is the base for all other function of management. It means planning is the basic function of all other managerial functions. It provides a base for other managerial functions like organizing, staffing, directing and controlling. We can say that structure of all other functions depends on planning. All other functions are performed within the framework of planning. A management process is a circular process beginning with planning ending to planning for improvement & adjustment.

2) **Planning is a Mental Exercise:** Planning is an intellectual activity which requires a manager to think before acting. Planning requires application of mind involving intelligent imagination, sound judgment etc.

3) **Planning is pervasive:** Planning is required at all levels of management as well as in all departments of the organization. But the scope of planning differs at all levels and all departments of the organization. Planning is required in all sectors, i.e. business, industry, profession etc. whether it is of large scale or small scale and in all the department of organization like purchase, production, marketing, finance department etc. however nature of planning differs from one department to another.

4) **Planning is Flexible:** There must be flexibility in planning, because plans are always based on future, which is uncertain. So flexibility will give a chance to make changes as per future requirements. If future assumptions upon which planning are based prove wrong, then the original plan must be revised in the light of changed conditions.

5) **Planning is Continuous:** Planning is the never ending process of management. Plans are prepared for a specific period of time i.e. monthly, quarterly or yearly. At the end of that period, there is the requirement of new plans. These plans are drawn on the basis of past performance & future conditions. Thus, planning is a continuous process.

6) **Planning is futuristic:** Planning is regarded as a forward looking function based on forecasting. Planning involves looking ahead and preparing for the future. Planning is never done for past but is done for the future to achieve certain objective. Therefore, it is said that planning is thinking before doing. Planning is based on estimated future trends of social, economic and technological changes because it has to tackle the future requirements.

7) **Planning is Goal - oriented:** In setting of objectives and the process of achieving that objective, the planner goes through an intellectual process. The main purpose of plan is always to determine the goal to be achieved and the activities to be performed to achieve these goals. So planning relates to creative thinking for the solution of various problems.

8) **Involving choice (alternative):** Planning can be when there are two or more alternatives and the planner can make a choice for the best, in other words, in the absence of choice there will be no planning because then there is a single way of doing something i.e. to be adopted.

9) **Efficiency of operations:** Planning is made with the objective of raising efficiency of operations but it is not necessary that efficiency will rise, if may or may not. So the management should make continuous efforts to minimize the cost of wastage and improving the efficiency by use of latest change in technology.

10) **Planning is closely linked to objectives:** Each plan specifies the objectives to be attained in the future and the steps necessary to reach them. As Billy E. Goetz said, "plans forecast which actions will tend towards the ultimate objective...Managerial planning seeks to achieve a consistent, coordinated structure of operations focused on desired ends."

OBJECTIVE OF PLANNING

Planning involves selecting missions and objectives and actions to achieve them, it requires decision making, and that is choosing future courses of action from among many alternatives. Planning in any organization serves to realize the following objectives -

1) Planning can bring co-ordination and co-operation among various activities of the organization.
2) Proper planning leads to the best utilization of resources and reduces the wastage. This helps in achieving the economy of the operations.
3) Planning may convert the uncertainty into certainty.
4) Planning provides a provision to meet contingencies and tackles them successfully.
5) Through effective planning, objectives of the organization can be attained in time.

IMPORTANCE OF PLANNING

Accounting to Koontz, O'Donnell and Weihrich, "Planning is an intellectually demanding process; it requires the conscious determination of courses of action and the basing of decisions on purpose, knowledge and considered estimates. Planning is one of the most important functions of management because of the following factors:

1. **Makes the objectives clear and specific**: Planning clearly specifies the objectives and the policies or activities to be performed to achieve these objectives in other words what is to be done and how it is to be done are clarified in planning.
2. **Offsetting the uncertainty and change:** Planning is necessary to look ahead towards future and to take decisions regard facing the expected changes/requirement of the future. **E.g.** before coming of summer session producers started production for the products to be used in summer.
3. **Plans to facilitate decision-making:** To achieve the objective predetermined under planning, business has to take various decisions by considering the available resources. If job may be completed by using various alternatives (e.g. manually or by machines) and the best alternative is decided by the management, which is more helpful in achieving the objective.

4. **Provides basis of control:** Under controlling actual performance is compared with the planed performance (target/objective). So planning is the base of controlling process.
5. **Leads to economy and efficiency:** Planning clarifies the work and its method of doing. Resultantly it reduces confusion and wastage of resources in the form of thinking at the time of doing. So efficiency of the worker will be raised which will further result economy in production.
6. **Facilitates integration:** Under planning proper directions as per plane are provided to the subordinates. Resultantly they all make effort towards the achievement of preplanned objective. Such co-ordination of sub-ordinates and their departments will certainly help the organization in achieving its objective.
7. **Encourages innovation and creativity:** Planning is the process of thinking in advance and so plans are made to achieve a target at future date by using latest methods and technology to perform the industrial/business activities and so plans lead to innovation.
8. **Facilitates control:** Planning facilitates the managers in performing their function of control. Planning and control are inseparable in the sense that unplanned action cannot be controlled because control involves keeping activities on the predetermined course by rectifying deviations from plans. Planning facilitates control by furnishing standards of control. It lays down objectives and standards of performance, which are essential for the performance of control function.
9. **Improves motivation:** The effective planning system ensures participation of all managers, which improves their motivation. It improves the motivation of workers also because they know clearly what is expected of them. Moreover, planning also serves as a good training device for future managers.
10. **Improves competitive strength:** Effective planning gives a competitive edge to the enterprise over other enterprises that do not have planning or have ineffective planning. This is because planning may involve expansion of capacity, changes in work methods, changes in quality, anticipation of tastes and fashion of people and technological changes, etc.
11. **Achieves better coordination:** Planning secures unity of direction towards the organizational objectives. All the activities are directed towards the common goals. There is an integrated effort throughout the enterprise. It will also help in avoiding duplication of efforts. Thus, there will be better coordination in the organization.

LEVELS OF PLANNING

In management theory, it is usual to consider that there are three basic levels of planning, though in practice there may be more than three levels of management and to an extent, there will be some overlapping of planning operations. The three levels of planning are discussed below:

1. **Top level planning :**

   Also known as overall or strategic planning, top level planning is done by the top management, i.e., board of directors or governing body. It encompasses the long-range objectives and policies or organization and is concerned with corporate results rather than sectional objectives. Top level

Check Your Progress :

1. Define planning.
2. What are the differene between goal and plan.
3. What are objectives of plannig.

planning is entirely long-range and inextricably linked with long-term objectives. It might be called the 'what' of planning.

2. **Second level planning :**

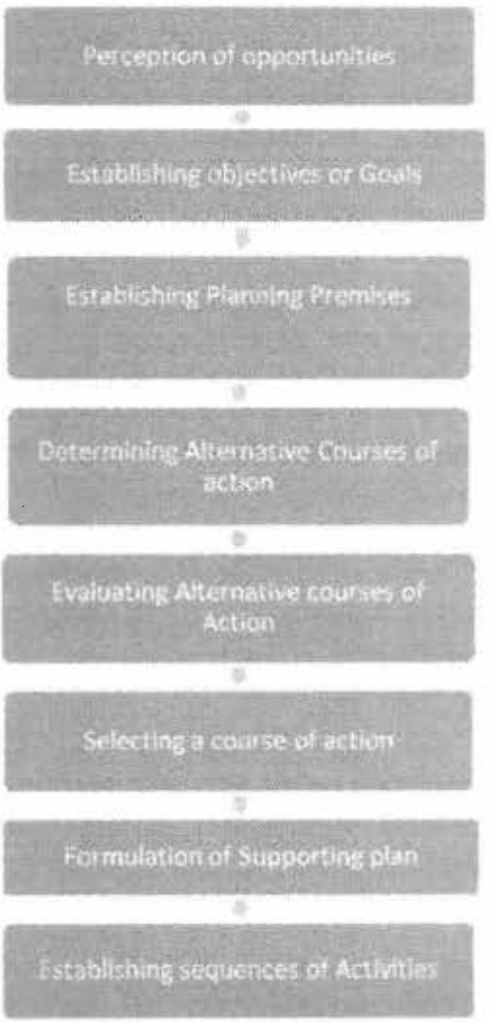
   Also known as tactical planning, it is done by middle level managers or departmental heads. It is concerned with 'how' of planning. It deals with development of resources to the best advantage. It is concerned mainly, not exclusively, with long-range planning, but its nature is such that the time spans are usually shorter than those of strategic planning. This is because its attentions are usually devoted to the step-by-step attainment of the organization's main objective. It is, in fact, oriented to functions and departments rather than to the organization as a whole.

3. **Third level planning :**

   Also known as operational or activity planning, it is the concern of departmental managers and supervisors. It is confined to putting into effect the tactical or departmental plans. It is usually for a short-term and may be revised quite often to be in tune with the tactical planning.

PLANNING PROCESS:

Planning is the process used by managers to identify and select goals and courses of action to achieve their goals.



Planning Process

1) **Perception of Opportunities:** Perception of opportunities is not strictly a planning process, but awareness of opportunities is very important for planning process because it leads to formulation of plans by providing clue whether opportunities exist for taking up particular plans. Managers should know where they stand in the light of strengths and weaknesses, understand what problems they have to solve and what they expect to gain. There are a number of techniques that will help you to do SWOT Analysis & Risk Analysis.

2) **Establishing Objectives or Goals:** The second step in planning process is to establish objectives of an organization. In other words, we can say that we should know, where do we want to be in future & what is to be accomplished by the various types of plans.

3) **Establishing Planning Premises:** The third step in planning process is to establish planning premises that is the conditions under which planning activities will be undertaken. The planning premises are both external and internal. External premises include technological changes, population growth, political stability, sociological factor etc and internal factor may include sales forecasts, politics and programmes of the organization etc.

4) **Determining Alternative Courses of Action:** The next step in planning process is to search alternative courses of action. The manager should find out the most fruitful possibilities among various possibilities. The concept of various possibilities or alternatives states that the particular objective can be achieved through various actions.

5) **Evaluating the Alternative Courses of Action:** After determining the alternative courses of action, the next step is evaluating them and examining their weak and strong points. At this stage, an attempt is made to evaluate how each alternative would contribute to the organization objectives and select the best course of action with the help of operation research and mathematical techniques, so, that the pre-determined objectives may be achieved.

6) **Selecting the best course of Action:** After the evaluation of various alternative courses of action, the best one is selected. Sometimes after evaluation, we get more than one course of action which may be equally good, in that case the planner may choose more than one alternatives. Therefore, planner must be ready with alternatives, normally known as contingency plan, which can be formulated in changed situation.

7) **Formulation of Supporting Plan:** After formulating the basic plan, various plans are derived so as to support the main plan, these plans are known as derivative plans. In an organization there can be various derivative plans like buying raw material, buying new equipments, recruitment and developing personnel, etc. These plans are formulated for supporting the basic plan.

8) **Establishing Sequences of Activities:** After formulating the basic and supporting plans, the sequence of activities is determined so that plans are put into action. Budgets can be prepared for various periods, it can be decided who will do what and at what time and so on, this type of sequencing is helpful in implementing the plans.

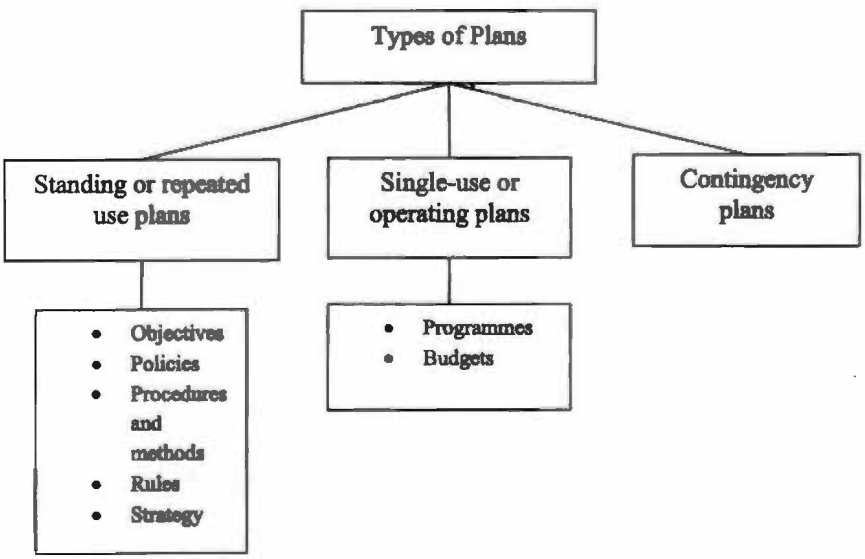
NOTES

SIX P's of PLANNING

This can be defined as follows:

1) **Purpose:** An effective planning system requires a clear understanding of the organization's purpose. Why this organization exists? Is it to increase profit, or to introduce more products or to increase market shares etc.? The purpose of the organization's existence must be clear.
2) **Philosophy:** Philosophy means the fundamental beliefs of the organization as to how the organization's purpose is to be achieved.
3) **Premise:** Premise involves the knowledge of strength and weaknesses of the organizations so that the organization can deal with the changing environment, effectively.
4) **Policies:** Policies are general guidelines that help in managerial thinking and action. Policies are the basis for planning. In a typical organization, there are production policies, financial policies, accounting policies and so on.
5) **Plans:** Plans represent specific objectives and it guides us step by step as to how to reach the objectives of the organization.
6) **Priorities:** Goal Priorities would determine what is relatively more important. The priorities will determine an appropriate allocation of resources. The priorities of goals would be established on the basis of philosophy and premises of the organization as well as social, political and economic measures.

TYPES OF PLANS:



1) Standing or Repeated use Plans :

These plans are designed to deal with recurring problems. These plans are prepared by managers at different levels. When a particular problem arises, a standing plan provides a guidance to solve this problem.

The major types of standing plans are as follows –

- **Objectives:** Objectives or goals are the ends toward which activity is aimed. In an organization all the department may also have its own objective to the attainment of organization's objectives.
- **Policies:** Policies are the general guidelines for taking action. According to George R. terry - "Policy is a verbal, written or implied overall guide, setting up boundaries that supply the general limits and direction in which managerial actions will take place". In short, policies deal with "how to do" the work.
- **Procedures and Methods:** A procedure is a standing plan that outlines a series of related actions that must be taken to accomplish a particular task. Methods are the manners of work performance, and follow the set procedure.
- **Rules:** A rule indicates what an organization should do and what it should not do. The rules prescribe a definite and rigid course of action without any scope for deviation.
- **Strategy:** Strategy may be defined as the general programs of action and deployment of resources to attain comprehensive objectives. The success of the plan requires that it should be strategy oriented.

2) Single - Use plans :

Single use plans are used only once when the period is over, a new plan is devised for the next period. This plan focuses on unique or rare situations within the organization. Single use plans include the following aspects of planning -

- **Programmes:** Programmes include all the activities necessary for achieving a given objective. In order to accomplish an objective, programmes lay down the principal steps and sets an approximate time for its fulfillment.
- **Budgets:** Budget may be defined as a financial statement which is prepared prior to a definite period of time, for the purpose of attaining a given objective. Budget estimates the men, money, materials and equipment in numerical terms, required for the implementation of plans.

3) Contingency Plans :

Contingency plans are the plans which are formulated for some unexpected contingencies. These plans are mentioned in advance in order to face any contingency in the near future.

TYPES OF PLANNING:

Planning is deciding in advance what to do and how to do. It is one of the basic managerial functions. Before doing something the manager must formulate an idea of how to work on a particular task. Thus planning is closely connected with creativity and innovation. There are many ways in which an organization can undertake planning process, some are as follows:

1. **Corporate Planning :**

   The corporate planning activities are carried out at the top level management. The top level management is responsible for the formulation of such plans and it is prepared according to the inputs received from the environment or the lower level management. These plans are usually long term in nature.

2. **Functional Planning :**

   Functional planning is the planning that covers some functional areas like production, finance, purchasing, and marketing. The following steps are necessary for an effective functional planning.

   - The functions should be clearly defined.
   - The activation without a function should be homogenous.
   - The scope and limit of each function should be determined.
   - The inter relation between different function and the functional goals with the organization goals should be well defined.

3. **Strategic planning :**

   Strategic planning deals with the basic objectives, policies and the strategies of the organization. The strategic planning may be carried out in a series of steps that includes:

   - Specifying Mission & Objective,
   - Elaborate environmental scanning,
   - Strategy formulation
   - Strategy implementation
   - Evaluation & Control

4. **Operational Planning :**

   Operational planning is also known as short-term planning. Operational planning is the process of ensuring the most effective use of resources, ensuring to develop a control mechanism, and to ensure effective implementation of the action so that organizational objectives are achieved. Operational planning is done by the lower level management and it defines the detailed manner and programme as to how current operations are to be carried out.

5. **Long-term & Short term Planning :**

   Long-term planning sets long-term goals of the organization and then formulate specific plans/strategies for attaining these goals. Long-term planning is of strategic nature and involves more than one-year period.

   Short-term planning on the other hand is mainly concerned with the determination of short term activities to accomplish long-term objectives.

6. **Formal & Informal Planning :**

   Formal planning exists in the formal hierarchy of the organization. This type of planning is done at a large scale and is based on the pre-defined policies and the rules of the organization.

Informal planning is usually carried out in very small organization where the formal organization structure may or may not exist.

ADVANTAGES OF PLANNING

Planning determines where the organization is now and where it will be in the future. It provides a framework within which a business operates. Planning is that function which never ends and is observed in all aspects of the organization. The basic purpose of planning is to reduce risk and to initiate a co-ordinated effort for the success of the organization. Some of the advantages of planning are as follows–

1) **Planning helps in Co-ordination :**

   All managers are involved in setting future goals. Planning helps to resolve the differences among different departments and all efforts are aimed at achieving the common goal. The activities are co-ordinated harmoniously towards the predetermined goals.

2) **Helps in Achieving Objectives :**

   Planning sets the goals or objectives of an organization; it gives effective direction to the employees &, clarity in their role. Therefore, planning helps the organization to accomplish the pre-determined objectives.

3) **Effective Control :**

   In planning the manager of the organization sets goals and develops plans to achieve these goals. These goals and plans then become standards against which performance can be measured. The function of control is to ensure that the activities conform to the plans.

4) **Economy in operation :**

   With the help of proper planning unnecessary production, ineffective utilization of resources may be avoided which leads to cost reduction. This results in the economy of resources.

5) **Better Utilization of Resources :**

   Planning decides what to produce how to produce and how much to produce. Thus planning results in better and efficient utilization of resources.

Check Your Progress :

4. What planning should be consider in top level planning.
5. Name the six P's of planning.
6. What are types of plans.
7. What do you understand by formal planning.

6) **Promote Growth and Improvement :**

Planning sets standards to the control process. So, useless and unnecessary activities are avoided, it saves time and that time is used in developing new ideas. It leads to the growth and improvement of the organization.

7) **Planning secures unity of purpose & direction :**

In planning, separate and distinct activities are coordinated toward one common goal, and at same time, duplication and cross purpose working are avoided throughout the organization.

LIMITATIONS OF PLANNING:

Planning is subject to certain limitation and a proper understanding of them will go a long way in improving efficiency of planning. There are several limitations of planning. Some of them are inherit in the process of planning like rigidity and other arise due to shortcoming of the techniques of planning and in the planners themselves.

Planning is an important function of management. However, the planning may fail if the following limitations.

- **Lack of accuracy:** Planning relates to future and future is always uncertain and so prediction about future is so much difficult. Moreover planning are based on data/information relating to past and as such planning based on any wrong information may not be useful to the organization.
- **Costs:** Formulation of plans involves too much cost which are in the form of time spend, money spent etc. but sometimes there is little benefit from in plan and then it becomes a burden for the institution. If the plan is not useful than the amount or time spent on its formulation is a waste.
- **Advance effect on decisions:** Some plans are rigid and a manager faces difficulty while making any changes where as there may be continuous change in environment where as the quick decision is required as per the changed environment.
- **Delay in actions:** Planning requires some time for thinking, analyzing the situation and designing the final plan and so in case emergency decision is required it will take time and business will lose its opportunity. Moreover delay in decision will further delay the action.
- **Psychological barrier:** People in organization have to work strictly according to plan where as they may be able to give better performance in a way decided by themselves. Secondly they do not think beside the plan and performs their activities like a machine without using their psychology.
- **Limited flexibility:** There may be some changes in planning only up to some extent because measure changes in plan will further attract the changes in supporting plans also and as such the whole system is disturbed moreover changes in plans time and again will prove a wastage of time and money spent on previous plan (pre-changed plan).

- **Human elements:** Planning are the results of thinking of human being. Information on the basis of which plan is formulated may not be free from bias or there may be some other errors which will further Reebok (problem) the better plan.
- **Improper plan:** Sometimes lower target will be easily achieved and we will feel false sense of security. On the other hand over planned target beyond resources cannot be achieved even all effort both are the situation of improper plan.
- **Planning is a time-consuming and costly process:** This may delay action in certain cases. But it is also true that, if sufficient time is not given to the planning process, the plans so produced may prove to be unrealistic. Similarly, planning involves costs of gathering and analyzing information and evaluation of various alternatives. If the management is not willing to spend on planning, the result may not be good.
- **Planning is a forward-looking process:** The planner must possess the required initiative. He should be an active planner and should take adequate follow up measures to see that plans are understood and implemented properly.

Answer of the Check Your Progress

1. Planning is a preparatory step in any task of the organization. It is a systematic activity which determines when, how and who is going to perform a specific job. Planning is a detailed programme regarding future courses of action.
2. Goals are desired outcomes for individuals, groups, or entire organizations. Plans are documents that outline how goals are going to be met and that typically describe resource allocations, schedules, and other necessary actions to accomplish the goals.
3. Planning can bring co-ordination and co-operation among various activities of the organization. Proper planning leads to the best utilization of resources and reduces the wastage. This helps in achieving the economy of the operations. Planning may convert the uncertainty into certainty. Planning provides a provision to meet contingencies and tackles them successfully. Through effective planning, objectives of the organization can be attained in time.
4. Also known as overall or strategic planning, top level planning is done by the top management, i.e., board of directors or governing body. It encompasses the long-range objectives and policies or organization and is concerned with corporate results rather than sectional objectives.
5. The six P's of planning are as follows :—

   (a) Purpose (b) Philosophy (c) Premise

   (d) Policies (e) Plans (f) Priorities

6. There are three types of plans, there are :—
   (a) Standing or repeated use plans.
   (b) Single use or operating plans
   (c) Contingency plans.
7. Formal planning exists in the formal hierarchy of the organization. This type of planning is done at a large scale and is based on the pre-defined policies and the rules of the organization.

EXERCISE

1. Explain meaning and definition of planning.
2. Write down features of planning.
3. Explain objectives of planning.
4. Write a note on importance of planning.
5. Explain levels of planning.
6. Write a note on planning process.
7. Define six P's of planning.
8. Write down different types of plans.
9. Explain types of planning.
10. Write down advantages of planning.

8 Control

The Chapter Covers :

- Meaning & Definitions of Controlling
- Control Process
- Nature of Control /Characteristics of Control
- Importance of Controlling
- Limitation of Controlling
- Principles of Effective Control Systems
- Necessity of Control
- Objective of Control
- Elements of Control
- Types of Controls
- Qualties of Effective Control System

INTRODUCTION

Controlling is a fundamental managerial function. It is the process of comparing actual performance with established standards, for the purpose of taking action to correct the deviations if any. It is the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objective. The basic purpose of a well designed control system is to ensure that results are achieved according to plan. Controlling is a continuous process of measuring actual results of operation of an organization, and compares it to the standards and takes corrective actions if necessary.

MEANING & DEFINITIONS OF CONTROLLING

Controlling is the process through which managers ensure that actual activities conform to the planned activities. Some of the definitions of controlling are as follows:

According to George R. Terry, "Controlling is determining what is being accomplished, that is, evaluating the performance and, if necessary, applying corrective measures so that the performance takes place according to plans."

According to Kountz O' Donnel, "Management control implies measurement of accomplishment against the standards and the correction of deviations to ensure attainment of objectives according to plans."

According to E.F.L. Brech, "Controlling is checking current performance against predetermined standards contained in the plans with a view to ensure adequate progress and satisfactory performance."

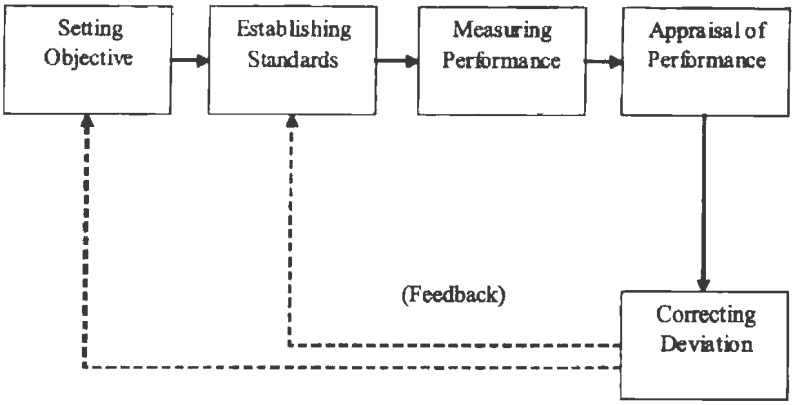
On the basis of above definitions, it may be concluded that the control is a process through which the performance of subordinates is evaluated to see whether the activities of the organization are going on in the required manner or not. Whether the employees of the organization are doing their jobs according to the orders and directions issued to them or not. If anything is found wrong, remedial measures are taken for that so that the activities of the organization may go on in the right way and in the right direction.

CONTROL PROCESS

The control process involves the following basic steps

1. Setting objectives
2. Establishing standards
3. Measuring performance
4. Appraisal of performance
5. Correcting deviation

1. **Setting objectives:** The first step in control process in the setting of objective. The objectives must be clearly specified and understood. The objective should be specific as well as meaningful.
2. **Establishing standards:** Standard are the targets against which subsequent performance will be compared. They are yardsticks of performance and specify what should be accomplished. To make the standards effective they must have the following feature:-
   a. Standards should be set in quantitative terms to the maximum possible extent.
   b. Standards should concentrate on results and not on procedures.
   c. Standard should be revised periodically to keep them updated.
   d. Standards should accurate and flexible.
3. **Measuring performance:** Once the standards and objective have been established, the next step in the controlling process is to monitor and measure the actual performance. Monitoring and measurement is a continuous activity and involves collection of data that represent the actual performance of the activity so that a comparison can be made between what is accomplished and what was intended to be accomplished. The manager while comparing the performance with the standards has to find out not only the extent of variation but also the causes of variation. Measurement of performance should be accurate and reliable. It should be simple & clear. Where quality standard are established performance should be measured in quantitative terms.
4. **Appraisal of performance:** The comparing step determines the degree of variation between actual performance and the standards. Comparison of actual performance with the planned target or standards involves two steps i.e. finding the extent of deviation and identifying the causes of deviation. If performance



Process of Control

matches the standards managers may assume that every taking is under control. If performance falls short of standards, managers must find out the extent of deviation. This deviation may be due to error in planning, defective implementation or careless operative performance.

5. **Correcting deviation:** The Manager after finding out the deviation from the prescribed standards has to take steps to correct the deviation. The corrective action may involve a change in methods, rules, procedures etc. Sometimes variation may occur due to setting of unrealistic standards. That is, the objective may be too high or too low.

NATURE OF CONTROL /CHARACTERISTICS OF CONTROL

1) **Controlling is a dynamic/Continuous process:** Controlling involves continuous review of actual performance and taking corrective actions, if required.
2) **Control is a function of management:** Control is a follow-up action to the other function of management. This function is performed by all the managers in the organization.
3) **Control is action oriented:** A good system of control facilities timely actions so that there is minimum waste of resources, time and energy.
4) **Control leads to post mortem of past events:** Control leads to appraisal of past activities. The short comings in the performance of various individuals and departments are revealed by the control process. It helps in knowing the reasons of poor performance.
5) **Control is forward looking:** Control is forward looking. It is related to future, as past cannot be controlled. It is usually a preventive technique as the presence of control systems leads to minimize wastage, losses and deviations from standards.
6) **Essential at every Level of Management:** Controlling is not a specific function to be performed at any specific level of management. It is required at every level of management for all the activities and all the departments.
7) **Attainment of Goals:** The main object of control is to ensure the proper functioning of the organization according to the pre-decided rules, policies, plans, procedures and programmes. It aims at the attainment of pre-decided objective of the organization.

IMPORTANCE OF CONTROLLING

Controlling helps to ensure that objectives and accomplishments are consistent with one another throughout an organization. The importance of controlling function of management may be described as follows:-

1) **Control facilities decision making:** Controlling helps managers to identify the gaps between thinking and doing functions of management. It helps to find out the problems in performance and to take appropriate decisions to cure these problems.
2) **Control facilities decentralization:** Control enables the top management to get the feedback which helps them to ensure that the decision taken at the lower levels are consistent with the policies and the interest of the organization.
3) **Control ensures proper implementation of plans:** Planning provides purpose and direction to organizational activities and controlling is the process of checking current performance against per-determined standards contained in the plans, with a view to ensure satisfactory performance.
4) **Control helps in co-ordination:** Controlling facilities the work of co-ordination, this is possible by keeping all the activities and efforts directed towards the achievement of goads in conformity with plans and programmers.
5) **Control improves employee's morale:** Controlling creates an atmosphere of order and discipline in the organization. Employees know well in advance what they are expected to do and the standards against which their performance will be judged. It induces them to do things in a proper manner. It increases the morale of employees to perform well.

LIMITATION OF CONTROLLING

1) **External factors:** The management cannot contract external factors which may affect performance because they are beyond the control of management. For example: Government action, market forces etc.
2) **Difficulty in setting standards:** The determination of standards is very essential for control. These are many things like production, quality etc that can be standardized either in physical or financial terms but there are some activities, which cannot be subjected to any scientific or accurate measurement.
3) **Responsibility cannot be fixed:** In organization there are a number of deviations for which nobody in particular can be held responsible like in an organization we can't blame anyone for the failure of machinery during production.
4) **Oppositions by Subordinates:** Generally, it has been the experience the subordinates oppose the system of control because they feel that it will increase the burden of work upon them.
5) **Expensive:** The process of control is sometimes so expensive that the benefits of this process are less than the expenses incurred on it. Modern techniques of control are very expensive. It is suitable for the large scale business and industrial enterprises.

PRINCIPLES OF EFFECTIVE CONTROL SYSTEMS

There are certain principles of effective control systems. There are as follows:

1) **Need & nature of activity:** The control system should meet the need and nature of activity. For example: Control system used in the finance department will

naturally differ from the production or the sales department. Similarly, need & nature of small business is different from the big business.

2) **Prompt report of deviations:** The control system should enable subordinates to inform their superiors in time about their performance, this would help the superiors in detecting deviation and in taking prompt corrective actions.

3) **Forward looking control:** A good control system is one that detects deviation early enough so as to enable the managers to take quick corrective actions.

4) **Objective standards:** Objectives provide control standards against which actual performance can be evaluated. So objective standard should be definite and clear.

5) **Flexible Control:** The plans and objective may change according to the needs of the situation; therefore control system should be flexible so that it can be adjusted to suit the needs of any modification or alteration in the plans and objectives.

6) **Economical Control:** The control system should be economical. The benefit derived by the business concern from the control system should be more them the cost involved in its maintenance.

7) **Corrective Action:** The control system should not only detect deviation from the pre-determined standards but also should provide solutions to the problems that are responsible for deviation. In the words of Koontz & O' Donnell, "An adequate system should disclose where failures are occurring who is responsible for them and what should be done about them."

8) **Simple control:** To be effective, Control must be simple and easily understandable to the managers as well as subordinates.

NECESSITY OF CONTROL

A control system is needed for three purposes:-

1) **To measure progress :** The Control process measures progress towards the goals of the company. The manager of the concern measures the undertaking of the enterprises or department, whether all the activities of the enterprise are in planned course or not.

2) **To uncover deviation :** The control process helps to uncover or expose the deviation of the concern by comparing actual performance to the pre-determined standards. A successful control process is one that takes corrections to the organization before the deviations become serious.

3) **To indicate Corrective Action :** A control system is needed to indicate the corrective actions. Control system may reveal all the facts that are needed to be redrawn, for example plans need to be redrawn or there is need for reassignment or clarification of duties.

OBJECTIVE OF CONTROL

Following are the important objectives of control:-

1 Control aims the measurement of actual performance.

2 Control aims to identify the variations, if any.

Check Your Progress :

1. Define controlling ?
2. What steps involve in control process.

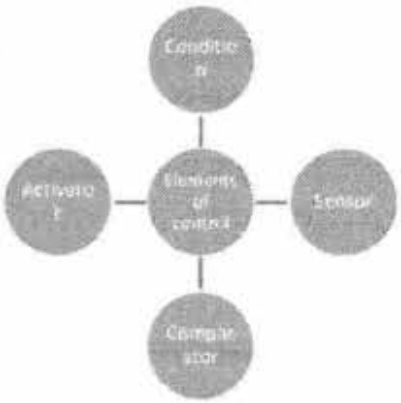
3 Control aims to rectify the variation and prevent their recurrence.

4 Control aims that the problems and hindrances may not repeat.

In brief, the main object of control is to get the work done by a manager from his subordinates according to the pre-determined standards. If any difficulty or problem arises in the performance of the work, best efforts are made to solve the problems so that the work may go on the required manner and pre-determined objectives of the enterprise may be achieved easily.

ELEMENTS OF CONTROL

Following are the four basic elements of control:



1) **The Characteristic or condition to be controlled:** The first element is the characteristic or condition of the operating system which is to be measured.

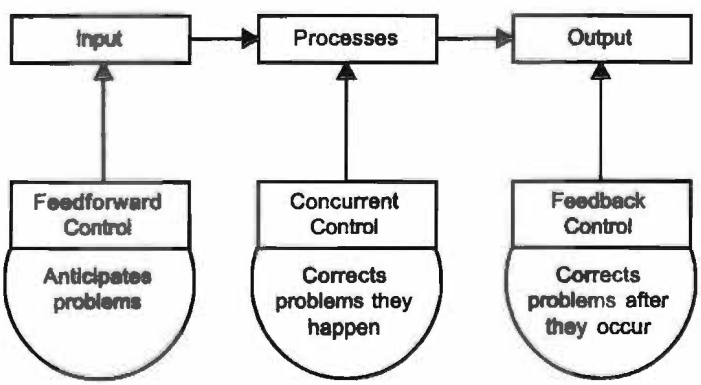
2) **The sensor:** The second element of control is the sensor. It is a means for measuring the characteristic or conditions.

3) **The comparator:** The third element of control is the comparator. It determines the need for correction by comparing what is occurring with what has been planned.

4) **The Activator:** The activator is the fourth element of control. It is the corrective action taken to return the system to expected output.

TYPES OF CONTROLS

Control can focus on events before, during, or after a process. For example, a local automobile dealer can focus on activities before, during, or after sales of new cars. Careful inspection of new cars and cautious selection of sales employees are the ways to ensure high quality or profitable sales even before those sales take place. Monitoring how salespeople act with customers is a control during the sales task. Counting the number of new cars sold during the month and telephoning buyers about their satisfaction with sales transactions are controls after sales have occurred. These types of controls are formally called **feed forward, concurrent, and feedback,** respectively.



1) Feed forward controls :

These controls are sometimes called preliminary or preventive controls, attempt to identify and prevent deviations in the standards before they occur. Feed forward controls focus on human, material, and financial resources within the organization. These controls are evident in the selection and hiring of new employees. For example, organizations attempt to improve the likelihood that employees will perform up to standards by identifying the necessary job skills and by using tests and other screening devices to hire people with those skills.

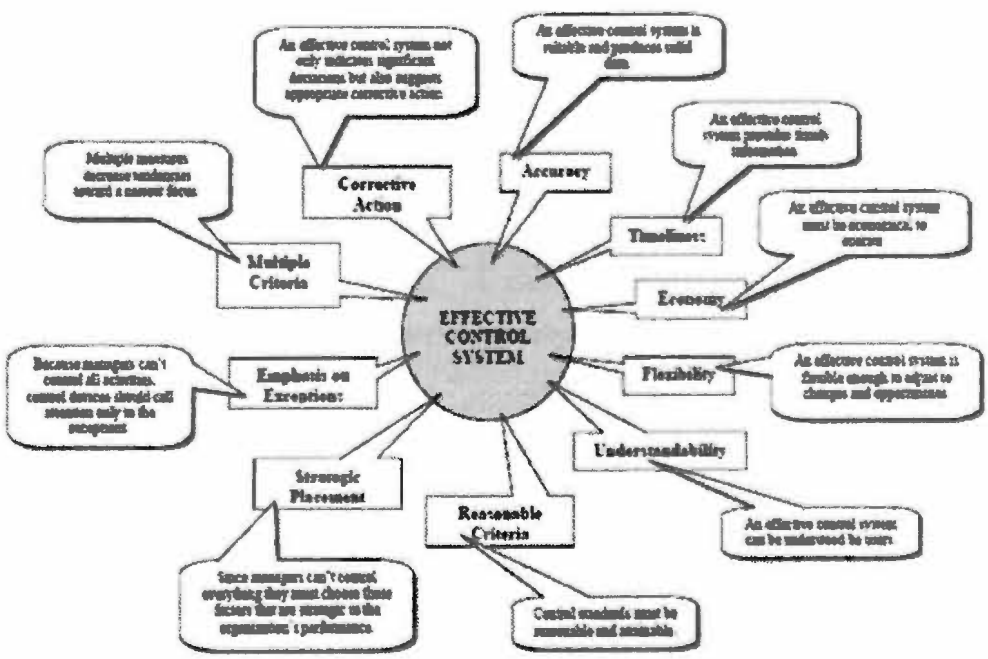
2) Concurrent controls :

These controls monitor ongoing employee activity to ensure consistency with quality standards. These controls rely on performance standards, rules, and regulations for guiding employee tasks and behaviors. Their purpose is to ensure that work activities produce the desired results. As an example, many manufacturing operations include devices that measure whether the items being produced meet quality standards. Employees monitor the measurements; if they see that standards are not being met in some area, they make a correction themselves or let a manager know that a problem is occurring.

3) Feedback controls :

These involve reviewing information to determine whether performance meets established standards. For example, suppose that an organization establishes a goal of increasing its profit by 12 percent next year. To ensure that this goal is reached, the organization must monitor its profit on a monthly basis. After three months, if profit has increased by 3 percent, management might assume that plans are going according to schedule.

QUALTIES OF EFFECTIVE CONTROL SYSTEM



Check Your Progress :

3. What are the elements of control.
4. What do you mean by concurrent control.
5. What is the importance of controlling.

Answer of the Check Your Progress

1. t is the process of comparing actual performance with established standards, for the purpose of taking action to correct the deviations if any. It is the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objective.
2. The control process involves the following basic steps
   1. Setting objectives
   2. Establishing standards
   3. Measuring performance
   4. Appraisal of performance
   5. Correcting deviation
3. Following are the four basic elements of control :—
   (i) The Characteristic or condition to be controlled; (ii) The sensor; (iii) The comparator; & (iv) The Activator
4. These controls monitor ongoing employee activity to ensure consistency with quality standards. These controls rely on performance standards, rules, and regulations for guiding employee tasks and behaviors. Their purpose is to ensure that work activities produce the desired results.
5. The importance of controlling function of management may be described as follows:-
   - Control facilities decision making;
   - Control facilities decentralization;
   - Control ensures proper implementation of plans;
   - Control helps in co-ordination
   - Control improves employee's morale

EXERCISE

1. Explain meaning and definition of controlling.
2. Write down features of control.
3. Write a note on importance of controlling.
4. Explain limitations of controlling.
5. Write a note on control process.
6. Define principles of effective control system.
7. Explain need of control system.
8. Write down objectives of control.
9. Explain elements and types of control.
10. Explain qualities of effective control system.

9 System Planning and Initial Investigation

The Chapter Covers :

- Introduction
- System planning
- Why system planning ?
- Strategic MIS planning
- Managerial and operational Mis planning
- Strategies for determining information requirements
- Getting information from the existing information system
- Prototyping
- Initial investigation
- Information service request
- Activities in initial investigation
- Background analysis
- Fact-Finding techniques
- Data collection
- Correspondence and questionnaires
- Personal interview
- Observation
- Research

INTRODUCTION

Before we accomplish a task, we prepare a success plan about it. No matter whether the task is related to building construction, business related, marriage related or concerned with a journey, we prepare a plan from its beginning to end. Likewise, the development of a system starts with a efficacious plan. In this chapter, we'll study about the initial investigation taking place for it with different functions and steps.

SYSTEM PLANNING

Information, for ever, have been important for a company or institution. Today the advancement of information technology has made its operation and control easier. The success of yours or your company depends on your information management. Computer has become a part and parcel of information technology, as a result companies have focussed their attention on it.

WHY SYSTEM PLANNING ?

Today, business without information is almost a failure. Successful planning is the key to the success of business. Why is a successful strategy essential for business today ?

What is the planning capacity necessary in business skill ? The chief reasons behind it are the following–

- **High Interest Rate** – To initiate a business on a big scale one's own capital is not enough. For it, the outer sources have to be included in capital building. Among outer sources, government or private banks, Private lending companies or Money lenders are the principal ones. If one borrows from these firms or people a fixed amount must be given to them as interest. Therefore, it must be taken care of that one gets maximum benefit on the investment.
- **Inflation** – Price hike and inflation lay pressure upon a company to gain a better profit ratio.
- **Lack of resources** – Today, the unavailability of sufficient resources is the greatest difficulty of a company or a commercial unit. Scarcity of resources prove a hindrance for the company's extension projects.
- **Regulatory Constraints** – There are many rules and policies of the government which hinder the companies in launching their products in the market.
- **Competition** – Today products are available with same quality but at different price-rates. Companies are on their toes to sell their products with different offers in the market. Competition compells companies to produce better quality products at low cost.

The above mentioned reasons inspire a company to develop a system which is better from every angle and which is not possible without preplanning.

STRATEGIC MIS PLANNING

When you are developing an information system, it must be developed under the MIS (Management Information System) rules of the organisation on institution. In it, two things must be taken care of. One is time and the other is purpose. What the duration of time is, means whether it is long time or for one or two years. Purpose means what the level of planning is. Whether its original relation is strategic or managerial or operational. Strategic planning is a systematic pattern which determines the following functions-

- Attaining the basic objectives
- Necessary plannings and policies to achieve the objectives
- An efficient program for implementing the strategies

The first thing in a strategic planning is to set the MIS objectives and determine the probable results to be obtained from them. While thinking over these plans we

should calculate the strategic planning of the organisation or the institution, the system or the services to be presented, the role of user in system development and the technology being used. Once one sets the objectives of MIS, the MIS policies itself become a guideline for implementing the whole strategy. In addition, the MIS policies for the sake of implementation, become long-range means conceptual, medium-range means managerial, and short range means operational programs.

While preparing an strategic plan, different types of questions come to our mind and the answers to which are essential for determining the plan. For example, what sorts of MIS objectives and plans can be achieved from the corporate strategic plan ? Who will appraise and recommend the plan or the program ? What is the time span of the plan ? What things will be included in the plan ? What will the plan lay stress upon ?

In most of the cases, the answers to these questions depend upon the structure and complexity of the MIS organisation, the level of the computerisation of the company, the interference of the authorities of the higher management in recommending the plan.

MANAGERIAL AND OPERATIONAL MIS PLANNING

The managerial MIS plan links the planning program with operational program. In this process the specific functional program is to be related with a particular number of years and it is displayed how long term results will be drawn by implementing the plans.

After this short term programs are charted out which are related to the day-to-day activities of the company. These are the programs set for a year. For instance, operating expense budget, human resource budget, the time table for the implementation of the new system are all short-term programs which are designed to implement the master plan of the organisation by computerisation of the labour-intensive fields of the business.

MIS operating plan, admitting the user, defines the necessities of the system. One should recommend only those MIS objectives which exist in the corporate plan and those applications should be identified and selected which are the priorities of the organisation. To understand this link look at the model of three steps -

- **Strategic System Planning** – In this step a relation is established between the plan of the organisation and the plan of the new system.
- **Analysis of the Required Information** – In this step, to operate the specific application of the system plan the system requirements are identified.
- **Allocation of the resources** – This step includes hardware, software, telecommunication facilities, personal and financial resources to implement the development of system.

The plan of system development activities is an important aspect of the planning operation in context of its importance and the commitment of planning resources.

Extensive corporate strategic objective should be the base of system development strategies which operates the operating goals in the form of special function plan. When we make the planning process format, it becomes easier to get the co-operation of high, medium and operating management.

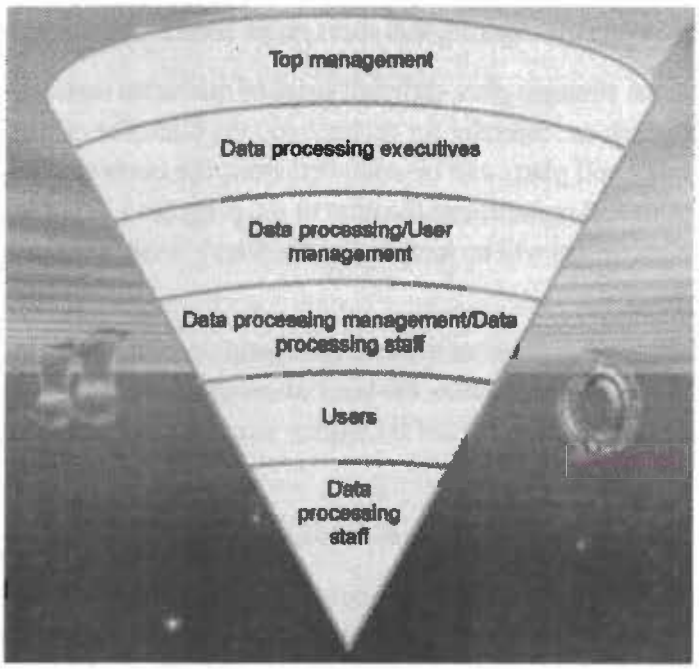


Figure : The top down approach of the system planning

In the Figure, the top-down approach has been displayed, in which the relation between the corporate strategic plan and the goals and activities of system development work is clear.

Determining the User's Requirements

In the creation of computer based information system complete and accurate information requirements are expected. But it is very difficult to determine the information requirements of every user. In fact, it is one of the most difficult tasks of system development. There are several reasons behind this -

- The system requirements keep on changing. The user's requirements are rectified as per the requirements of the system.
- The requirements can be expressed only by experienced users. It is very difficult for common users. Functions or processes can't be described easily.
- The serious involvement and dedication of a user is very difficult. Even the reinforcement implementation of their works is not received.
- The interaction pattern between the user and the analyst in designing the information requirements is very complicated.

The users and the analysts, as it has been seen, do not hold one opinion regarding problem solving, for instance, in the analysts point of view, the problem definition must be transformable into system design, the expression output of which must be quantitatively in connection with input, process and data structure. It is an ideal method of developing a good system when all the features are known in the most

suitable conditions and within the time limit. In contrast to it, the user is satisfied with the qualitative definition which clarifies the system in generality. Flexibility is the principal consideration. System directives should change according to their necessities as it does after the system implementation.

On the basis of these contrastive considerations, when the user tries to define his information requirements from the analyst's point of view, finds himself in a painful condition. By putting his strategies across the user wants to satisfy the analyst.

These strategies are as follows -

- The user, in his report, tries to insert many types of reports in the definitions of his requirements, exception processing etc. which shows his want of experience.
- The user requests to add many times more system features than required which later end in reducing the number and coming to only required features.
- For want of knowledge, the user becomes rigid on particular things and starts demanding for it. In such conditions, the analyst feels failed for it is only the user who can guess the real requirements.

  A person feels difficulty in giving the full account of his imformation requirements. It gets difficult, when asking about the true requirements, to get the correct and complete answer. The following features are responsible for it.
- A human mind has high capacity, long-time memory or low capacity, short-time memory. The mind with a short memory has the limits which prevents him from remembering which requirement is important, at the time of the interview. It normally doesn't happen that all the important requirements are mentioned at the time of the interview.
- People generally get biased in their selection and use of data. There can be many forms of this partiality. For example, some users mention only recent developments and ignore the old ones.
- People have very limited conscience.

  A successful analyst looks for information requirements by using a simple model. It includes organisational and policy issues to know the requirements in true sense. Ordinary analysts don't pay heed to these things.

Their aim is to try to know about the requirement of the users as soon as possible.

STRATEGIES FOR DETERMINING INFORMATION REQUIREMENTS

There are three principal strategies to bring the information regarding a user's requirements into light asking, obtaining information from the existing information system and prototyping.

Asking – In this strategy, the information is gathered from the user by just asking. This is supposed to be a permanent system, where the users are fully informed and can rein in their partiality while defining their problems. There are three methods of asking -

Questions can either be open ended, or closed. In open-ended questions, the respondents are ready for an answer. It is used when opinions and advice are important. For example, How do you evaluate the latest addition in your hardware ? In contrast to it, closed questions seek only one answer out of a set of answers.

For example, For how long have you been working on this system ? Such questions are asked when the factual answer is known. More information regarding it is available in the next chapter.

Brainstorming is a technique to be used for creating new thoughts and for obtaining information requirements. This method is suitable for drawing a conclusion on the non conventional solution to a problem. The guided method of brainstorming asks every participant to define an ideal solution and then choose the most feasible one. It works well for those users who have some knowledge of the system but find it difficult to accept new ideas.

Group consensus asks the participants their expectations regarding specific variables. For instance, in delphy enquiry, every participant fills in a questionnaire, then there is the summarization of the results and given to the participants with a follow-up questionnaire.

The participants are invited to make alterations in their answers. The results are again summarized and given to the participants. This debate goes on through a questionnaire until the participants' answers are much convergent. The speciality of this method is there is no psychological pressure on the participant to answer.

GETTING INFORMATION FROM THE EXISTING INFORMATION SYSTEM

Determining the information from the existing information system is called data analysis approach. In it, the user is asked which sort of information is gathered in present and other pieces of information necessary ? Articulating the information requirements depends fully on the user. The analyst examines every report, have discussions with the user on every examined report and determines the incomplete information requirements by interviewing the user. The analyst, mainly, is involved in improving the flow of the current data. The decision against the same is analysis. It divides a problem into many bits, so that the users can focus separately upon every troublesome point. It also determines policy and organisational goals which are relevant in identified decision making areas and necessary special steps. After this, the analyst and the user refine the decision process and information requirement for the last statement of the information requirements.

Data analysis method is ideal for structured design creation however it is necessary in it that the users articulate their information requirements. The main drawback in it is there are no established rules for obtaining and justifying those information requirements which are not related to the organisational rules.

In the decision analysis method, the information requirements are linked with decision and organisational goals. This is useful for these unstructured decisions and information which tailor the decision and creation style of the user. The biggest problem in it is that the information requirements change with the promotion or the change of the user.

PROTOTYPING

The third strategy is used for determining the information requirements when the user cannot establish the information requirements rightly before the information system gets ready. The absence of the current model might be a reason which can be made the basis of requirements or the trouble in visualizing the candidate system might be the other reason.

In this case, the user needs to be anchored on real-life-system so that adjustments can be made. Therefore, iterative discovery method obtains the primary sets of the information requirements and creates a system to fulfil these requirements. The more experienced the users get in its use, the more they demand for additional requirements or rectification in the system.

In short, the information requirements are searched by system use. Prototyping is suitable in such an environment where a concrete model is constructed for determining the user's requirements where the information requirements are evolving. Which strategy should be chosen depends upon the incertainties in the determination process of the information requirements, it means the incertainties like the stability of information requirements, the capability of articulating the information requirements of the user and the analyst's ability to elicit conclusions of the requirements and evaluating their accuracy are the basis of accepting this strategy. The facts related to it, have been provided in the second chapter also.

INITIAL INVESTIGATION

Whenever a system analyst gets an opportunity of system development, he before initiating the development, studies some basic facts. This study in itself is called Initial Investigation. There are three chief queries in this initial investigation -

- Does the system deserve a change ?
- Will modification in the current system achieve the goal whatsoever ?
- Will the current system be completely changed with a new one ?

When requested for developing a system, a system analyst tries to find out the answer to the questions given above and the requester too tries to co-operate with the analyst in this context. For it, the requester provides the analyst with the complete account of his/her current system. In addition, the expected goals of the new system, the inconveniences from the current system, the time limit in which the system is to be completed, input/output account and other basic information are given to the system analyst.

This account of the requester reveals the necessity of change and the analyst is authorised for the first or primary investigation. The work starts after the system analyst grants his permission for it. When both of the sides accept the proposal, then first the project proposal is prepared which includes background investigation, fact finding and analysis and presentation of results. After this when the proposal is accepted, the system performance and the user oriented specification of the analysis of the feasibility of the new system starts. In the feasibility study, the analyst besides the best system for that specific performance, identifies and evaluate that alternative system as well. The feasibility study has been presented in chapter 7.

Identification of Problems

The system analyst spends a lot of time in identifying the principal problem at the time of system planning.

Identification of Needs

The user or the system analyst thinks of developing an alternative system only when he feels necessity of it. The user hopes for an alternative for external information requirements such as supplying the government regulations or fulfilling the request of his own management to generate more informations.

The user might be well-acquainted with the unsatisfactory performance for which they are responsible. For instance, the frequent late billing of the customers can be a matter of worry for the manager of the accounts receivable department or if there is any increament in the percentage of the delinquent accounts, it might be a point to ponder over.

Likewise the system analyst who is familiar with the operational or administrative field, can put some advice across for improvement. The system analysts maintain an interaction with those users and try to know what is the drawback in the operation. The problems are also identified through the joint discussion between the analyst and the user.

INFORMATION SERVICE REQUEST

To clarify it more, we would here consider, as an example, a general industrial systems enviornment in which the system analysis department is the part of a big information company which we'll name information services. Information services are responsible for programming co-operation and information resource management as well as communication data processing, office automation equipment and operations. We, like information service request, investigate, the formal request for information service support.

INFORMATION SERVICE REQUEST

JOB TITLE : _____

NATURE OF JOB : New ☐ Revised ☐

OBJECTIVE : _____

DATE OF REQUEST ___/___/_____ (mm/dd/yyyy)

DATE OF COMPLETION ___/___/_____ (mm/dd/yyyy)

ANTICIPATED BENEFITS	LABOUR	NON-LABOUR
REDUCED COST ☐ FASTER RESPONSE ☐ INCREASED REPORTING ☐ OTHERS (SPECIFY) _____ _____ _____	GRANTED HOURS _____ GRANTED AMT. Rs._____	GRANTED HOURS _____ GRANTED AMT. Rs._____

INPUT DESCRIPTION	OUTPUT DESCRIPTION
TITLE _____	TITLE _____
DESCRIPTION _____	DESCRIPTION _____
COMMENTS _____	COMMENTS _____

TO BE FILLED BY THE REQUESTER

REQUESTED BY : MR./MS. _____ DEPTT._____ TITLE:_____ TEL.____

APPROVED BY : MR./MS. _____ DEPTT._____ TITLE:_____ TEL.____

(FOR OFFICE USE)

FILE NO. _____ ACCEPTED ☐ REJECTED ☐

SIGNATURE _____ DEPTT._____ TITLE:_____ TEL._____

SYSTEM ANALYST MR./MS. _____

REMARKS _____

* CORRESPOND WITH US MENTIONING FILE NO.

Figure : Blank Information service request

The information service request has been displayed in Figure. Such type of document contains the following facts -

- **Job Title** – The title of the job requested by the user.
- **New or Revised** – Therein is written which sort of system– new or revised– has been discussed.
- **Requested date** – The date of request.
- **Date of Completion** – The probable date for completing the task.
- **Labour** – The authorization of the expenditure of the labour hours and the amount.
- **Objective** – A brief description of the main purpose of the task.
- **Others** – Besides labour, the authorization of the hours and amount spent on computer.
- **Anticipated benefits** – The list of principal benefits such as reduction in cost, speedy progress of the work etc. which the company will obtain from the system.
- **Output description**

  Destination – entity which will receive the outputs.

  Comments – describes the chief symptoms of the inputs.
- **To be filled in by the requester -**

  The name, department, post, telephone no. of the requester.

  The name, department, post, telephone no. of one who recommends.
- **To be filled by information services -**

  File no – Any no. which the analyst company enters for the record of the assignment.

  Accepted/Not Accepted – The mention of whether the project was accepted by the analyst company or not.

  Signature – The name, department, post and telephone no. of the authority.

  Remarks – The mention of some particular comments filled in by information services such as the reason for rejection, the demand for some more information, the introduction of the analyst etc.

Additional Information – The rear part of the form or an additional page or a particular form can be used for giving some other and important information on the part of the requester.

This is important that the information service requesters identify maximum output objectives and input sources for they establish the field or context of that information system on which the research is being carried out. Generally, to create a good and meaningful information service request the extensive participation of the user is required.

An information service request has two sorts of positive responses. The first answer is can do or' can be done'. If all the required data and other resources are available, the information service request can be accepted as a project director without editing.

It can be done with the existing system on which both the user and the system analyst have worked upon and are familiar with.

On the other hand, if the work is new, the system is larger or if many factors are strange the answer is of different type. It is known as a limited I.S.R. in comment section of the information service request and is mostly limited to the initial investigation. It helps the analyst create more decisive I.S.R. and study the problem before authorising additional expenditure for ending the study step. After this, when the initial investigation ends, a revised I.S.R. is prepared by the analyst and is investiagated by the user-sponsor.

The project told by the revised I.S.R. is direction oriented. It can be accepted without any alteration during the appraisal or it can be re-edited.

It the work is to be advanced with the appraisal report, the last IRS is prepared and when it is accepted by the user and the information service manager, this ISR works as a contract between the user and the analyst.

As it has been informed above that the limited ISR generally authorises only the initial investigation, in the following sections, we'll describe the basic elements of the initial investigation.

ACTIVITIES IN INITIAL INVESTIGATION

Several functions are used in the initial investigation -

- Initiation of Project
- Analysis of Background
- Finding the Facts

Initiation of Project

The analyst starts the initial investigation with limited I.S.R. Limited ISR has been displayed in Figure. It authorizes initial investigation for I.S.R. financial and Inventory Accounting system.

The system analyst contacts those users who can be influenced by the system in the user's own organisation and other organisations. These users are directly influenced by the activities of the analyst, therefore will be responsible for the analyst's activities.

Hence, the senior user manager, generally, sends an information memorandum to the concerned user in which the general purpose of the investigation is mentioned and so are the identity and the responsibilities of the system analyst. This memorandum starts from the managerial level and goes to all of them whom the system will affect. The Figure displays the same kind of memorandum.

INFORMATION SERVICE REQUEST			Page 1 of 2
JOB TITLE : *Initial investigation of financial cum inventory Accounting System*			
NATURE OF JOB :	New ✓	Revised	
OBJECTIVE : *To improve interal accounts, trace order and dispatch and manage inventory*			
DATE OF REQUEST	*01 / 03 / 2004* (mm/dd/yyyy)		
DATE OF COMPLETION	*30 / 12 / 2004* (mm/dd/yyyy)		
ANTICIPATED BENEFITS	**LABOUR**	**NON-LABOUR**	
REDUCED COST ✓ FASTER RESPONSE ✓ INCREASED REPORTING ✓ OTHERS (SPECIFY) *Inventory control*	GRANTED HOURS *200* GRANTED AMT. Rs. *40,000/-*	GRANTED HOURS *50* GRANTED AMT. Rs *5,000/-*	
INPUT DESCRIPTION		**OUTPUT DESCRIPTION**	
TITLE *Customer Statement* DESCRIPTION *Customer* COMMENTS *NA*		TITLE *Sales Order* DESCRIPTION *Customer* COMMENTS *NA*	
TO BE FILLED BY THE REQUESTER			
REQUESTED BY : MR./MS. *Rangaswamy* DEPTT. *Accounts* TITLE: *Manager* TEL *011-2254310*			
APPROVED BY : MR./MS. *Shweta* DEPTT. *Accounts* TITLE: *V.P.* TEL *080-22103456*			
(FOR OFFICE USE)			
FILE NO. *DL11023* ACCEPTED ✓ REJECTED			
SIGNATURE *Arun* DEPTT. TITLE *Manager* TEL *011-34103456*			
SYSTEM ANALYST MR./MS *Arun Agrawal*			
REMARKS *Limited ISR. All input & output descriptions are experimental. Mr. Arun Agrawal has been assigned as system analyst.*			

* CORRESPOND WITH US MENTIONING FILE NO.

Figure : A Computer System information service request

The work area of the initial investigation might vary. It can range from one man effort to a group effort. In the initial investigation, the system analyst doesn't focus much on the size of the system, he in every condition, has to work under the project management framework. This framework includes project file, project plan and status report chart and project cost report chart. Project file system is necessary for project management. The chief elements of project file are -

- I.S.R. obtained from the project, others and memorandum
- Plan and
- Deposited documents and papers for work.
- The memorandum and report prepared in the project should be measured according to the initial investigation and the work area and depth assignment of the project management framework. Without paying attention to the size of the project the requirement of the efficient project management is the principal basis for providing the document of the completed work and advancing the study phase.

The main activities accomplished during the initial investigation are background analysis, finding the facts, operating and presenting the results.

NOTES

Check Your Progress :

1. What reasons are behinds for planning a successful strategy.
2. What are principles for determining information requirements.
3. What functions are used in the initial investigation.

MEMORANDUM

TO: HEADS OF ALL DEPARTMENTS
CC: V.P. (Finance), V.P. (Accounts), V.P. (Sales & Marketing), V.P. (Systems)
FROM: Accounts Manager
SUBJECT: Study of an financial cum Inventory Accounting system.
DATE: July 16, 2003

I have requested that the Systems Analysis department of our Information Services Division start a study of the feasibility of developing a new financial cum inventory Accounting system. As you are aware, we are currently experiencing delays in collecting account payments because of no computer based system. Reasons include stemming from our business success, is an anticipated accelerated growth in the number of new accounts and in the daily volume of invoices. Another is the corporate plan to establish regional cost centers.

Mr. Arun Agrawal has been assigned the responsibility for conducting an initial investigation. He will be working most closely with Mr. Rangaswamy, Head of the Accounts Department. However, I have asked that Mr. agrawal visit with each Accounting Division department head preparatory to beginning his investigation in order to explain his approach to this assignment. I will appreciate your cooperation in aiding him to familiarise himself with all of the current accounting operations and documentation related to accounting system currently in use. Please inform your personnel of Mr. Arun Agrawal assignment and solicit their participation in an area which can contribute significantly to the profitability of our corporation.

Approved by:

(*Dev Prakash*) (*Jai Shree*)

Dev Prakash Jai Shree
Accounts Manager Vice President, Finance

Figure : A model of the memorandum

Their objectives are understanding the current system and preparing a logical model for a new or revised system.

BACKGROUND ANALYSIS

The analyst analyses the background related to the proposed application. Its objective is to be acquainted with the organisational environment and physical process of the new or revised system.

The analyst should know the whole structure or framework of that organisation under which the current system is operating and under which the new system will be operated.

It is also necessary that the interaction between the procedure and the organisations. Usually, the complicated work process results in an inefficient organisation. The analyst may advise for the organisational change. Therefore, the system analyst owns the following responsibilities in this regard.

- Obtaining the organisation chart.
- Obtaining or preparing the organisation work list.
- Knowing the names and responsibilities of the people shown in the organisational chart.

Since the product flow observes the movement of the material and the physical processes done over these materials, the analyst investigates them to experience these physi-

cal process well. If anybody wants to understand and implement the system, which will perform in the real work environment, this experience is important.

For example, if a company manufactures a small article like circuit in a large number and that company manufactures big devices like computers in small number, both the processes will differ markedly however a computer will be fitted with many circuits. The system for both of them will be entirely different. The first process will be repititive and component oriented while the process from the second will not be repititive and will be system oriented.

TO: R. Swamy, Head, Accounts Department

FROM: Arun Agrawal

SUBJECT: Financial cum Inventory Accounting System

DATE: July 30, 2003

I have used the manuals and procedures which you sent me to prepare a grid flowchart and an input-output analysis sheet. These reflect my understanding of the flow of documents between the customer, the shipping department and the Accounts department. A copy of my flowchart and accompanying input-output analysis sheets are attached to this memo. I would like to discuss the chart with you and will call you for an appointment in a few days. I also would appreciate it if, at the same meeting, you could provide me with answers to the following questions :

1. Do you feel delay in payments from customers ? If yes, specify the reasons please. .....
2. Are you satisfied with the information available in the customer statements ? If not, please suggest important changes. .....
3. What is usually difference between the date of sale and date of billing ? .....
4. Do you have further grievances ? If yes, please explain all that you wish.

Figure : A model of the memorandum

Having received the information of the required background the system analyst supervises the information environment in which the proposed system is to be operated. For this the analyst finds facts and analyses them and then arranges them and gives the extracts.

FACT-FINDING TECHNIQUES

The analyst obtains data from two chief sources. The first is written documents and the other is personnels who are familiar with the systems which is being studied. The analyst chooses the fact finding technique which is very appropriate in some specific circumstances. The documentation process of some systems are very good while of some others very bad.

The analyst's fact finding technique mainly contains data-collection, correspondence and questionnaires, personal interviews, observation and research. But all the techniques neither can be used at one place nor can they be effective everywhere. At some places it depends upon the circumstance, for instance at some place the questionnaires might be more effective and the interview might be of little use or might not work at all.

DATA COLLECTION

In the first phase of fact-finding the analyst gathers all the documents related to that system and arranges them on which the research is in progress. These documents include form record, report, manual, procedures and CRT display layouts. Amidst these documents some might be illegible, specially those documents which are in the electronic form. The

analyst is very careful about relying on the validity of the gathered documents. It means the analyst investigates it well whether the collected documents are valid or not. The procedures, for instance, cannot be updated and there are some people who hesitate in presenting the procedures exactly. In addition the changes brought about because of the problem can not be displayed in the system too. The system analyst should have a very keen eye on all these things. Besides, until the analyst is well-acquainted with the system and its operating personnel, the analyst should gather totally new information. This information can be obtained through correspondence questionnaire, personal interview and direct inspections.

CORRESPONDENCE AND QUESTIONNAIRES

The system analyst has a method with the help of which a system analyst can ensure that a procedure is active and is being followed. For it, he requests those people who are aware of the procedures of different activities of that specific system. The analysts can complete this task by marking the suitable portion of the manual or its procedures and sending them with explanatory letter to responsible people.

The analyst can clarify the purpose of investigational activities through correspondence and inform the people and can convey through it his expectations from them. It is of specific importance that the correspondence be done before the interview and the subject and the special topics be mentionedin it.

The questionnaire is an important and effective means of correspondence. For instance, it is the only successful means of getting answers from people in a large number especially when they are not at one place but far away. The questionnaire should be brief. It increases the possibility and swiftness of answers.

The questionnaire is used for obtaining answers to specific questions from people. But for the possibility of wrong answers to the questions in the questionnaire personal interviews can be arranged as per the necessity. In figure 4.5 you can see the same sort of question based letter.

PERSONAL INTERVIEW

Personal interview is one of the most successful method of obtaining information. In the interview interaction is held between two people. This process takes place between two people– the interviewer and the interviewee. The interviewer is one who asks questions, it means who interviews and the interviewee is one who answers the questions means who is interviewed. The interviewer is generally the system analyst. In this course, the system analyst who is the interviewer, should consider himself more a information seeker than the information provider. Though the purpose of an interview, in the eye of an analyst, is to present the project before the interviewee and establish his trust, but its primary purpose is to obtain information from the interviewee. Therefore a system analyst should try his utmost to be a good listener. Interviews are crucial, for people are the most important part of a system. The success or failure of the system depends upon the acceptance or refusal of those people who'd be affected by the system.

The personnel ensure the validity and feasibility of the system. Given below are some directives related to the interviews :

- Conduct the interview carefully.
- To retain the relevance of the interview, conduct it in a planned manner. But when querrying the interviewee, never impose any of your plans or complicated rules on him.
- Don't argue with the interviewee nor do you try to show your knowledge before him.

- Select the time and place wisely. The place should be free of all the obstacles as well as should be peaceful. Punctuality is a must.
- Know the name and the post of the person you are interviewing.
- Be courteous to the interviewee.
- Don't use any sort of tape recorder or video camera.

Some more information related to it is presented in the chapter 5.

OBSERVATION

During the fact-finding activities like data-collection, interview, an experienced analyst observes the function of a running system and prepares questions on the basis of that observation and draws conclusion on the source basis. A skilled analyst invites his power of observation and remembers it. After observing the whole process the system analyst is capable of establishing relation between the work flow and the data flow and identifying the irregularities.

Observation is a continuous process. It is generally informal. But there are some formal techniques for it which the system analyst uses as per his convenience. The system analyst can perform the work of observation at a pre-set time or all of a sudden. The system analyst can do the statistical analysis. One of the efficient observation methods which is in the form of the means of communication, is to prepare data-flow diagrams. For example the data flow diagram can identify the wrong process of the customer billing. This may bring the analyst to this conclusion that wrong billing process may be a possible reason for the delay of account collections. The detailed information related to it has been given in chapter 5.

RESEARCH

Research is the last and decisive method of fact-finding. Research is important when the new application is being considered. Research is a medium of motivation for generating creative problem solving methods. All the fact-finding methods which we have mentioned so far are all in-house research.

But, many of the information resources are external. These include commercial and business publications such as Journals for systems management, Data management publish the experiences of skilled analysts on different aspects of system development and provide important suggestions too.

There are some organisations of this sort in India also. For instance, such experiences are brought out in the bulletins of National Informatics Centre and many other computer magazines. Many products of the companies which the companies generally advertise, acquaint the system analysts with hardware, software and other pieces of information for his own works.

The government publications are generaly relevant specially as the means of obtaining back-ground information. Likewise libraries are a great treasure of such information where the concerned literature can be had in large number, with the help of the index.

But the principal problem regarding this literaure is that by the time these are brought out, most of the information has lost its relevance. Two sources much in vogue for this are vendors and personal contact. The sellers, such as I.B.M. Corporation or the Microsoft Company found that if they give application co-operation to their customers, they can enhance the influence of their products, besides, the market of their products will grow. The analyst who can differentiate between the basic requirements of the system and the probable extreme excitement of the seller, can use this big source of research. Similarly,

Check Your Progress :

4. What do you understand by fact finging techniques.
5. Define question aires.
6. What operations are perform in observation.
7. Define research.

NOTES

the industries and the application based publication frequently publish monthly report and especial report. Many of the computer magazines like DataQuest, Times etc. keep on publishing something or the other on this subject, the uses of which can be useful in this connection.

The analysts should mainatain a relationship with the system analysts of the other companies with whom they may exchange advice when needed. To establish such relationships, there are several such organisations from which you can obtain a membership and can make your research more useful by participating in the seminars, workshops, meetings etc. as well. Today, for a system analyst, Internet is a blessing for research. Hundreds of such articles are there on the Internet and many world-level magazines are available on it, obtaining whose membership you can be continuously benefitted.

Answer of the Check Your Progress

1. The chief reasons behind it are the following–
   - High Interest rate
   - Inflation
   - Lack of resources
   - Regulatory Constraints
   - Competition
2. There are three principal strategies to bring the information regarding a user's requirements into light asking, obtaining information from the existing information system and prototyping.
3. Several functions are used in the initial investigation -
   - Initiation of Project
   - Analysis of Background
   - Finding the Facts
4. The analyst's fact finding technique mainly contains data-collection, correspondence and questionnaires, personal interviews, observation and research. But all the techniques neither can be used at one place nor can they be effective every-where
5. it is the only successful means of getting answers from people in a large number especially when they are not at one place but far away. The questionnaire should be brief. It increases the possibility and swiftness of answers.
6. During the fact-finding activities like data-collection, interview, an experienced analyst observes the function of a running system and prepares questions on the basis of that observation and draws conclusion on the source basis. A skilled analyst invites his power of observation and remembers it.
7. Research is the last and decisive method of fact-finding. Research is important when the new application is being considered. Research is a medium of motivation for generating creative problem solving methods. All the fact-finding methods which we have mentioned so far are all in-house research.

EXERCISE

1. Explain meaning of system planning.
2. Why system planning is required?
3. Write a note on strategic MIS planning.
4. Explain Managerial and Operational MIS Planning.
5. Why defining user's requirements is a difficult task?
6. Write a note on Strategies For Determining Information Requirements.
7. Define activities of initial investigation.
8. Explain fact finding techinques.
9. Write down a note on personal interview.
10. Explain the concept of observation.

10 Structured Analysis and Feasibility Study

The Chapter Covers :

- Introduction
- What is Structured Analysis ?
- Why Structured Analysis ?
- Charts
- Data Flow Diagram
- Guidelines for Drawing Data Flow Diagrams
- Logical and Physical Data Flow Diagrams
- Data Dictionary
- Data Dictionary Definition and Entries
- Decision Trees
- Structured English
- Why Feasibility Study ?
- Steps In Feasibility Study
- Preparing Detailed Description of Candidates
- Identifying Meaningful System Characteristics
- Determining Performance and Cost for Each Candidate
- Weighing the System Performance and Cost Characteristics

INTRODUCTION

In the last chapter you have read about system development life cycle, the definitions of a system analyst and his ability, the strategies to be applied in system analysis and design and different fact-finding techniques.

In this chapter, you will read about different tools of structured analysis, for example, the charting techniques, data flow diagram, data dictionary, decision tables etc.

In the last chapters, we came to know about the initial investigation. Upto the phase of initial investigation we have known about the basic things of system, for instance, up to this phase we determine the minimum requirements of the user and get acquainted with the main problem. Upto this step, the analyst is able to prepare the project directive after the investigation of the purposes of system development, the

hindrance in it and the required output, with the help of the user and get acceptance from him. After it, the function of the new system has to be defined for which feasibility study is carried out. On the basis of this study we select the most appropriate system according to the requirements of the probable task. This chapter will deal with the information related to feasibility study.

WHAT IS STRUCTURED ANALYSIS ?

Structured Analysis is a set of techniques and graphics tools with the help of which a system analyst can prepare a new type of system specifications which the user can comprehend easily. There are many tools of structured analysis, of which the principally used are the following :

- Charting Techniques
- Data Dictionary
- Structured English
- Data Flow Diagram
- Decision Tree

WHY STRUCTURED ANALYSIS ?

In the last chapters we have studied the procedure of making a computer based system and the contribution of a system analyst in system development life cycle. The main objective of system development is to provide a user with a system as per the need of the user.

The analysis is the centre of this type. It is the main part of the first step of system development life cycle. In the first step we are focussed on problem definition and initial investigation where the analysis helps us understand the system well.

In the second step instead of feasibility study we find out the probable solution of the system by the exhaustive study of the system. The input obtained from it is system specification, which starts the system design. During the analysis of the current system, the analyst collects unstructured data by interviews, questionnaire, on-site observation, procedure manual etc. According to the traditional method, the analyst organises and changes with the help of flow-chart which is helpful in communicating the system development and user.

But the system flowchart displays the physical system instead of logical system owing to which it gets difficult to identify what is happening and how in the system.

The traditional method has following problems :

- System life cycle provides very little quality control through which errorless communication may take place between the user and the analyst.
- The analyst very soon gets restless with the technical description of the system. The information gathering takes a long time. There is no tool to control and collect the description which is required and which should be available.
- Following are the limits of present analytical tools -
  (a) The system description given in English is so confusing that it gets difficult for a user to know how the system parts can be arranged.
  (b) System and program flowchart before understanding logical necessities, display physical implementation.

- There are some problems related to system specifications which are as follows:
  (a) The revision of system specification is difficult. The change in one requirement of the user affects many parts of the system.
  (b) System specification expresses the user's requirement in the form of hardware which instead of what the user wants the system to do, will implement the system.
  (c) If the user has to know about a part of the system he will have to look for the whole document.

Owing to the above mentioned drawbacks, the analyst requires a few things according to the blue-print from where he can start system design. In this process, instead of physical implementation, the function is needed to be stressed. The process is called structured analysis process for which the necessary tools are written in the last chapter.

CHARTS

A chart is a pictorial expression of relationship and movement. It is also used in information communication, comparative work, giving importance to some facts and guessing in some particular circumstances. A chart by relating the items of information, shows comparison in their midst on an index or scale. A chart picturises an important change or pattern and lays stress on this change. A chart presents the past facts and can complete the work of anticipating the future time. Therefore a chart can be used in above said works for the sake of analysis. Charts are mainly of three types; bar-chart, line chart and pie chart. Several of these charts are used to show relation and motion, but a few of them are more useful in showing relation while some other are more appropriate for picturising motion. For example, bar charts and pie charts are more useful in displaying relation, while the line charts are more capable in showing motion.

BAR CHARTS

Bar charts are more useful than other charts in showing relation amidst elements. For this reason and since it can be comprehended in different orders, bar charts are used in displaying management. When the bar is separated, the charts display relation. When they are put together it forms a sign of motion pattern. In figure the bar chart has been shown laying stress on relation and motion. Separate bars can be shaded to increase their visual effect.

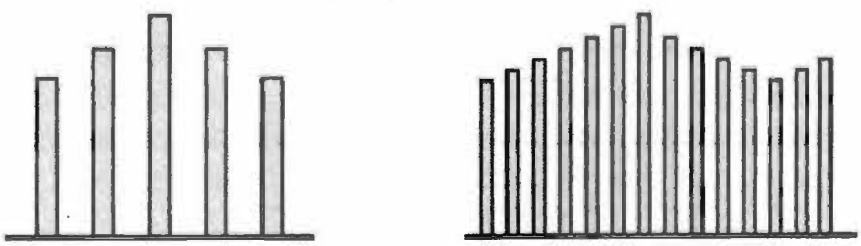


Figure : Bar chart showing relation (left) showing motion (right)

Line Chart

Line chart is the commonest example of chart. Line charts are generally called graphs because these are generally formed by linking the plotted dots. Line chart

can show the speed in a way better than any other chart. It can show trends, curves or any other relation where the rate of change is important. To compare the trends two or more lines are used.

If more than one lines are displayed in the line chart then different types of lines- solid, broken, dotted, can be used to show the disparity, but it is not good to use too many lines in it. If three or four lines are given in the chart, the plots can cover some parts and make the message of the chart vague. There can be several lines on one chart but they should not overlap the other segment. Because of overlapping the other segments of the lines, the chart can confuse the user. The figure displays the example of a line chart.

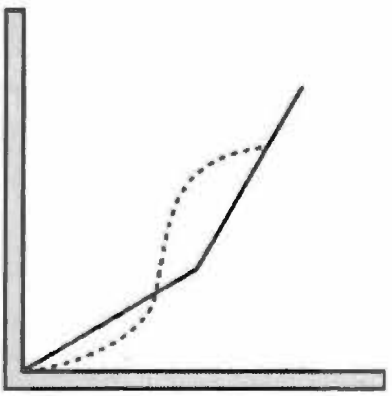


Figure : The example of line chart

Pie Charts

A pie chart is very good at showing ratios in percentage. In the figure, a pie chart has been displayed, in which the chart has been divided into four parts, it means each part amounts to 25%. By presenting a data in two pie-charts one can compare two different data sets. For instance, as per the consensus of 1981-1990 the population of the people of four main religions in India; Hinduism, Islam, Sikhism, Christianity is 83, 13, 3 and 1 respectively, while the data as per the consensus of 1991-2000 are 83, 12.75, 2.25 and 1. It has been shown in figure.

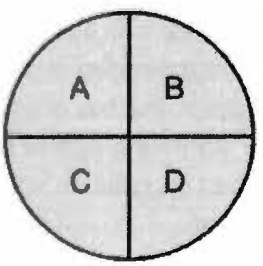


Figure : A piechart which has four equal portions and each is of 25% value.

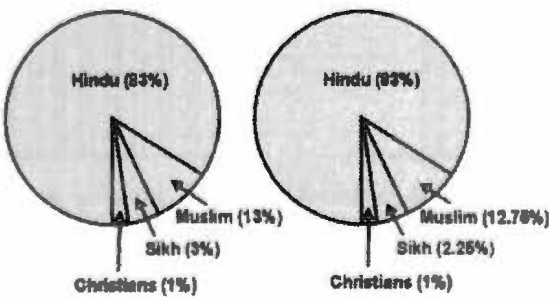


Figure : Two pie charts presenting their comparative facts of the consensus of two decades.

- This record is not reliable. Its only objective is to explain the pie chart.

BETTER PERCEPTION : DEVELOPMENT OF EFFECTIVE CHARTS

Six steps are used in developing an effective chart -

- √ Decide the message for the chart.
- √ Select the most appropriate chart to convey the message.
- √ Create the initial layout of the chart.
- √ The layout of the chart should be of such type that it lays more emphasis on the message.
- √ Revise the chart and remove all the unnecessary words and delusive descriptions.
- √ Give the final touch to the chart.

With the help of the step-wise instructions given above, you would be able to draw a good chart. The most important thing while drawing your chart should be that your chart does not mislead the viewers and is based on facts.

DATA FLOW DIAGRAM

Data flow diagram is an important tool of structured analysis which was evolved by Larry Constantine. Data flow diagram is a complete network which describes the data flow in the whole system, Data stores and mentions those processes which changes the flow of data. DFD is a formal and logical extract of network system which contains many possible physical configurations. It is why the use of a set of symbols which doesn't indicate the physical forms denotes data source, data flow, data transformation etc. Practically, the manual set of symbols for data-flow diagram has not yet been contained. Here you will use four symbols in data flow diagram which has been displayed in figure.

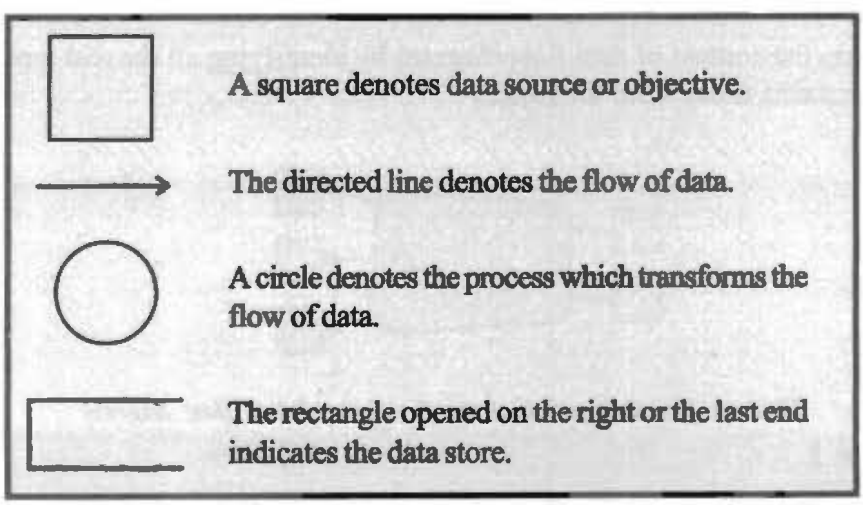


Figure : The symbols of data flow diagram.

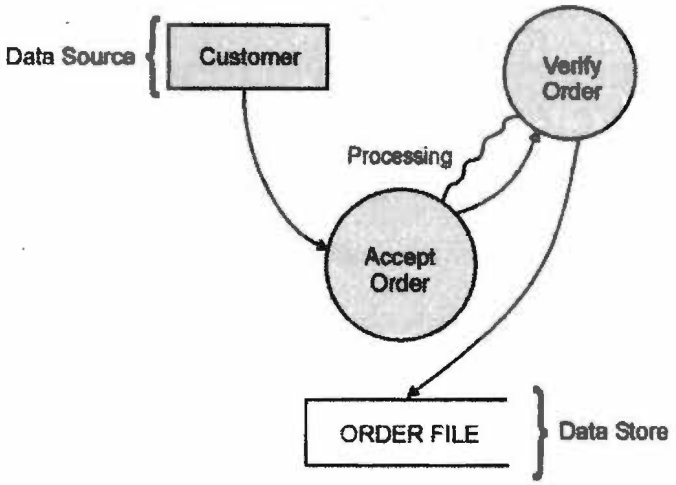


Figure : A model of data flow diagram

Likewise, the circle in figure denotes the transformation process and the label inside the circle describes the process by using action words in English. Data flows are directed lines which identify the input data flow and output data flow on every process circle. The data store is denoted by the rectangle which is labelled and open on the last end which identifies the data store or file. The label marked on the square is an external entity which is the source or objective of the data flow.

It has been displayed in Figure 6.5, how the current logical system can be obtained by preparing data flow diagram in the phase of study, which is a logical extract or model of the current physical system. Later, one more DFD will be evolved while developing the logical model of the new system. After that, the alternative physical system which satisfies the logical requirements of the new system, will be evaluated for selecting the cheaper and practical requirements of the physical system.

GUIDELINES FOR DRAWING DATA FLOW DIAGRAMS

A data flow diagram, as it appears from the previous study, is complicated. Therefore, following some guidelines while drawing it, makes its formation easier. There are seven general rules for it which can be helpful for a system analyst at several steps. These rules are as follows :

⇨ **Rule 1**

Set up the context of data flow diagram by identifying all the real input and output data flows. (See the figure)

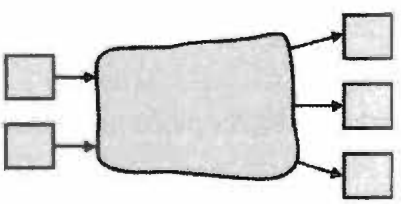


Figure : The delineation of the first rule of data flow diagram

⇨ **Rule 2**

Select the initial point for drawing a data flow diagram in the order of– from input to output and output to input and from centre to out. (See figure)

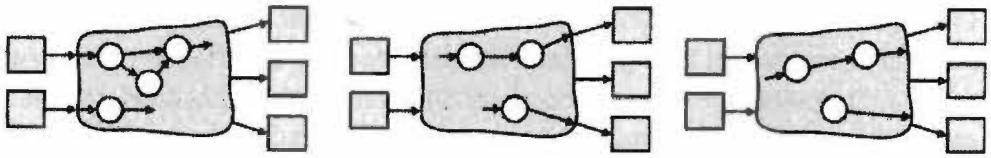


Figure : Delineation of the second rule of data flow diagram

⇨ **Rule 3**

Impart meaningful labels to all data flow lines. (See the figure)

Figure : The delineation of the third rule of data flow diagram

⇨ **Rule 4**

Write verbs on all the processes which relates the input and output data flow. (See figure)

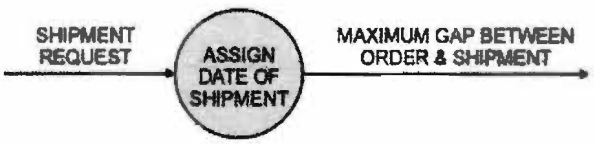


Figure : The delineation of fourth rule of data flow diagram

⇨ **Rule 5**

Delete the useless functions in the programming process. (See figure)

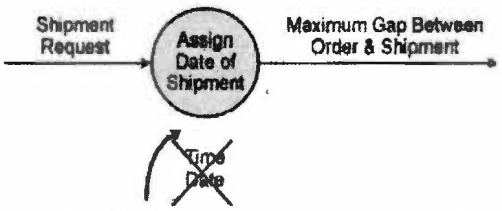


Figure : Dilineating the fifth rule of data flow diagram

⇨ **Rule 6**

Do not include control or information related to control flow. (See figure)

Figure : Delineating the sixth rule of data flow diagram

⇨ **Rule 7**

Do not pour too much information in a single data flow diagram.

LOGICAL AND PHYSICAL DATA FLOW DIAGRAMS

You can classify data flow diagrams in two categories. They are logical or physical. A logical data from diagram mainly focuses on the business the way it is operated.

It is not concerned with how the system will be constructed. Instead, It describes the business events that take place and the data required and that take place and the data required and produced by each event. Conversely, a physical data flow diagram shows how the system will be implemented including the hardware, software, files and people involved in the system. The table shows a comparison between logical and physical models. Notice that the logical model reflects the business, whereas the physical model depicts the system.

Design Feature	Logical	Physical
What the model depicts	How the business operates	How the system will be implemented (or how the current system operates)
What the processes	Business activities manual procedures	Programs, program modules and represent
What the data stores represent	Collections of data regardless of how the data are stored	Physical files and databases, manual files
Types of data stores	Show data stores representing permanent data collections	Master files, transaction files. Any processes that operate at two different times must be connected by a date store.
System controls	Show business controls	Show controls for validating input data, for obtaining a record (record found status), for ensuring (succesful completion of a process, and for system security (example : Journal records)

Table : A comparison between logical and physical DFD

Ideally, systems are developed by analysing the current system (the current logical DFD) and then adding features that the new system should include (the proposed logical DFD). Finally, the best methods for implementing the new system should be developed (the physical DFD). This progression is shown in Figure.

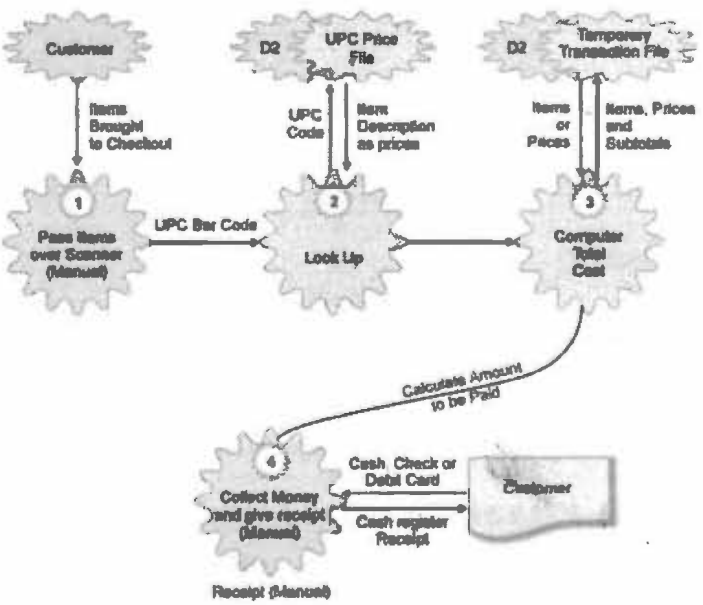


Figure : Physical Data Flow Diagram

Developing a logical data flow diagram for the current system affords a clear understanding of how the current system affords a clear understanding of how the current system operates and thus a good starting point for developing the logical model of the current system. This time-consuming step is often omitted so as to go straight to the proposed logical DFD. An example of one type of logical model is the navigation charts created for websites when using Microsoft FrontPage..

One argument in favour of taking the time to construct the logical data flow diagram of the new system. Processes that will be unnecessary in the new system may be dropped, and new features, activities, output, input and stored data may be added. This approach provides a means of ensuring that the essential features of the old system are retained in the new system. In addition, using the logical model for the current system as a basis for the proposed system provides for a gradual transition to the design of the new system. After the logical model for the new system has been developed, it may be used to create a physical data flow diagram for the new system.

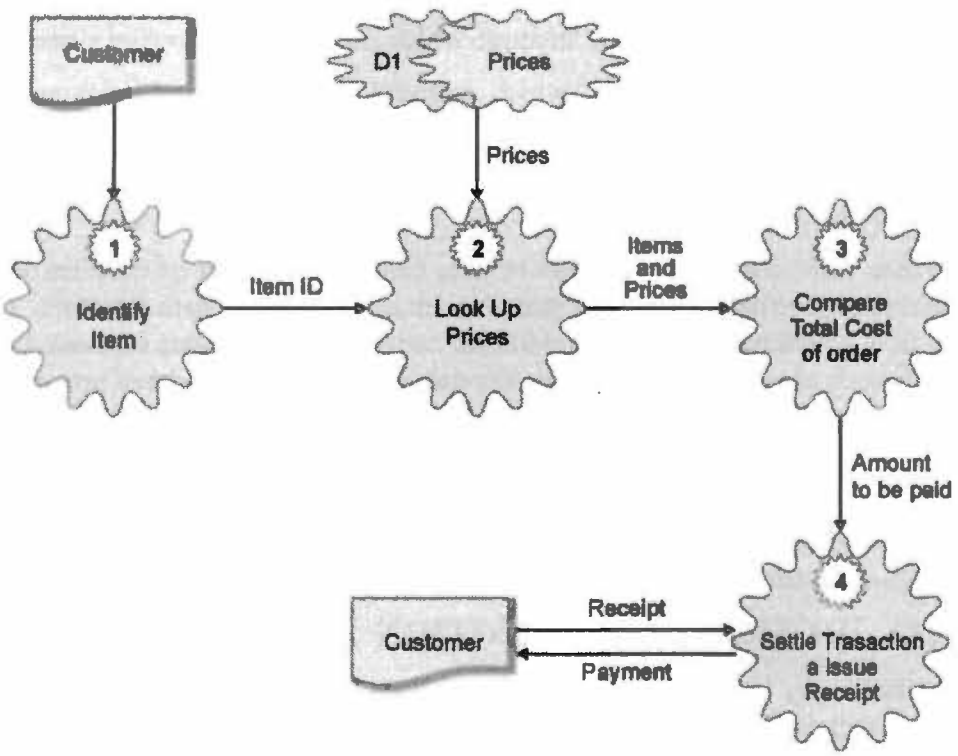


Figure : Logical Data Flow Diagram

Figure show a logical data flow diagram and a physical data flow diagram respectively for a grocery store cashier. The customer brings the ITEMS to the register; PRICES for all ITEMS are LOOKED UP and then totaled; next PAYMENT is given to the cashier; finally, the CUSTOMER is given a RECEIPT. The logical data flow diagram illustrates the processes involved without going into detail about the physical implementation of activities. The physical data flow diagram shows that a bar code- the universal product code (UPC) BAR CODE found on most grocery store items - is used. In addition, the physical data flow digram mentions manual processes such as scanning, explains that a temporary file is used to keep a subtotal of items, and indicates that the PAYMENT, could be made by CASH, CHECK or

Check Your Progress :

1. What is structured analysis ?
2. Define charts and name the types of charts.
3. What do you understand by line chart.
4. What is logical DFD ?

NOTES

DEBIT CARD. Finally, it refers to the receipt by its name CASH REGISTER RECEIPT.

DATA DICTIONARY

Data Elements and Data Structures

Most of the activities of the system analyst relate to data for analysing the problem and designing the system. An analyst must know about all the data which the system generates and uses. In addition, a system analyst implements new system data which are worth using and includes other data required for the system.

Before starting to design a new system all the data elements used by the system and the relations amidst them should be defined as well as clarified. A data element is the smallest unit of data which is meaningful for that system, in which it is used. There are structured relation between data elements. These relations which are called data structure are the characteristics of data streams and data stores which the data flow diagram brings out.

Data structures are made of data elements and other data structures. For instance "Name-PhoneNo" can be a data structure which contains the following elements -

- Data structure "Name" which includes the Lastname, Firstname and Middlename.
- And, Date structure "PhoneNo." which includes data elements - ISD code, S.T.D. code and Phone No.

The data flow, during the analysis of data flow diagram can be considered as dynamic data structure and data store can be taken as static data structure. The data flow which cannot be divided further can be considered data element. Data store is such place in a system where the data is stored in the midst of processing transactions. These include File and database.

To be clear, one data flow diagram will be for a very limited use if we are unable to define all those data which appear to be on it. The requirement of a well-linked and practical documentation of the data flow diagram can be fulfilled by maintaining the data-dictionary.

DATA DICTIONARY DEFINITION AND ENTRIES

Data dictionary is a central store which defines all the data structures inside a system, such as data element, data flow and data store and describes them. There are at least five following points in a data dictionary entry -

- Name of data structure
- Identification of the data structure as a data flow, a data store or a data element.
- Other names by which the data structure is called.
- Definition of the content of the data structure.
- Significant comments

The definition of each data dictionary entry must be complete, terse and correct.

Decision table is a tabled technique of describing the logical rules. Most people want to be attached to the decision table with the logic of computer program. But,

decision tables are specific tools for system analysts because they are effective source for expressing the logic of administrative rules and procedures. The basic format of decision table has been shown in Figure. The table has four parts:

- **Condition Stub** – enlists all the conditions which are thought over.
- **Condition Entries** – describes the rules to be followed.
- **Action Entries** – indicates those actions which are to be performed.
- **Action Stub** – identifies the action which is to be followed.

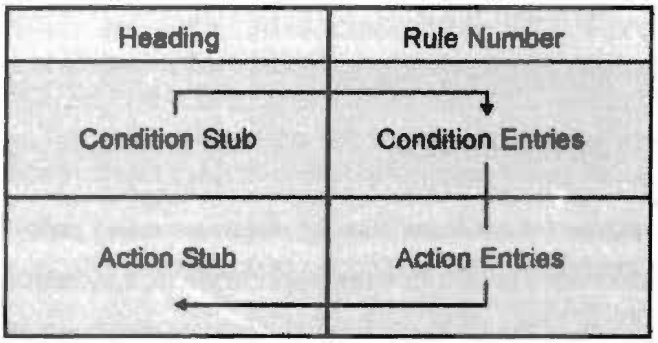


Figure : The basic format of decision table

The decision table is read in the direction marked by a thick arrow. The condition stub is read as "if" statement while the action stub is read as "then" statement. These statements are attached with a rule which is the co-ordination of the condition entry and is usually indicated by Y (yes) or N (no) and the indicated action is directed by X.

Here, we'll take an example, which will show how the decision table can be summarised and displayed. The following example is based on the cheque encashment policy in a supermarket.

- If a customer has a valid store identification card, his cheque will be encashed for the purchase of more them one thousand rupees. If the customer has no valid Credit card but shows two other sorts of identification card, his cheque can be encashed for the purchase up to five hundred rupees, otherwise the store manager can authorise the acceptance of the cheque.

The decision table related to cheque encashing policy has been shown in the Figure. A common rule in it as follows : "If the customer has a valid credit card, and the purchasing is not more than 500 rupees and the customer has two identifications, then the cheque of the purchasing amount be accepted.

Mind that Y and N has not been given in all the boxes of the condition entry section. It is necessary to avoid worthlessness. In the rule-4, for example, the purchasing amount is more than 500 rupees and the customer has no valid card, then the store policy will not accept his cheque till the store manager authorises it. Therefore, it is not necessary that Y and N condition stub be written before "two other identifications".

Usually, the system analyst uses the decision table in making the programmer circulate the implied system logic in the policy and procedure. When such logics are provided to the programmers then they are capable of developing the extensive program logic in a more effective manner. A decision table, after this, is such a technique which is instrumental in eleminating a big ptifall which has earlier hindered the effort of developing an efficient computer based business system.

Cheque Cashing Policy		1	2	3	4
	Valid Store Identification Card	Y	N	N	N
	Purchase => 500		N	N	Y
	Two other identifications		Y	N	
	Purchas > 1000	X			
	Allow purchase amount		X		
	Call store manager			X	X

Figure : the decision table of cheque encashing policy

In short, a decision table is of following importance to, a system analyst -

- The structure of the table is a brief and correct statement of decision logic.
- A table is an effective means of communication with the computer programmer because it is easily understandable.

These examples are the examples of the use of a table. We have just looked at some tables and further will see many more. Here we should keep in mind about the tables that they are a strong tool for data collection, analysis and the report of relations amidst data.

Decision Trees

A decision tree is a chart like a network which is similar to a decision table. Just like a decision table, it, while displaying all the actions, describes the logical rules which is the result of different combinations of conditions.

The picture shows how the combinations of conditions are conducted by making network branches. This special picture is a logical alternative of the decision table shown in previous figure.

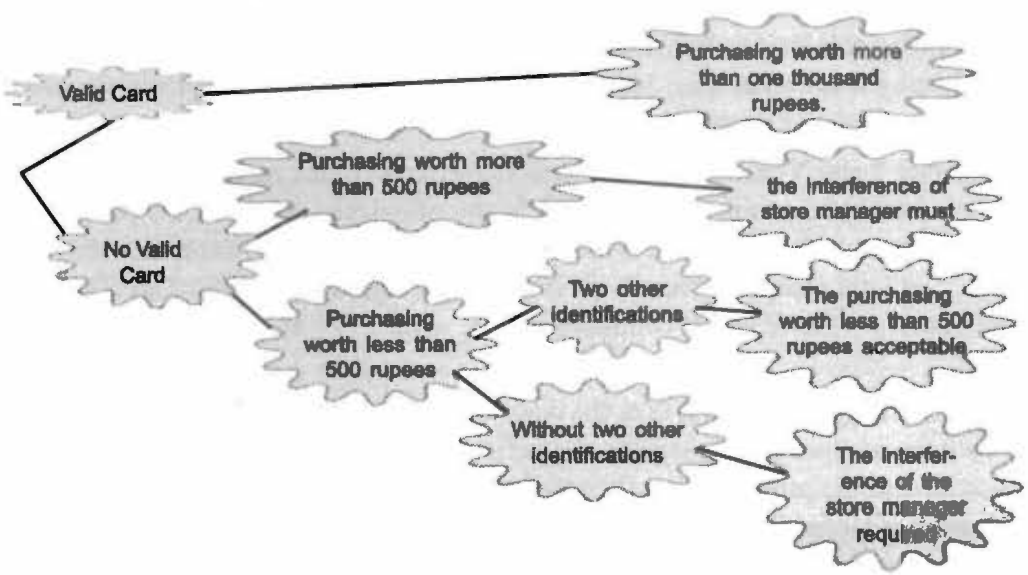


Figure : Decision tree (based on the example of decision table shown in figure)

Decision tree is less well-linked than decision table and in some cases is less accurate to present the complicated branching relations. But a decision tree provides an easily understandable picture which can be read to show how the small and big logical portions go together. Just like decision tables, a decision tree can denote the logical form of both the system and the computer program.

SPRAIN YOUR BRAIN

Programming is about to begin on a system designed to aid a retail firm in sales and inventory management. The system will be online, using data communication methods over leased telephone lines. The project manager has identified the following steps in the development of software and the most likely development times. They are listed in the expected order of starting.

Overall control modules	2 weeks
Sales portion of system	
Input module	1 week
Edit module	3 weeks
Reporting module	2 weeks
File development	2 weeks
Software testing	2 weeks
Inventory portion of system	
Input module	2 weeks
Edit module	6 weeks
Reporting module	4 weeks
Inventory reorder module	2 weeks
Physical inventory module	1 week
Software testing	3 weeks
Systems testing	2 weeks

Data communication lines must be ordered at least six weeks before they are needed. They will be required to perform system testing. All equipment needed to develop and operate the system is already on-site.

a. Develop a bar chart for the project. Use week numbers (1, 2, 3,.....) to show calendar periods.

b. Develop a PERT chart for the system, using the time estimates provided above. The development of the two portions of the system can occur simultaneously. Data communication lines can be installed independently of programming activities. Show the earliest and latest time estimates for each activity.

c. Examine the PERT chart to determine where there is slack time.

d. Are there any dummy activities in this development effort? If so, identify them and indicate why they are dummy activities.

STRUCTURED ENGLISH

Structured English is used during the analysis stage of a project to identify business processes eg **If hours greater than 40 pay fixed rate plus actual – 40 times**

rate. It is described in class as 'in English but with half the words missed out'. Its cousin pseudo code is performed closer to actually writing the program and is written in a form that can be easily converted into programming statements. Pseudo code enables the programmer to concentrate on the algorithm, without worrying about the peculiarities of the programming language. Figure makes an illustration of user's language to programming.

```
If valid store identification card
    THEN
        allow purchase more than 1000
    ELSE
        If purchase more than 500
    THEN
        Call store manager
    ELSE
        If two other identifications
    THEN
        Allow amount of purchase upto 500
    ELSE
        Call store manager
```

Figure : A model of structured english

In decision tables, structured English is also used, which is a method of displaying logical process in outline format. The structure of structured English results in the form of accepted structured design defined terminology. It describes the logical processes which the computer can accomplish and it also expresses the method in which the logic can be expressed. Structured English has been given in Figure which is equal to the decision tree in Figure 6.9. Though Structured English, in this example describes systems level logic, this pseudo language technique is used to explain the logic of computer program. These logics are in pseudocode, since it is a pseudo programming language. The pseudocode is used as an alternative to the computer program flow chart.

WHY FEASIBILITY STUDY ?

In feasibility study the work of an analyst is to identify a new system, describe it and evaluate it and after it select the most appropriate system for the expected work. Its principal purpose is to find out any sort of opportunity to solve the problem. During this study, the definition of the problem is given a definite form and all aspects of the problem implied in the system are ensured. In addition, an exact estimation of the size, cost/benefit of the system is done. After the feasibility study, feasibility report is prepared. In which the nature and time of the probable solution is described.

STEPS IN FEASIBILITY STUDY

The most important and difficult part of a feasibility study is to identify the new system and to evaluate its performance and cost. This process is a high-level creative task which requires imagination and experience.

This task demands a procedure. It has the following important steps which will be discussed further in detail.

- Forming the system team
- Reviewing the system data flow diagrams
- Developing the system candidates
- Evaluating preliminary evaluation of candidates
- Preparing detailed description of candidates
- Identifying meaningful system characteristics
- Determining performance and cost for each candidate
- Weighing the system performance and cost characteristics

Forming the System Team

From the time of initial investigation, the analyst keeps working with the representatives of the user-organisation. Upto this phase, this user representative has given a lot of information about user requirements for the current system and the new and revised system. In the first phase of feasibility study a system team is prepared bringing other trained and experienced participants together. This team includes one or two persons from management and one or two technical experts who have a very good knowledge of data-processing.

The team should contain dedicated and interested people who can represent their concerning tasks well and help understand the system problems and look for the ways of solutions. The input obtained from the team members and their reactions shown on the inputs received from others help an analyst understand what sorts of things they consider important in a function. Usually, this fact-finding is the only medium to clarify the whole picture before the analyst. Besides the team members can provide better suggestions to consider its feasibility.

The second benefit of the system team is, we while making the plan, associate the user and the management with the system making them equally important partners. Thus the work of system development becomes the benefit of the whole organisation instead of personal benefit. As a result, in every phase of system development the user and the management very happily extend their contribution.

Reviewing the System Data Flow Diagrams

The second step of feasibility study is to appraise data flow diagram which were prepared during system performance definition activities. During the definition of the system we turned the "what" of system into "why" of system it means from the logical description of the system we come to its physical description. The system analyst, with the data flow diagram, is able to focus on the sketches of several outputs, system input, output and the data change of the new system. But some analysts in additon to data flow diagram help in visualising the physical characteristics of the information oriented and process oriented flow charts.

Developing the System Candidates

The third step of feasibility study is to develop the candidate physical system which can present the output selected in data flow program. In this phase the hardware

devices are considered. It is determined whether the hardware devices have the capacity to complete the system functions like input, processing, storing and output.

In this phase also, the system team is important for a system analyst. The job of a system team is to do something extraordinary while examining the hardware co-ordination for each of the four basic functions. If some team members don't know anything about some above mentioned devices, the other members of the team who have such knowledge give the presentation of the team.

Evaluating Preliminary Evaluation of Candidates

Generally, there are a lot of members in the team who should be extensively evaluated. Therefore the fourth step of feasibility study is to do the initial evaluation of the system candidates. Its objective is to reduce the number of system candidates so that they can be arranged well.

In developing the system candidates one, without any evaluation, has to brainstorm as many candidates as possible. In the initial evaluation, if a system is not practical on cost basis, it is discarded. The candidate systems which require such technologies that is not available in the company or does not fit in the corporate philosophy itself, is also discarded.

The scrutiny goes on until the number of candidates is very little or in such a number which is easily manageable. The original number of candidates which is to be evaluated depends upon the time and resources available with the company. The systems which have to go through extensive evaluation are put into the candidate system matrix.

PREPARING DETAILED DESCRIPTION OF CANDIDATES

The fifth step in feasibility study is to prepare a detailed description of the system. This detailed description must include flowcharts and narratives, specific constraints, identified inputs, processing requirements and storing requirements.

IDENTIFYING MEANINGFUL SYSTEM CHARACTERISTICS

In this phase of feasibility study one selects criteria for the evaluation of the candidate system on the basis of their performance characteristics and cost. The performance standard contains accuracy, control ability, flexibility, growth potential, response time, storage requirements and usability. These characteristics are described as quality and in any of the function such evaluation is done to measure the relative performance of the candidate system. For such evaluation, some experts use good, very good, best, bad, worst etc. These measures depend upon the collective decision of the system team.

The system cost includes the cost on developing and running the system after its implementation. The cost factors, which are important in system evaluation, consist of equipments, facilities and the training expenditures.

The system cost gets far more important when additional devices such as computer etc. are to be purchased or the devices already available are to be remodelled or updated. The cost of devices which are already available would not be considered in the evaluation of the system if their costs remain the same in both the cases (whether the system is accepted or rejected). Facility costs show the expenditures created because of construction of additional room or building or the change in the

existing facilities. The aditional air-conditioners for computer installation, flooring for laying the cable, the installation of security devices are its examples. Training costs are not collected till they can be easily noticed. These costs are noticed when the staff of the company are sent somewhere out for training or the in-house training expenditures can be included into such costs. But the general training in the work cannot be easily separated from the work hours and hence difficult to calculate. In short, training cost stands for the cost which take place on the training of the staff.

Determining Performance and Cost for Each Candidate

The next step in feasibility study is to prepare entries for candidate evaluation matrix. Though performance ratings are subjective the analyst should be very fair in the appraisal or price-determination and should use similar unit of measurement for every candidate.

The accuracy of the candidate doesn't denote the accuracy of the device but it stands for the accuracy of the system. One computer, possibly cannot be more accurate than the other computer (it means both will be the same provided the computers have no differences.). However if a computer used by one system performs on the other system the accuracy might vary. Therefore accuracy is related to those terms which are used to enter source data in the system and more that are used to keep the data faultless. No system is free from faulty data. Control capability is related to the safety of the system. Control capability keeps the system safe from human mistakes, forgery, and illegal manipulation of data. Flexibility stands for co-ordination with the system such as making revised or new outputs. Growth potential is a measure that to what extent the system can achieve growth inside it without any large modification or the revision in any of its part (computer).

Such alterations are generally expensive. A system should be capable of being expanded without any modification for a few years. The faith of the analyst that the system can generate the desired output round after round is reliability rating. In reliability rating all such weak points should be brought to light which are being used by the system or by any of its devices and can obstruct the operation of the system. The time consumed between entering the data by the user and the display of the computer output is called the response time of the system. Batch processing includes the time consumed in the activities of data collection in the system and the time consumed in distributing and processing the output.

In the case of the display terminal used in an online business system, the time consumed in entering, demanding and seeing the data on the terminal is called response time. Storage requirements stand for the main storage of the computer based system. Usability is one of the most important criteria. Usability is the evaluation of the meaningfulness of the criteria system by those people who have to run it. It is seen to how simple and user-friendly the system is. This is the last criteria of the acceptance of the system.

WEIGHING THE SYSTEM PERFORMANCE AND COST CHARACTERISTICS

In some cases the stored performance and cost data will present a candidate as an obvious selection. In this phase the feasibility study comes to an end. But at times, it is very difficult to find the most suitable candidate even to this stage. The eighth

step of feasibility study is to prepare weighted candidate evaluation matrix. This matrix candidate considers the evaluation entries on the basis of their importance and then implements a rating number. The rating number is a process of counting the total score of the candidate.

Candidates → / Evaluation criteria ↓	Candidate-1		Candidate-2		Candidate-3	
Performance	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Accuracy (2)	3	6	5	10	5	10
Control (4)	3	12	3	12	4	16
Feasibility (2)	5	10	3	6	4	8
Growth potential (4)	1	4	1	4	5	20
Response time (5)	3	15	3	15	5	25
Storage requirement (2)	5	10	5	10	2	4
purpose (5)	2	10	3	15	5	25
Costs						
System development (5)	5	25	4	20	2	10
System process (2)	5	10	4	8	3	6
Payback (5)	5	10	4	8	3	6
Total Score		112		108		130

Figure : weighted candidate appreciation matrix

A weighted candidate evaluation matrix is prepared in the following five steps -

- ⇨ Divide the evaluation criteria as per the class of importance for example, extremely important, important etc.
- ⇨ Give a weighting factor to each class. These factors are proportionate to the effect of every criteria in the selected candidate system.
- ⇨ Give a rating to each candidate after comparing that with other candidates. This comparative rating can be from 1 to 5 in which 5 is the best and decreasingly 1 is the least.
- ⇨ Count the score of each criterion of the candidate. For it, multiply the class of relative rating with the assigned weight.
- ⇨ To know the total score add the rating given in the column of each candidate.

The similar sort of weighted candidate evaluation matrix has been given in the figure 7.1.

Feasibility Tests

How beneficial and practical the proposed system is for business/institution, can, according to most of the analysts, be tested in four ways. These tests are the following:

- ⇨ Operational Feasibility
- ⇨ Technical Feasibility

- ⇨ Schedule Feasibility
- ⇨ Economic Feasibility

The criteria of operational and technical feasibility measure the capability of problem and solution. The operational feasibility is man based while the technical feasibility is computer based.

The economic feasibility is related to the cost and benefit of the information system. The schedule feasibility is related to the project program.

OPERATIONAL FEASIBILITY

The criteria of operational feasibility measures the importance of the problem. In other words, the operational feasibility decides how aceptable the solution is. There are two aspects of operational feasibility it means in operational feasibility two aspects are certainly considered.

- Is the solution to the problem available ?
- What is the opinion of the user and the management about the problem and the solution?

To get the answer of the 1st question, consider the following points –

- ⇨ **Performance** – Is the system capable of performing in appropriate amount in a given time ? What is its response time ?
- ⇨ **Information** – Does the system provide relevant, accurate information to the users and the managers at the right time and in the right format ?
- ⇨ **Control** – Does the system contain any safeguard rule regarding saving the data and information from any forgery ? Is data or information available in a system safe in case of loss of unwanted/unwilling change?
- ⇨ **Efficiency** – Is the system capable of ensuring the maximum use of the available resources ?
- ⇨ **Service** – Is the system practical and expandable ? Is the system capable of providing optional and reliable service ?

To make the other facts– such as what the users and the managers think of solving the problem– clear, it is necessary to find answer to the following questions.

- ⇨ Does the system have the support of the management ?
- ⇨ What do the users feel about their experience in the new system ?
- ⇨ Do people want any change in the system ? If they want, how this problem can be controlled?
- ⇨ How will the working enviornment of the user change ? Will this environment be favourable to the user and the management ?

Basically, the above given question addresses the political acceptance of the problem solving.

In the later phases of the development life cycle usability analysis is done during finding the operational feasibility. This is a test of the user interface of the system and it is to be found out in this system how easy it is to learn and use it. Besides, it is also found out during this analysis to what extent the system user interface supports

Check Your Progress :

5. Define data dictionary.
6. What is pseudo code ?
7. What is feasibility test and how it is tested.
8. Define economic feasibility.

the probable productive level. Several big companies, software consultants and software developing companies appoint experts to conduct its thorough test. To observe and record the working posture of a user on a system, special devices, such as video camera, tape recorder etc. are used. The aim of all their activities is to indicate those areas of the system where the chances of a user committing mistakes is the maximum or those areas which confuse the user or is complicated to him. During this they try to know the reactions of the users and view their productivity.

But the question is whether the user interface of the system can work or not ? In this regard, the experts think that the following questions can be helpful in knowing how useful a user interface is –

- ⇨ How much time does anybody take in its training ? It means how easy it is to learn.
- ⇨ How easy is it (in both the cases when you use it frequently or use it off and on) to use ? How much growth is registered in productivity when you are using it continuously ?
- ⇨ To what extent you, the user, are satisfied ? Can it be given priority amidst all the user interfaces you have worked upon so far ?

TECHNICAL FEASIBILITY

It is seen in technical feasibility whether it is practical and appropriate. The technical feasibility addresses three main issues –

- Is the proposed technology or solution practical ?
- Is the required technology available ?
- Is the technical skill available ? And is the schedule right ?

Is the proposed technology or solution practical ?

For any defined solution the technology is generally available. The question is, whether the technology is easily applicable in our problems. Some companies prefer the most advanced technology, while some other give priority to authentic and matured technology. A matured technology has an extensive customer base related to problem and solution.

Is the required technology easily available to us ?

After deciding that the required technology is practical for solution the second biggest question is whether this technology is available to us or is easily available ? If the technology is available, we should ensure whether it has necessary capability. For example. we need a printer and it is also available but if it has no capability of printing reports or documents according to the new system, it is useless.

Is short, we need positive responses to the following questions –

- ⇨ Is the required technology available ?
- ⇨ Is the available technology capable of working according to the new system?
- ⇨ Is the technology affordable ?

Do we have technical expertise, and the set time is appropriate ?

This aspect of technical feasibility is the most important which often escapes the attention of the analysts. Most often we avail matured and suitable technology but the technical expertise to use it in an appropriate way is not available. Though people can, later, be trained in the technology but it will hinder the timely start of the function.

SCHEDULE FEASIBILITY

Usually, for most of the projects the deadlines are fixed. This time limit is of two types- mandatory and desirable. You have to decide what sort of time limit you have, means whether it is mandatory or desirable. If the time limit is mandatory it means, in case it does not develop by a certain period or date, there is the possibility of penalty being inflicted, the analyst cannot strike a compromise in this issue. But if the time limit is desirable, the analyst can talk of the alternative time limit.

Good system analysts give equal importance to both right work and right duration. There should be no disadvantage in the work done in a deadline besides, going beyond the deadline for maintaining the quality of the work is not supposed to be the characteristic of a successful system analyst.

ECONOMIC FEASIBILITY

The point on which every business company emphasises is economic feasibility. In the initial phase of the analysis, the analyst estimates the cost and benefit of the system in a general way. In this phase the analyst is capable of calculating the cost and benefit of the system accurately. More detailed information related to it has been given in the next chapter.

Feasibility Reports

In the end of feasibility study, the analysts prepare a feasibility report which is for the management committee. Its aim is to inform the management about all those things which the analyst has felt during this study. In this report all those requirements and drawbacks are highlighted during the study which are to be fulfilled by the management. This report is important for the management also, seeing which they can take decisions regarding the project easily.

Answer of the Check Your Progress

1. Structured Analysis is a set of techniques and graphics tools with the help of which a system analyst can prepare a new type of system specifications which the user can comprehend easily.
2. A chart is a pictorial expression of relationship and movement. It is also used in information communication, comparative work, giving importance to some facts and guessing in some particular circumstances. Charts are mainly of three types; bar-chart, line chart and pie chart.
3. Line chart is the commonest example of chart. Line charts are generally called graphs because these are generally formed by linking the plotted dots. Line chart can show the speed in a way better than any other chart

4. A logical data from diagram mainly focuses on the business the way it is operated. It is not concerned with how the system will be constructed.
5. Data dictionary is a central store which defines all the data structures inside a system, such as data element, data flow and data store and describes them.
6. Pseudo code enables the programmer to concentrate on the algorithm, without worrying about the peculiarities of the programming language.
7. How beneficial and practical the proposed system is for business/institution, can, according to most of the analysts, be tested in four ways. These tests are the following:
   - ⇨ Operational Feasibility
   - ⇨ Technical Feasibility
   - ⇨ Schedule Feasibility
   - ⇨ Economic Feasibility
8. In this phase the analyst is capable of calculating the cost and benefit of the system accurately.

EXERCISE

1. What is Structured Analysis ?
2. Why Structured Analysis is needed?
3. Write down problems related to system specifications.
4. Explain different types of charts.
5. Define data flow diagram,
6. Write down guidelines for drawing data flow diagram.
7. Explain logical and physical data flow diagram.
8. Define data dictionary.
9. Explain decision trees.
10. Explain structured English.
11. Why feasibility study is required?
12. Write down steps of feasibility study.

11 System Design

NOTES

The Chapter Covers :

- Introduction
- Design Process
- Phases of Design
- Methodologies of Designing
- Structured Design
- Functional Decomposition
- Module Coupling and Cohesion
- Prototyping
- Information Engineering
- Joint Application Development
- Rapid Application Development
- Object Oriented Design
- Development Activities
- Audit Considerations
- Processing Controls and Data Validation
- Audit Trial and Documentation control

INTRODUCTION

System design is an important phase of system development life cycle. In this phase the extensive design of the system, selected during the study, is completed. Besides, the user oriented performance specification transforms into technical design specification. In this study, the topics related to this will be discussed.

DESIGN PROCESS

This step of system design plays an important part in system development life cycle. In this phase, the type of system imagined during the study, is implemented.

In this phase, the performance specifications transform into design specifications. It means, in this phase the analyst sees to it that now the performance of the system determined in the phase of analysis be completed. During this phase, the analyst performs the following processes –

- Prepares a time-table of design activities.

- Works with the user to determine the different data inputs of the system.
- Creates the model of the new system using data flow and entity relationship diagram.
- Defines the data requirements using data dictionary.
- Writes program specifications.
- Identifies hardware/software and orders for those ones which are to be used in the system design.

PHASES OF DESIGN

When we design a system, first and foremost we prepare its outline which can be called the logical design of the system. It generally describes source and input, destination and output, data collection and data flow. After it, is the physical design of the system in which on the basis of those specifications which had been prepared under the logical designing, the system is prepared and according to the same the analyst directs all his programmers what sorts of programs they should prepare. The programmers as per the directions prepare input, output and database. This phase includes, designing the physical system, planning the system, implementation, preparing the investigation and implementation plan, deciding new hardware/software and updating other things. The designing of physical system includes the determination of input/output media, the designing of database and the mention of backup procedures, the designing of physical information flow in the system and physical design workprocess.

METHODOLOGIES OF DESIGNING

Besides information technology, there has occured a change in the methodology of the development of information system. When the system analysts apply new methods of analysis and designing of the system, the main objective of all these is to bring improvement in the working skill and result of the analyst, to improve the documentation to minimise the expenditure, to strengthen the communication amidst the whole designer goup, and to standardise the methods of designing.

BETTER PERCEPTION : THE DELPHI METHOD

The objective of most Delphi applications is the reliable and creative exploration of ideas or the production of suitable information for decision making. The Delphi Method is based on a structured process for collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback. The Delphi method has been widely used for business forecasting and has certain advantages over another structured forecasting approach.

The Delphi method was developed, over a period of years, at the Rand Corporation at the beginning of the cold war to forecast the impact of technology on warfare. The Delphi method was used by RAND Experts when they were asked to give their opinion on the probability, frequency and intensity of possible enemy attacks. Other experts could anonymously give feedback. This process was repeated several times until a consensus emerged.

According to Wissema (1982), unfortunately the Delphi method is also sometimes used for a normal inquiry among a number of experts. Delphi

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has found its way into industry, government, and finally, academe. It has simultaneously expanded beyond technological forecasting (Fowles, 1978). Since the 1950s several research studies have used the Delphi method, particularly in public health issues (such as, policies for drug use reduction and prevention of AIDS/HIV) and education areas (Adler and Ziglio, 1996; Cornish, 1977).

The Delphi method is an exercise in group communication among a panel of geographically dispersed experts. The technique allows experts to deal systematically with a complex problem or task. The essence of the technique is fairly straightforward. It comprises a series of questionnaires sent either by mail or via computerized systems, to a pre-selected group of experts. These questionnaires are designed to elicit and develop individual responses to the problems posed and to enable the experts to refine their views as the group's work progresses in accordance with the assigned task. The main point behind the Delphi method is to overcome the disadvantages of conventional committee action. According to Fowles (1978) anonymity, controlled feedback, and statistical response characterize Delphi. The group interaction in Delphi is anonymous, in the sense that comments, forecasts, and the like are not identified as to their originator but are presented to the group in such a way as to suppress any identification.

In general, the Delphi method is useful in answering one, specific, single-dimension question. There is less support for its use to determine complex forecasts concerning multiple factors. Such complex model building is more appropriate for quantitative models with Delphi results serving as inputs. This point is supported by Gordon and Hayward who claim that the Delphi method, based on the collation of expert judgement, suffers from the possibility that reactions between forecasted items may not be fully considered. The need for the cross impact matrix method of forecasting integrated with the Delphi method is pointed out by many researchers. An improvement in forecasting reliability over the Delphi method was thought to be attainable by taking into consideration the possibility that the occurrence of one event may cause an increase or decrease in the probability of occurrence of other events included in the survey. Therefore cross impact analysis has developed as an extension of Delphi techniques.

In the original Delphi process, the key elements were (1) structuring of information flow, (2) feedback to the participants, and (3) anonymity for the participants. Clearly, these characteristics may offer distinct advantages over the conventional face-to-face conference as a communication tool. The interactions among panel members are controlled by a panel director or monitor who filters out material not related to the purpose of the group.

STRUCTURED DESIGN

Structured design is a data-flow based method. This method starts with system specification which identifies the input and output and describes the functional aspects of the system. Again the system specification is used in the form of the basis of graphic representation (data flow and data flow diagram of process).

The structuerd design divides the program into small independent modules. The modules are arranged in a hierarchy which brings one module of the business area close and is organised in top-down method, the description of which has been given below. Thus structured design is a process which minimises the complications and divides the problem into small manageable fragments which is called modulization or decomposition. Thus, structuring minimises the intitive reasoning and promotes the maintainable, provable system.

The design is called top-down when it is made on the module of hierarchy and each module has an entry and an exit sub routine. The primary features of this design are the following–

- The incomplete but early version of design are very useful in resembling the real system.
- The structure of the design itself provides control and improves the morale.
- Defines the procedural characteristic order which determines the processing.

Therefore the structured design originates from the hierarchical view of the application. The top level shows the most important division of the work and the lowest level presents the description.

FUNCTIONAL DECOMPOSITION

The documentation tool is hierarchy or structure chart for structured design. It is a graphic tool to represent the hierarchy and it has three elements :

- The module is represented with the name of the rectangle. It is a contiguous set of elements. (See the figure)

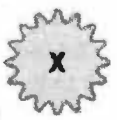

Figure : Module

- The connection is represented by a vector which connects two modules. Its general meaning is– the first module has called the other. In figure the X module besides the Y module, calls the Z module.

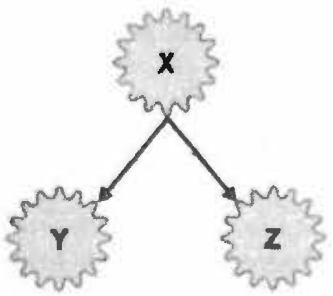

Figure : Connection

- Couple is represented by an arrow with a circular tail. It represents the transfer of data items from one module to the other module (See figure). In the figure, A, B, and C are couples. The module X calls Y and sends A downwards. Likewise the module X calls Z and gets C back by sending B documents.

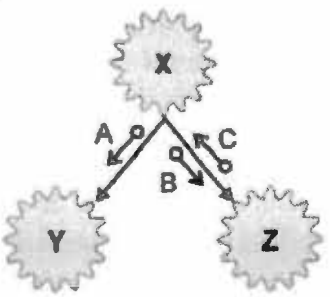

Figure : Coupling

MODULE COUPLING AND COHESION

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Module coupling stands for the number of connection between the calling and called modules and the complexity of these connections. There must be at least one connection between a module and a calling module. The aim of the design making easily understandable codes, is to give as much freedom to the mudules as possible.

Module cohesion means the relation amidst elements inside a module. If one module performs more than one discrete functions then the direction or the elements are not intimately linked with one another. The modules which perform one function at a time are supposed to be more cohesive. They are less inclined to faults. The modules which perform more than one functions are less cohesive and are more inclined to faults.

PROTOTYPING

The analysts are coming from traditional design to prototyping. This is a modern engineering based method of design which has been designed like this :

"A model on the basis of which some thing is created."

It means, Prototyping is a technique under which we create the real form of a thing and on the same basis, further, the similar things are produced. For example, Maruti Co. first creates a model of a new car and after it many similar cars are produced and made available in the market. The detailed information on prototyping has been given in the last chapters.

INFORMATION ENGINEERING

Information Engineering is a data-centred and process-sensitive technique which is fully implemented, unlike structured analysis, in an organisation. Its basic idea is this that the information system can be produced like any other product.

JOINT APPLICATION DEVELOPMENT

As it has been told in the earlier section, modern structured analysis and information engineering both lay stress on model driven development. Prototyping emphasises the production of working prototype. Joint Application Development lays stress upon co-operative development of the system owner, user designer and builder and prepares a complement of all the three techniques– modern structured analysis, information engineering and prototyping.

Joint Application system, by applying most organised and intense workshop, defines the system owner, user, analyst, designer and producer as well the system and designs it. It is also known as Joint Application design and Joint Requirements Planning.

RAPID APPLICATION DEVELOPMENT

Another method of system design is Rapid Application Development, the purpose of which is to combine the prototyping technique and joint application development as well as several structured techniques to intensify system development.

Check Your Progress :

1. Define structured Design.
2. What is module coupling.
3. Define module cohesion.

Rapid application development with the help of the interactive use of structured technique and prototyping defines the requirements of the user and designs the original system. The developers, by using the structured techniques, first creates the initial data and react on the models of the commercial requirements. After that, with the help of the prototype, the analyst and the user, investigate the requirements and purify the data and react on the model.

This cycle, goes on like prototype after the model and then the prototype, until, the combined business requirements and technical design statement to be used as outcome in the new system, are obtained.

OBJECT ORIENTED DESIGN

Object oriented design is one of the modern techniques. The function of this technique is to refine the requirements of earlier identified object and to define design specific objects.

The function of object oriented analysis is to ensure by the study of the present object, whether it can be used again or it can be used for a new work. This technique can be used to define new or modified object which will be linked with the present object.

For example, in design implementation decision, during the object oriented design the designer might have to revise the data or to process those characteristics of object which were designed during system analysis. Likewise, design implementation decision might make it compulsory that the designer defines the new set of object which will create an interface with the help of which the user can interact under the new system.

DEVELOPMENT ACTIVITIES

There are many development activities during structured design, those are- database design, implementation planning, system test preparation, system interface specification and user documentation. (See figure)

- **Database Design :** This is related to the design of the physical database. A key has to determine how to implement the access path. A physical path is desired out of a logical path. It can be implemented by pointers, chains or other mechanism, which we'd discuss in the next chapter, File Organisation and Database Design.
- **Program Design :** Database is a decision to be used in the programming language related to design and is flowchart process, coding and debugging procedure before transformation. The operating system, restricts these programming languages which will function on the system.

  When the system design is in progress and programming starts then plan and test both cases are required for implementation soon. It means, there must be a detailed time-table for system test and the training of the user staff member.

  The planned training provides time to sell the system to those people, who will use it regularly. As a result, user resistence should be the least.

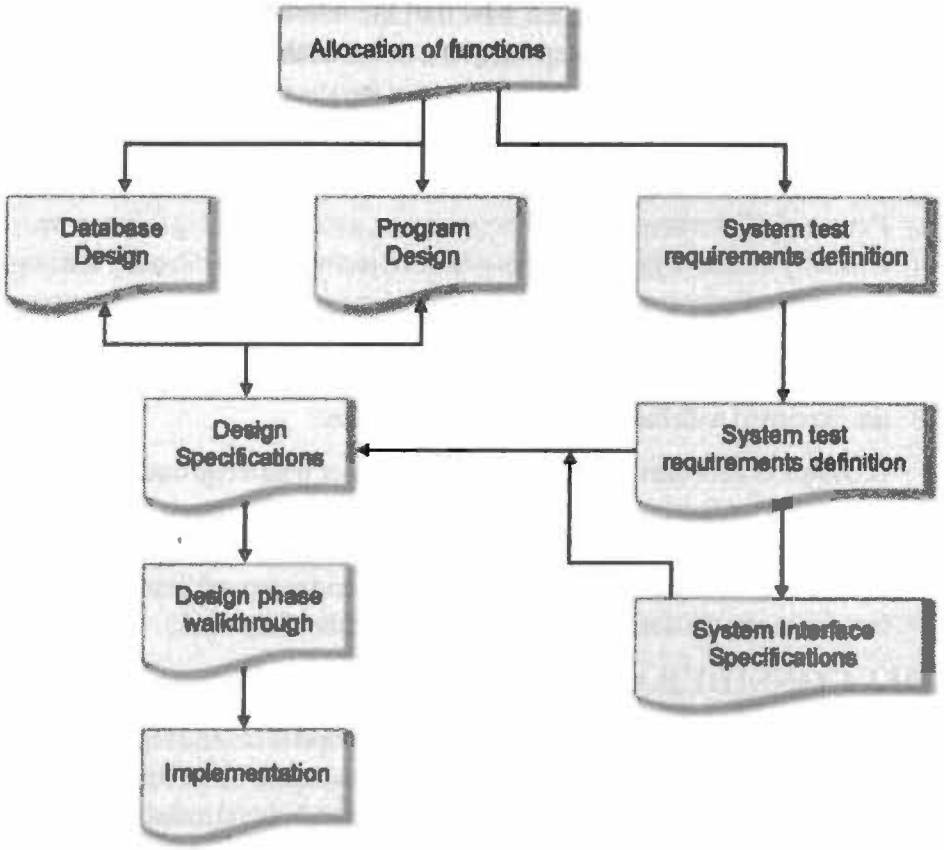


Figure : The activities used in system design

- **System and Program Test Preparation :** Each aspect of the system has its own different requirements. When all the programming and investigation are complete, the system is tested. The test issue keeps all the aspects of the new system such as actual operating user interface in its range. System and program test requirements become a part of design specification which is the prerequisite of implementation.

  Acceptance testing is totally in contrast to system test which passes the system through a procedure so that the user can be assured that the candidate system will stand true to the stated requirements. Acceptance test system is technically similar to system test but politically, it is different. In system test the faults are silently found out and corrected. The acceptance test is done in the presence of the user, audit representative or the whole staff.

  Since the test matter can be shared by both system test and acceptance test, the system test can be seen as revision practice of acceptance test. The acceptance plan or criteria must be present in structured specification feature.

- **System Interface Specification :** This part ensures it for the user how he would enter the information in the system and release it. The designer proposes several alternatives to the user. There must be consent by the end of the design so that machine to machine and man to machine protocols can be defined well before implementation.

  Before the implementation of the system, the user documentation must be prepared as the manual of the user or the operator. The manual directs how the sys-

tem can be set up and operated, how the input can be provided and accessed, how the information can be updated or re obtained and in which format the output can be displayed or printed. Most part of this documentation cannot be written until the operational document is completed, which is a task that follows the design.

- **Personal Allocation :** Only a few years ago, a medium or big scheme was operated by a team of programmers whose objective was to intensify the implementation. Unfortunately, there, instead of merit, number was more stressed. The structured process of design and implementation is useful to simplify the planning process. The stress is laid upon this fact that the genuine programmers are interested with the work in the actual deadline.

  A complete structure provides the chart designer with a real outline of the programming work which are to be done. The programmers can be entrusted with the responsibility of completing the task. A team of programmers is flexibly connected with other sub-systems. Once the roles and responsibilities are allocated inside a team, the designer can keep an eye on the team work.

AUDIT CONSIDERATIONS

A well designed system must have controls for proper operation and regular auditing. Often a new system fails for not laying stress on data-control. Therefore, to get rid of errors and control forgery the standards of accuracy, consistency and maintainability must be specified.

A system design presents new controller elements and changes the control procedure. New controls are designed in the form of relational comparisons which find out those errors, which are created by the use of the system, and controls them. In a manual system, the internal decision depends upon man-made decisions, personal care and labour allocation. In a computer based system, the number of people employed lessens. Software package is an effective substitute to human-made decisions in processing the routines and investigating the errors.

While designing the new system, the design must point-out the error-control point and examine them on the basis of the frequency of errors, cost and the time invested in finding them out. By identifying the spots of the anticipated errors, the designers can create an error-control process so that the errors can be dealt with swiftly and at reasonable cost.

PROCESSING CONTROLS AND DATA VALIDATION

Many methods have been created to control the act of processing. For example, the data records can be divided into small groups and controlled. If it is found that there is an error in Batch Processing, the erring batch, without disturbing the remaining batches of the file, can be reviewed. If all the controls remain, the batch is accepted. If the batch remains but some records are rejected, the batch is detained till the error is corrected.

Besides, Batch control, many other programmed checks can be used to test the data, which are as follows –

- The completeness check ensures that all the fields of the record are present and are read in proper sequence. Multiple record, in the check, identifies the auto-check numbers of program record which completes the transaction. If errors are found all the record groups are rejected.

NOTES

- Consistency check denotes the relevance of one data-type for another. For example, it might be the policy of the retailer that he can give 30 percent discount to the players on all of these business demands and upto 10,000 rupees without charging interest. The demand from a customer, must be checked as per these provisions so that congruity could be maintained with the directed policies.
- The reasonableness checks any transaction against a standard so that it can be decided whether it stands the check or not. For example, if the maximum wages is 10 rupees per hour and no overtime is allowed. Then, 500 rupees total weekly income of a staff member will be wrong because the limit is 480 rupees (10×8×6).
- Sequence check identifies that the data records are in proper order before processing. A check of false records may be admitted in the routine.

AUDIT TRIAL AND DOCUMENTATION CONTROL

An important function of system controllers is to provide an audit trial. An audit trial, is a designed routine which makes the analyst, the user or the auditor check some process or some field of the new system. An audit trial contains journals, ledgers and other documents which the auditor uses to find out some transaction done through the system.

In a computerised system, the record list and the format usually create troubles in finding out some transaction thoroughly. The following are the reasons behind it :

- The data stored in a magnetic medium such as a tape or a disk can be read by only one computer and using the computer program.
- Data processing activities are difficult to be seen, for they are inside the computer system.
- It is difficult to check a data-series without the help of a computer system.
- Direct data entry removes the physical documentation for an audit program

The way to control all those obstacles is to keep a file of all the transactions. For example, a transaction can be recorded on a tape, which might be as an input in the audit program. The system analyst must be acquainted with basic auditing or work closely with an auditor so that effective audit trial can be ensured during the designing phase.

Documentation is also required for the proper auditing of a system. Documentation is a basis of review of the internal controls by internal or independent auditors. This system also provides a reference for maintenance. An analyst has to spend a lot of time on documentation. When the deadline for the implementation is tight, the first thing required is documentation.

Documentation program may consist of internal or external hard copy documentation. It should be congruent to all the system prepared according to the standard. Therefore, the scheme of accepting a new design, may first have documentation before programming and transformation. In short, the first objective of auditing is to ensure the integrity of the system by checking the control created in the design of a new system. The audit considerations should, in the very first state, be included in system development so that it can be changed in time. Neglecting this important step may hinder system implementation.

Check Your Progress :

4. What do you understand by RAD.
5. What do you understand by audit trial.

Answer of the Check Your Progress

1. Structured design is a data-flow based method. This method starts with system specification which identifies the input and output and describes the functional aspects of the system. Again the system specification is used in the form of the basis of graphic representation (data flow and data flow diagram of process). The structuerd design divides the program into small independent modules.
2. Module coupling stands for the number of connection between the calling and called modules and the complexity of these connections. There must be at least one connection between a module and a calling module. The aim of the design making easily understandable codes, is to give as much freedom to the mudules as possible.
3. Module cohesion means the relation amidst elements inside a module. If one module performs more than one discrete functions then the direction or the elements are not intimately linked with one another. The modules which perform one function at a time are supposed to be more cohesive. They are less inclined to faults. The modules which perform more than one functions are less cohesive and are more inclined to faults.
4. Another method of system design is Rapid Application Development, the purpose of which is to combine the prototyping technique and joint application development as well as several structured techniques to intensify system development.
5. An audit trial, is a designed routine which makes the analyst, the user or the auditor check some process or some field of the new system. An audit trial contains journals, ledgers and other documents which the auditor uses to find out some transaction done through the system.

EXERCISE

1. Explain design process.
2. Explain various phases of design process.
3. Write down methodologies of designing.
4. Explain Delphi method.
5. Define structured design.
6. Write down a note on functional decomposition.
7. Explain module coupling and cohesion.
8. Define prototyping.
9. Explain joint application development.
10. Explain rapid application development.
11. What do you understand by object oriented design?
12. Write down various types of development activities.
13. Write a note on processing control and data validation.
14. Explain audit trial and documentation control.

12 Input, Output And Form Design

The Chapter Covers :

- Introduction
- Input Design
- Input Design Considerations
- Input Devices
- Output Design
- Form Design
- Types of Forms
- Layout Considerations
- Print Forms in Reasonable Quantities
- Automated Form Design
- Forms Control

INTRODUCTION

If the entered data is not true, the information cannot be true. To enter the data properly and easily during the development of an information system, an analyst considers input design one of the most important tasks. Likewise output design and form too are designed.

This chapter will deal with the facts related to input and output design. In addition, form design is also an important part of this chapter.

INPUT DESIGN

Input design is a process in which the user-oriented descriptions of the input, under program-oriented specifications, are turned into computer based business system. Wrongly input data is the most common cause of errors in data processing. The weak input design specially where the operators enter data from source input, invite wrong data to the system. Besides, the entered data is given less weightage. The

input design process was, in fact, done in feasibility study, where, first, the input data was found available for creating output data and keeping the master and transaction files well-installed and well operated. Secondly, the most appropriate type of input media- online or offline devices- was selected as the technique of receiving alternative data. In the phase of system design, the expanded data flow diagram identifies logical data flows, datastores, sources and destinations. The system flowchart checks the master files, transaction files and computer programs. The input data is organised in similar data groups. After this the input media selected in the phase of study is appraised. The additional study of alternatives is completed as per the need and work is allocated amidst equipments, manual operations and computer programs.

INPUT DESIGN CONSIDERATIONS

General form design considerations only collects the desired data and put the similar or related data into groups. Besides this, in the input design, the requirement of data entry operator needs to be considered. It has been mentioned below in the following way –

- The field length must be either documented or certified by documents. The data entry operator must know about the field length. It helps restrict the entered data to the determined space and if need be, mix the numeral data from the right.
- The order of the field must tally with the serial of the fields on source document. The data entry operator should be able to scan the source document in logical order.
- The operator should identify date format. The date format may be of different type such as- mm/dd/yy or mm/dd/yyyy or mmddyy.

INPUT DEVICES

The object of the input design is to input data in the most accurate manner. For it, several types of methods are used, some of which are the following –

- Visual Display Terminal
- Magnetic Inc Characters Recognizer/Reader
- Optical Bar Code Reader
- Optical Character Reader

Visual Display Terminal

Visual display terminal is one of today's most important methods. Effective screen design not only reduces the number of errors related to entering the data but also increases production and the satisfication level of the user. There are many on-line data entry stations (VDTs) which provide pictorial check of the input data and the source which make the user prompt. When the data are entered, they are echoed or displayed on the screen.

The user can correct or delete the data display it for processing or storage in the computer system. Every display station has its own memory which is called buffer in which data are stored. The most popular size of display screen is of 24 rows each having 80 characters.

Magnetic Ink Characters Recognition/Reader

Magnetic Ink Character Recognition is widely used in banking where one has to deal with a great number of cheques. MICR, known in short, is a method of machine-reading characters made of ink containing magnetized particles. A special purpose machine known as a reader/sorter reads characters made of ink containing magnetized particles. E-13B and CMC-7 are two major fonts that are used globally.

Figure : E-13B and CMC-7 fonts

In addition to their unique fonts, MICR characters are printed with a magnetic ink or toner. Magnetic printing is used so that the characters can be reliably read into a system, even when they have been overprinted with other marks such as cancellation stamps. The characters are read with a device similar in nature to the head of an audio tape recorder, and the letter for bulbous shapes ensure that each letter produces a unique waveform for the read head.

This method is fast, accurate and automatic moreover the chances of errors are negligible.

SPRAIN YOUR BRAIN

A new online system for maintaining customer information and retail transaction details will perform the following major functions: entering and revising retail transactions, entering and revising customer information, portion of the system will be the capability to enter information for new customers, edit details of existing customer records, delete customer records, and print customer information. Within the printing portion of the program, the user has the option of displaying the information for a specific customer of listing and printing information for all customers in alphabetical, customer number, or zip-code order.

The system is menu-driven and will enable the user to return from any point in the system to the previous menu or exit the system.

a. *The system should be designed as a militiamen system. Develop the menus for the application described as they pertain to the customer portion of the system. Design the screens to include all relevant information as it should be shown to the user. (The screen is 24 lines by 80 columns).*

b. *For the editing portion of the system, describe the input processing required to add, delete, and change customer records. Be specific about what input the user should provide for each type of transaction and how it should be validated by the system.*

c. *Indicate any appropriate visual emphasis in a and b.*

d. *Prepare a dialogue chart for the system.*

Check Your Progress :

1. Define input design.
2. What are the features of visual display terminal.

Optical Bar-code Reader

Optical bar-code reader identifies the combinations of the symbols which are to be coded. This system, known as Universal Product Code (UPC) applies on retail packages and is generally complicated to be designed. Optical Bar-Codes have been shown in Figure.

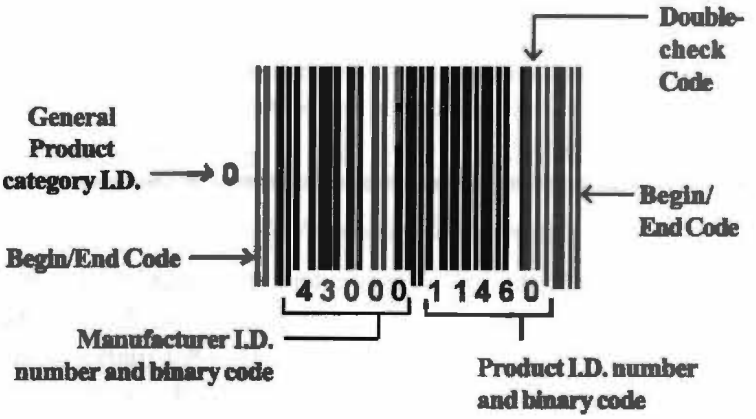


Figure : Bar Code

Bar Codes reader comes in two models-

- **Flatbed model,** that is used to provide products concerned information in super markets and big departmental stores.
- **Handheld model,** that is used to recognize prodcust in the courier services.

Figure depict the pictures of a bar code and a bar code reader respectively.

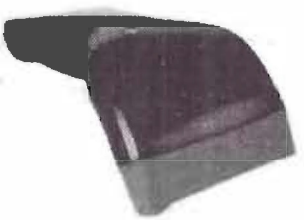


Figure : Bar Code Reader

Optical Character Recognition

Optical Character Recogniser is the technique in which pre-printed characters are distinguished by OCR and recognised thereafter. OCR can read characters printed by typewriter, character of cash register and credit card. The OCR fonts are generally installed in computer, they are also called OCR-standard.

OCR consists of special characters- letters, numbers and special symbols - that can be read by a light source that converts them into electrical signals that can be sent to the computer for processing.

The most popular OCR input device is the hand held wand reader as shown in Figure. The wand reflects light on the printed characters, and the reflection is converted by photoelectric cells to machine-readable code. You often see sales people in departmental stores use the wand to read retails tags and send data to the store's computer for billing and goods-ordering purposes.

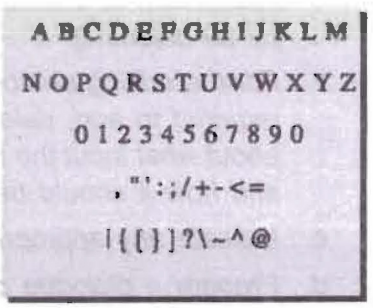


Figure : Optical Fonts

OUTPUT DESIGN

Output design, since the beginning of the project, has been a continuous action. In study phase, the outputs had been identified and described in project directive. Then a temporary output medium was chosen and sketches were made of every output. The most widely used output media are computer printers and VDT screen. Computer Print Charts and VDT display lay-out sheets were used for detailed description of outputs. Micro Computers are casting a dramatic effect on output design. The availability of graphics software and desktop publishing systems can make the automation of form-design possible for small organisations.

VDT SCREEN OUTPUT

The principles used in designing VDT screen output are similar to the principles used in the designing of form and computer printer output. VDT shows specially included titles and column headings.

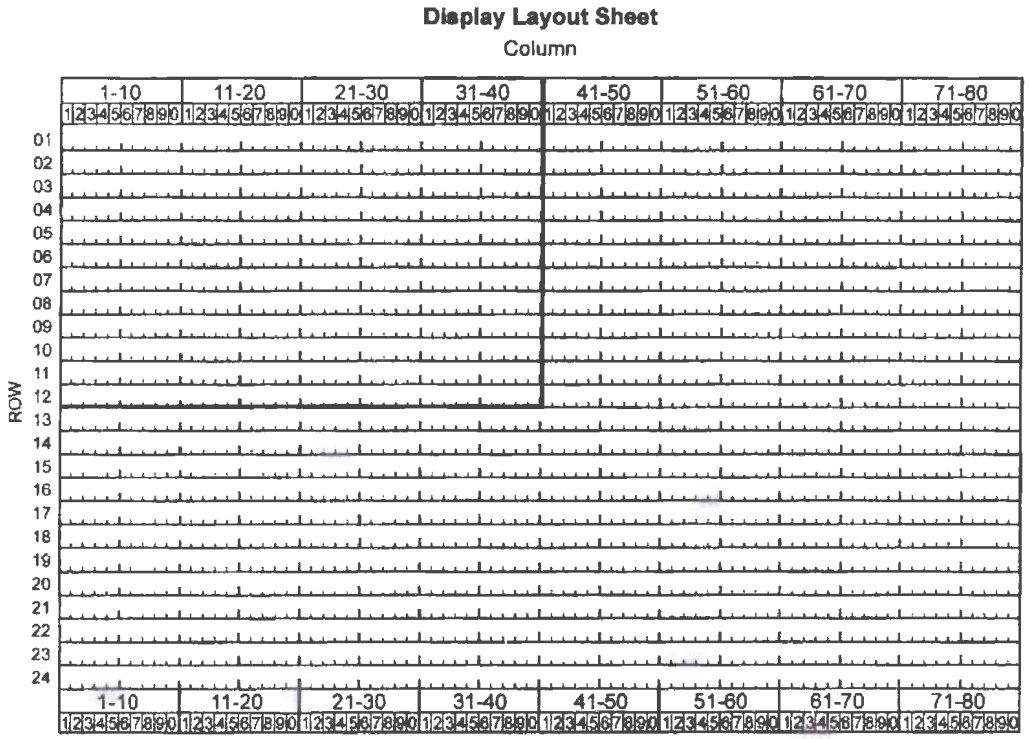


Figure : Display Layout sheet

The same requirements are identified with computer print chart. The differences are —

- The size of the screen.
- The amount of data to be output as record.

The size of the special screen is 80 characters from left to right and 24 rows downwards. VDT display is just like the printed output on several extended lines arranged in columns; however many times single record will be displayed on it. It is, especially true for those systems which access the data irregularly. Figure presents the example of such a form which designs VDT display. This form is called display layout sheet. This is very similar to such a computer print chart in which every design status and row is numbered.

GRAPHICS

In past times, all the printed outputs were presented on such printers which had fixed character sets. Which means, the characters are formed by striking by a font with a projected character on a ribbon. This method presents a high quality image of characters but limits them. Dot matrix printers create printed image by striking the ribbon with a matrix of small rods or pins. Every pin with the model of the dots creating an image on paper, produces a small dot. Instead of character we use a terminology like image for dot matrix because it does not create characters only but the image also can take any form showing flexibility. Dot Matrix can print any image like line, bar and pie chart, data-flow diagram, organisation chart, form or any image that can be described.

The biggest negative aspect of dot-matrix is that the quality of its print is lower than fixed character printer. Generally, this quality is not suitable for commercial or business use. During last few years Dot matrix NLQ or Near Quality Printer has been introduced in the market. These NLQ printers produce rather high quality image in which to get more solid looking characters every time double strike is made to fill up the gap between the dots.

The latest improvement in character printer is to provide laser printer on reasonable price. Laser or page printer produces image by using hardware like copier. In a laser printer, the output is received as a series of dots in dot-matrix, but these dots are much smaller in size and are nearer to each other. A common laser printer prints 300-600 dots every inch. This level is similar to the quality found in bright and glossy magazines.

DESKTOP PUBLISHING

Desktop publishing is a word which is used for the combination of a desktop or personal computer and a laser printer. Because of the flexibility of a laser printer to print any sort of image, the text and graphics can be combined as single image on one page. It enables the user to create newsletters, advertisement copy or brochure on his personal computer. Most desktop publishing software packages provide the facility of direct input in the automated typesetting equipment for the reproduction of extremely high quality. The required hardware for desktop publishing contains a laser printer of any of the brands and a personal computer which is sufficiently capable of running a software that can plan text and graphic images. Generally it means such a computer which has 20286 or faster processor.

BASIC PARTS OF A FORM

Most forms have five basic parts. These parts are title, instructions, heading, body and conclusion.

Title is the identity of the form. It should be completely terse but descriptive (which can describe the whole form). For example Sales Order. The title is always on top and in the centre of the form.

Instructions – It clarifies the method of using the form. To increase its utility, it should be kept in the beginning of the form. The instruction should be written in such a manner that it can attract the glance of the user before the form gets completed. Those forms which are divided in sections, must, in the beginning of each section, be provided with the infor-

mation related to that section. Some forms being most common and in use, general instructions are omitted from them. Instead of it, related labels are given on the line and the box. The bank cheques and receipts are examples of it.

Heading includes general identity data. For example it may have date, serial no. of the forms, name and address. Heading data is not the data for which the form has been designed but it is necessary for the purpose of identifying the record. The data used in the reference file are included in the heading. The heading, generally is separated by drawing a box on the form or drawing a horizontal line.

SALES ORDER FORM

National Sports Centre
Greater Kailash, New Delhi

Order No. 2314 Date : 12-04-2004

Customer Name :
Address :
Phone :

Special Instructions

Sl.N.	Particulars	Qty.	Rate		Amount	
			Rs.	P.	Rs.	P.
	Sub Total					
	Tax					
	Total					

Figure : A typical Form

Body – It contains that data for which the form is designed. For example quantities, item descriptions, unit prices, total prices in sales invoice. The body of the form is read in top to bottom and left to right order. It helps those people who complete the form or those who receive data from the filled up form.

Conclusion is the last part of the Form. It contains approvals, signature and summary data. It is in the bottom of the form.

FORM DESIGN

The cost of collecting the improved data and processed information are two principal costs of a system. Since most data which enters a system and leaves the system, is recorded in the form, Form design can affect the cost effectiveness of a system badly.

It is the task of a system analyst to help a user make the design of a suitable form and coordinate with the user in form production activities. It is also the task of the analyst that he should control and regulate creation of new and changed form within an organisation to check the costly duplication of form and form design effort.

TYPES OF FORMS

Generally form types are classified on the basis of the complexity of production. Thus, following are the type of classified form -

- Cut Forms
- Speciality Forms

Cut Forms – The most widely used forms are printed on a single copy of paper, which are called cut forms. Cut forms are generally designed by the user and printed by some local printer at home. Much of the ready-made stock taken by the stationery dealers are

also cut-forms. Cut forms, for convenience, are produced in pads, and many copies can be prepared in single writing by using carbon copies.

Speciality Forms – Speciality forms are more complicated. Multiple-copy forms, forms with special binding and forms designed by the use of a machine, are examples of it. The creation of speciality form is so complicated that the use of specific devices are required for their production or use. Most speciality forms are designed by some form producer, which are large printing firms and for the use of which specific devices are required. Some others are designed to be completed by the use of hand. There are some more for which the operations of both the hand and devices are required. Speciality forms are of four main types:

- Forms bound in books
- Continuous forms
- Detachable stub set
- Mailers
- **Forms Bound In Books** – The most simple speciality forms are those which are bound in books, which, except stronger binding, in other things are similar to the padded cut forms. They are designed in such a way that they can be completed with hands. Sales books and receipt books are examples of it.
- **Continuous Forms** – Continuous Forms are such forms which are sequence of pages tagged from one end to the other to a long continuous string. The most common example of continuous forms are the forms used in computer printers. These forms can be with single part (no carbon paper) or multiple part with carbon copies. Most often the forms, to be completed on computer, will generally be blank continuous forms. In this case, all the parts of the form are printed as functions of computer program. Until the forms are very complicated this process is almost as swift as using the pre-printed or formatted forms. The use of blank paper is often less costly and it saves from keeping a number of forms in the industry. Pre-printed computer forms are used when either there is a special need or a complicated form is designed. The examples of widely used pre-printed form are- cheques and customer statements. No matter whether the form is pre-printed or has been printed in the computer, it must be designed by the analyst.
- **Detachable Stub Set** – The type of speciality form which can be filled either by the machine or with the hand is a detachable stub set in which are enclosed one original and one or more carbon copies. This set can be bound with either carbonized or uncarbonized paper. Binding can be done on either end of the form but mostly it is done on the top left end. The bound part of the set or counterfoil is separated. Every copy can be separated from the set or to separate all the copies the counterfoil can be torn and removed. From the point of view of the case and condition of use these forms are very popular. These forms can be completed either in a machine or with hand. The person using the form needn't match the carbon paper and the copies of the form. Since every copy is bound, the copies cannot come out of the alignment no matter whether something is being written on the form or it is being put into the machine. The most common example of detachable stub is the form used by credit card companies for re-

cording charge sales. The devices used for recording the information from a user's Master card, Visa and other types of cards are found with many retailers.

- **Mailer** – The last general type of form is mailer. It is an edition of continuous form which is designed to be filled by a computer. Though its construction is so sufficiently different that it can be classified as the fifth type of speciality form. The mailors are such blank forms sealed in an envelope which, like continuous form, are tagged on ends and covered with cover page. On the selected area of a cover page and behind the next part of every envelope, there is a carbon paper. Data to be printed that include name and address are printed on the cover page. And the form inside of the envelope, because of being the carbon paper inside also gets printed. Generally, the data sent to the cover page is kept as a file copy. This is printed with that information which is not printed either on the envelope or on the form. The mailer forms are very expensive but their use saves the cost of keeping and sealing the envelope. Mailers, generally, contain information related to postal expenditure permit on them, it's why there is no need of pasting postal tickets on them. As soon as they are separated after printing they can be sent to the post-office. Such type of forms are generally used in reputed magazines for the purpose of business reply.

LAYOUT CONSIDERATIONS

Well-designed business forms can improve classical efficiency. The work flow can be increased and system costs can be reduced. To evaluate the effectivity of a form, an analyst must pay attention to four basic things :

- The filling up of the form must be easy.
- It should be easy to use the filled up form in the system.
- No such data should be collected in the form which will not be used in the system.
- The form should not be unnecessarily expensive.

The form should be easy to be filled up

A commercial form should be designed in such a manner that it can be filled up with speed and accuracy. It is important for an analyst to avoid such errors which have been included because of the design of the form.

The error produced out of designing can surface when the man completing the form is not sure which data is being requested for. In this situation including appropriate commands is wise. The commands should be given before the original part of the form starts. It should be minded that putting the commands where they are not required, obstructs clarity and consequently, the production cost of the form goes up.

Data items should be gathered on a logical pattern. The act of grouping requires minimum commands and it brings minimum errors to light. If before changing the topic, the logically related data is collected, the number of mistakes will be the least.

All data entry areas should be clearly labelled. Ensure that the label would apply on the upper or the lower line. If the form is to be filled up with a typewriter the label of the data area should be seen on the top of the data entry area so that the label might remain visible while the form is in the typewriter. Though the labels are required to be tense they should be complete enough to tell which data is being requested for.

Check Your Progress :

3. What do you know about optical Bar - code Reader.
4. Bar code are available in which models ?
5. What is cut forms ?

The horizontal blank space of a normal typewriter is 10-12 characters in an inch. Ensure that the data field is long enough to accomodate an answer. Keep in mind that hand-written entries need more space than typewriter written responses. For forms design, even the vertical blank space is important. Those forms which are expected to be filled with handwritten letters need at least one to half inch of vertical space. Those forms which are to be filled by a typewriter, need to be permitted half an inch of vertical space and it should be the multiple of the sixth part of an inch. Most standard typewriters print 6 lines in every vertical inch. Avoid that spacing in which the typist has to re-align his typewriter for each line. If the form always has to be completed with a typewriter then to make the realignment easier, leave the horizontal line. A user may have to spend as much time as he has to do in entering the data.

The completed form must be easy to be used in the system

While using, arrange the data on form. It is specially true when the data are entered in the computer through key-stroking operation.

An analyst in context of clarity and legibility should be careful of the effect of combination of ink and colour of paper on the form. The improvement or degradation is the result of the combination of the colour of the ink and the background.

The combination of general black colour on yellow is the best with regard to legibility. The coloured paper is used to separate several different copies of the form and help in the distribution of the forms. However, in the case of clarity of data the interference of coloured paper should not be permitted. It is particularly very troublesome for the lowermost copy of a carbon stack.

In so many trades/businesses the data is input in the computer system with the help of the optical scanner. If the optical scanning of the form is to be used the analyst should keep in mind the size of the characters and the spacing requirements. It is the responsibility of an analyst that he should check that the layout of the form favours the scanner hardware or not.

The form should not collect data that will not be used in the system

The analyst should check that all the data items requested on the form are necessary and are used in the system. Many times the data is collected on the form because they had been collected in the earlier version of the form. Those data items which are really not required, disarrange the form. Squandering the clerical time increases the unwanted expenditure of the system.

The form should not be unnecessarily expensive

The usability cost of a form is far more than its production cost. The best area of saving the effectiveness of a form, not its cost being much. Even then, the form should not be unnecessarily expensive. If a company has home based production capacity, then it should be decided whether the form is to be produced within the home or outside. The decision is taken considering the desired quality and complexity of the form with regard to home based capacity. Because, for complicated and high quality form home production is not always less expensive.

Design the form in its standard size, such as 8½" × 11" or 5½"×8½" inch. Printers purchase their paper in standard size. If a form of abnormal size is desired then owing to additional cutting and trimming of paper it may be unnecessarily expensive.

Generally avoid a form bigger than the size of 8½" × 11". Storage of a comparatively bigger form is more expensive and bigger and expensive file storage is required for them.

PRINT FORMS IN REASONABLE QUANTITIES

The bid of a printing job is a basic set up charge which remains same regardless of the quantity of the produced form. Hence, the purchase of form in big quantity is beneficial. But, for it, it is necessary to decide that on what rate the form is used (It means how much the form is used) what are the possibilities of its modification and its storage rate is low. The bigger the quantity is, the lower the cost of each form is.

AUTOMATED FORM DESIGN

One of the benefits of those personal computers with enormous capacity which are powerful today too, and of refined page layout is the automation of form design. Page layout program is designed for the typist quality output to work with laser printer.

Because of the availability of different sorts of style and size the form can be designed on personal computer by the analyst or the user. These forms are printed as high quality design layout. In many cases, the print quality of the form brought out from the laser printer is so good that it can be used as master copy for the production of form. If the print quality of the laser printer is not so good, the page layout system can give output to directly automated type-setting device.

These capacities reduce the required time for form design and enables the user to see, during design process, how its final form will look. The use of page layout software and laser printer on a personal computer is called desktop-publishing.

FORMS CONTROL

A form designed for effective use is an important step in the direction of controlling the cost of data collection. However the same importance should be given to checking the flood of new and comparatively cheaper forms from every department of the company. When it comes to forms, each department seems to be working independently from the other. The departments hardly enquire of one-another whether any form is still in stock. Therefore, a form control system is required.

The solution to this problem is two-faceted -

- Setting up a central form authority.
- Setting up a control file.

The control authority should be of such a person or group which possesses complete control on the whole company form. Before designing or modifying a form one should seek permission of that central authority. The benefit of this process is that the authority will have both information and model that which forms in present are in use or are being designed. Since many forms can fulfil the requirements of more than one departments, the authority can very easily provide the combination related to the designing and modification of the form. The use of one form instead of several forms of one type, is comparatively convenient in production, storage and distribution.

To keep the information of the form used in the company, two control files–one numeral and the other functional file–are required. In the numeral file, the list of all the forms in use are filed by number. Any form can be examined using its coded form number. The func-

tional file has an additional copy of each form. They are filled in the order of subject, operation and function.

If a form has several uses or functions, it will be found in the file more than once. Whenever a new form is required, then to ensure it whether there is a form for that purpose, the functional form can be investigated. When the functional form is fundamentally set up, several forms can be removed or consolidated.

Both of these control files help in forms inventory control. The information that which department uses some particular form and the information of its rate of use saves from the making of a big inventory of form and works as a timely reminder for the second order.

Answer of the Check Your Progress

1. Input design is a process in which the user-oriented descriptions of the input, under program-oriented specifications, are turned into computer based business system. Wrongly input data is the most common cause of errors in data processing.
2. There are many on-line data entry stations (VDTs) which provide pictorial check of the input data and the source which make the user prompt. When the data are entered, they are echoed or displayed on the screen. The user can correct or delete the data display it for processing or storage in the computer system.
3. Optical bar-code reader identifies the combinations of the symbols which are to be coded. This system, known as Universal Product Code (UPC) applies on retail packages and is generally complicated to be designed.
4. Bar Codes reader comes in two models-
   - Flatbed model, that is used to provide products concerned information in super markets and big departmental stores.
   - Handheld model, that is used to recognize prodcust in the courier services.
5. The most widely used forms are printed on a single copy of paper, which are called cut forms. Cut forms are generally designed by the user and printed by some local printer at home. Much of the ready-made stock taken by the stationery dealers are also cut-forms. Cut forms, for convenience, are produced in pads, and many copies can be prepared in single writing by using carbon copies.

EXERCISE

1. What is input design ?
2. Write a note on various types of input devices.
3. Explain optical bar code reader in detail.
4. Explain different types of input devices.
5. Define output design.
6. Write a note on graphics.
7. Explain various parts of form.
8. Define desktop publishing.
9. Explain different types of forms.

13 File Organisation And Database Design

The Chapter Covers :

- Introduction
- File Structure
- File Organisation
- Methods of Organising Files
- Objectives of Database
- Data Structure
- Types of Relationship Amidst Data
- Types of Data structure
- Entities and Attributes
- Normalization
- Why is Normalization Necessary ?
- Role of Database Administrator
- Managing Data Activities
- Managing Database Structure
- Managing Database Management System

INTRODUCTION

Till now, you have read about different steps of system analysis and design. In the last chapters you have come to know how input/output can be designed in a better way so that apart from data entry being easier the result can be clear and accurate. In this chapter we'll discuss things related to information gathering such as file organisation, database etc.

FILE STRUCTURE

The structure of a file is based on small units which from that unit in the ascending order takes the form of a file. The description of these small units are as follows–

- **Bit, Nibble And Byte** – We know that the base of gathering information in a computer is 0 or 1. This 0 or 1 is called bit which is an abbreviated form of Binary Digit and a group of 4 bits is called nibble and a group of 8 bits is called byte. One letter of the text we put on the screen through input device, is called byte. It means byte is supposed to be the smallest unit of a file.

- **Data Element** – Data element is known as database management system or in the common language of computer we call it field. Data element is a group of more than one byte which has a special meaning. For example Name, Age, Sex, Marital Status etc. given in your resume. Here the thing to mind is that the values in a field are called data elements. For examples the values in a Name field- RAJ, ABHISHEK, KARIM are data items.
- **Record** – The combination formed by the data elements related to some specific object is called record. For instance, out of a list of staff- the name, rank and salary of a staff-member is a record. For the specific identity of each and every record, a special identity which is unique is given. It is generally called ID number. It helps in responding to the record.
- **File** – A file is constituted of the groups of similar records. It means, a file can be described as a group of similar sorts of records. The size of the file has a limit which depends upon the available space in the storage medium used by you. In early days, the files, as per their processes, were stored on a disk tape. But today all sorts of a file process are done on the hard disk of the computer.
- **Database** – Database is called a group of related files. Its object is to fulfil the needs of different applications by checking the repeatition of similar data. The main objectives of database design are speeding the response time, making more information available on reduced cost, controlling the repeatitions, making the use clearer and easier, freedom of data and program, accuracy and integrity of the system, speedy recovery, secrecy and safety of information and making safe and strong end-user language available.
- **Database Management System** – Database management system supports the software features. It is also called fourth generation language. This computer information system is said to be user friendly. Query language helps the user access data and without writing the computer program provides swift responses to the user's query. The report writer prepares the report without any programming in the format prepared according to user specification.

FILE ORGANISATION

We create different types of files and organise them in better method. To organise the files, some things must be kept in mind, specially when you are developing a new system. In these, storage medium, processing means the method of processing and file safety are important.

METHODS OF ORGANISING FILES

There are three principal methods of organising a file which are as follows –

- Direct Access
- Sequential
- Index Sequential

Direct Access Storage

In direct access, data can be obtained in any order. No matter what the order of entering the data is, we through direct access can obtain them in any sequence. To clarify the difference between direct access and Serial access we can take the example of the cassettes used in the stereo systems and gramophone records.

The direct access is required more where data have to be obtained in any order.

Sequential Access Storage

In sequential access the data present in the file are obtained in the same order they had been stored. For instance, suppose, the roll no. records have been stored in the file without any sequence, when they would be accessed by the computer, we'd not obtain these data according to the alphabetical order of the names or in the ascending order of roll nos, but we'd obtain them in the sequence, they had been entered. Accessing the records in this way is called Serial Access.

Index Sequential Access Method

The Index Sequential Access is a compromising method between direct and sequential methods. In it, the data are arranged in an order but where the data are stored, there is an index. The index contains every record and its appropriate address. Its function is just like the index given in the hinder part of a book.

Employee Code	Address Location	Address Location	Employee Record
0001	1003	1001	0002 R.S. Patel
0002	1001	0002	0004 R.K. Rana
0003	1004	0003	R.P. Sinha
0004	1002	0004	N.P. Singh

Figure : Index Sequential Method

To understand this, see the following example -

For example, to find out the room of Dr. Sharma we'll look into the directory or index of that building and get the information about his storey and room no.

In this method, all the records are in sequence and the index table is used to obtain all the records without delay. In this method, the record can be stored in any manner but all the records are sequentially arranged in the table. An example of this method has been given in figure.

OBJECTIVES OF DATABASE

The objectives of database is to collect the related files and obtain their data after the required process in the form of information. Database helps the user obtain accurate information rapidly. For example, if we are preparing a database of a school then several files related to the school, such as the file of the students, the files of the teachers and the file of other staff will be created and a database will be prepared putting all together and will be processed. Some important purposes of database are the following:

- **Safety from Redundancy** – Generally, when the data are entered then despite observing carefulness one data gets entered more than once. Because of it the space in the storage medium goes in vain. Database helps identify this event which takes place during data entry.
- **Independence of Data** – Data is an important part of an organisation and addition, subtraction and modification in it is indispensable. An important objective of database is that the data should be independent it means it should not be based upon some specific hardware or storage medium so that any change

Check Your Progress :

1. What do you know about Bit, Nibble and Bytes ?
2. What is the mean of file.
3. What do you understand by Direct access storage.

in hardware or storage medium in future may not affect the data and there may not be any modification in the program required.

- **Economical** – The use of data, its storage and its retrieval should be economical. It means, the programming should be done in such a way that changing and updating it is easy and cost effective.
- **Accuracy and Integrity** – The quality of data and the subject matter inside it should be stable in database and any error in data can easily be detected.
- **Recovery of Data** – The data should, in no way, be affected in the case of the system going out of order. The data should not be damaged even when the system comes to a halt.
- **Confidentiality** – The data is the most potent weapon of a company and in the case of its leakage the goodwill of the company might be spoiled and the transaction might be affected. It means the database should be prepared in a way that in no way, the unauthorized people could access it. There should be fool-proof arrangement for it.
- **Performance** – Performance, here, stands for, the work done by the database specially the time taken in lieu of the inquiry. Though the response time varies on the basis of the nature of work, the least it is the best it is.
- **User Friendly** – The user should make the database easy to learn and use. The easier it is to learn the less time it will consume in its training.

DATA STRUCTURE

Before we try to understand what data structure is, we should discuss a few chief terminologies related to it.

- **Data Model** – Data model is a framework or a mental image of the user's view.
- **Data File** – Data file is the space where the real files are stored. Storage sequence is determined from the data model.
- **Database Management System** – Database management system is such a software which provides an interface between the data file in the disk and the program which requests for the process. Database management system stores and arranges the data.
- **Logical and Physical views of Data** – The logical view of data is this that how it looks and the physical view of data means how the data is stored and retrieved.
- **Schemas and Subschemas** – Schema is the view which helps the database management system act on the data requested by the application program in whichever storage it is. The example of schema is the display of landing and take-off of the aeroplane on the airport.

TYPES OF RELATIONSHIP AMIDST DATA

There are three types of relationship amidst data which are the following -

- One to One relationship

- One to Many relationship
- Many to Many relationship

In **one to one relationship**, there is an association of two separate entities. For instance of the student and his roll. no. and the husband and the wife. A student has only one roll no. Similarly a husband has only one wife and vise versa. (See the figure).

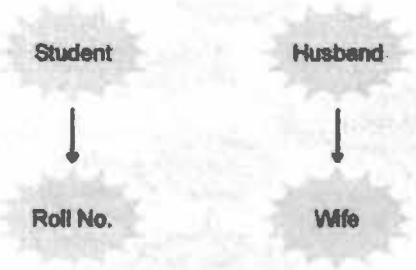


Figure : One to One relation

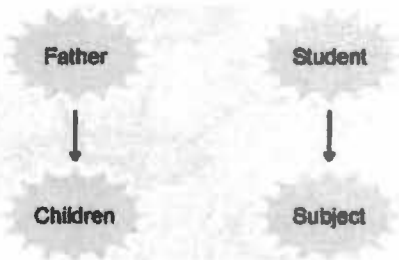


Figure : One to Many relationship

In **one to many relationship** any one entity might relate to several entities. For example a father to his children and the student to his subjects. A father may have several children and one student may take several subjects. (See the figure).

Many to Many relationship is the association of many entities with many entities. For example, between the teachers and the students and between the companies and the products. A school has many teachers and they relate to many students. Likewise there are many products in the market and their seller companies are many in number, (See the figure)

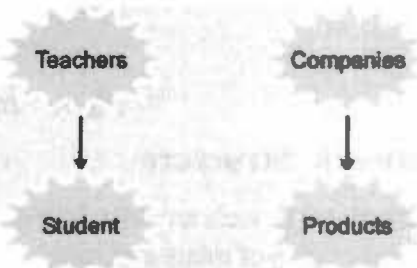


Figure : Many to Many relationship

TYPES OF DATA STRUCTURE

The structure of the data determines what sort of relationship there will be amidst the entities in the system. However all database management systems have only one method of data management, their methods of creating data are different. Data structures are mainly of three types- hierarchical, network and relational.

Hierarchical Structure

Hierarchical structure is also called tree structure. In such structures, there are not more than one entities on one side. In other words, it prepares structure based on 1:1 (One to one) and 1:M (One to Many) relationships. In it, the owning entity is called **parent** and the owned entity is called **child**. If the parent entity has no other owning entity, it is called **root** entity. For example, the figure 11.5 presents the description of a student, in which has been given the IDNo., Name, Address and the Date of Admission. Each has many owned entities except ID number. It is easy to design and understand the hierarchical model. (See the figure)

ST. PAUL SCHOOL

ID No.	Name			Address				D_O_A (Date of Admission)		
	Last	First	Middle	Street	City	Distt.	State	Month	Date	Year

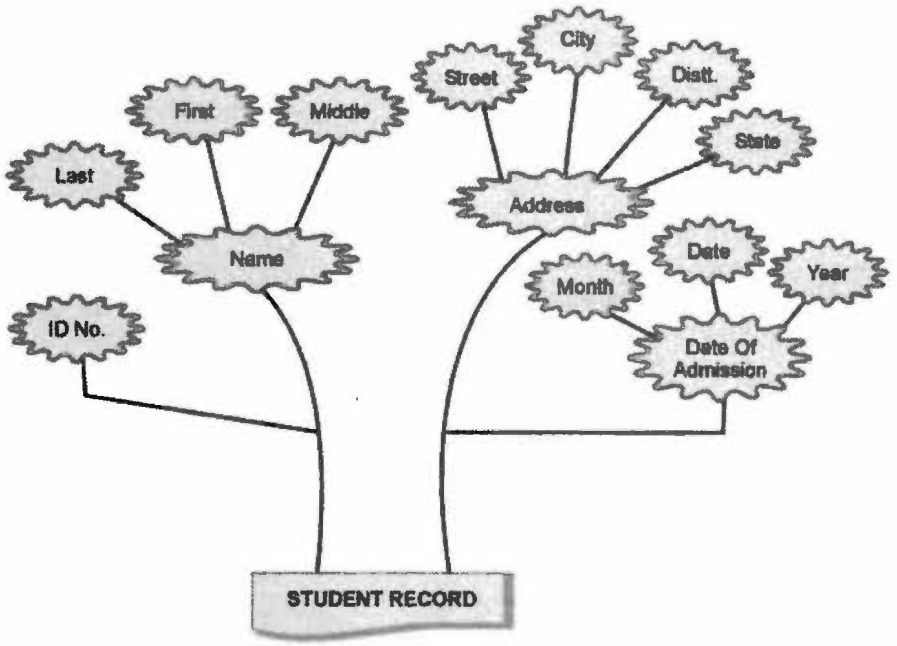


Figure : Hierarchical structure

Network Structure

Hierarchical models are not fit for all types of applications. For example, if there is the association of many and many entities, the hierarchical structure will not work. In such a case, the network structure is brought to use. In network structure, all three types of relationships 1:1, 1:M and M:M can be implemented. For example the products shown in the figure are of many companies sold in one shop. Therefore, if you see like this, all the three types of relationships will be on display in this figure.

1:1 – The relation of the shop with a particular company.

1:M – The relation of the shop with many companies.

M:M – The relation of different companies with different products.

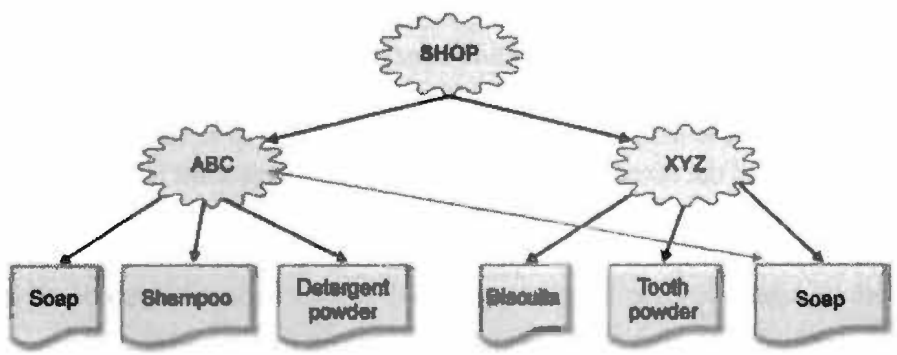


Figure : Network structure

In the Network structure, however the program construction is complex, it is relatively more practical and in vogue. To eleminate its complexity the network can be separated with its duplicate in several hierarchies. It will be the simplified form of the relation and will not be more complex than 1:M. In this situation, a subview of network structure will be formed. You can see the simplified network structure in figure.

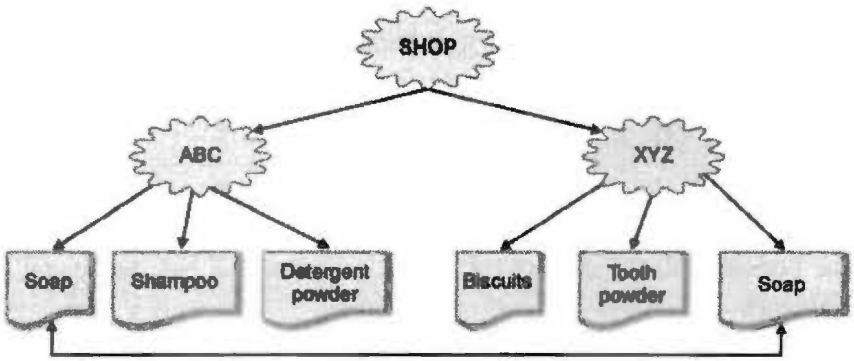


Figure : Simplified Network structure

Relational Structure

In the relational structure all data and relationships are presented in flat two-dimensional table which is called relation. Relation is just like a file in which in every row one record is presented. In the figure there is a relation in which the student entity has been shown with his roll no. and his fee dues. One whole column points out only one type of entries and each column has a unique name. In addition there is no repeatition or duplicate in the record. The row is also called **tuple**.

A relation database management system has the following symptoms –

- With its help, the user can update the subject matter of the table by adding, changing or deleting it. Any position can be changed.

Roll No.	Names	Fee dues
125	Kumar, Ajit	1950
223	Singh, Rajeev	2105
112	Kumari, Kanta	1250
305	Bharti, Pragya	0475

Figure : Student Relation

- It contains the capacity of enquiry as per label. For instance, what is the amount due against fee of Ajit kumar. Its answer would be 1950.
- A relation can be formed by connecting two or more tables. In contrast to the hierarchical and network structure, in which the relationships are predefined, the relational database system can form new relations on the command of the user.

For example, one relational database management system keeps two relations : FEE DUES and Classe. Now you want to develop such a question. The question, "Which class is Ajit kumar in ?".

Check Your Progress :

4. Define Data model.
5. What types of relationship amidst data.
6. What do you know about Hierarchical structure.

The following process will take place before this question is answered.

- Relation will be established between student fees and student classes.
- Combining both will be formed a relation and it will be kept in a temporary file.

Forming relational structure is easier than hierarchical and network structure.

Roll No.	Classes
125	VIII
223	X
112	IX
305	X

Figure : Student Classes

ENTITIES AND ATTRIBUTES

Entity is related to the interest of the user on the basis of which the data are collected and stored. It is also called data aggregate, for it contains several data elements. For example the student entitity includes the Roll.No., name and fee dues of the students.

Data entities can be explained using many terms, such as with the value key of attribute of entity and its example. For example, a student, who is an entity is known from his attributes, such as his roll no., name, class, section etc.

So, we can say that attributes clarify the entity. Attributes are stored in physical form as field or data elements (See the figure 11.10). Each attribute has its own unique value. For example, the roll. no. of a student is 125. Likewise, attribute keeps the value of a special occurance or instance of the entity. In figure, entity is the instance name of the student the value of which is Ajit Kumar. Other values which mention him are class, section and age. Therefore, VII and 08 will be the instance of the entity.

The unique identifier of an entity is key. In our example, roll no. is the unique identifier of Ajit kumar. There are no other identifiers for they might have the same value. These are called general identifiers.

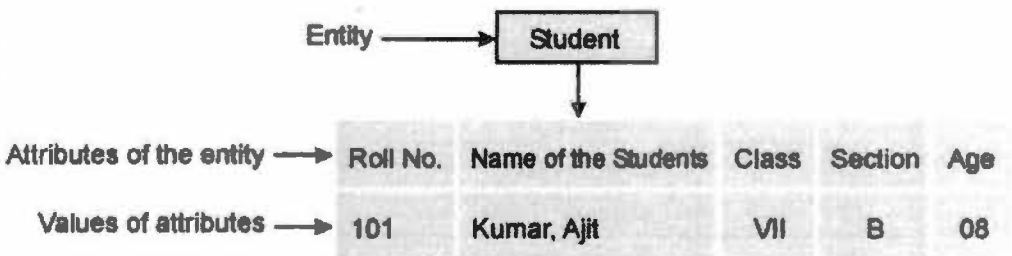


Figure : Attributes of entity

NORMALIZATION

Normalization is a technique that simplifies the relations amidst data elements. With the help of the normalization method the data collection in the record structure is replaced with more simple records which due to being pre-informative and practical, are easily operational. In the first step of normalization the data are changed in table or relations. In the next step, the table is saved from redundant data and is turned into non-redundant form. After it, the non-redundant model is turned into database definition which achieves the target of database design step.

WHY IS NORMALIZATION NECESSARY ?

Extreme and redundant data is unnecessary repeatition of the fact. It can create problems with data collection and retrieval. Normalization reduces the redundancy

of data. The redundancy of data creates incongruence and irregularity. Two things related to the redundancy of data are the following –

- When the same data repeats, the chances of committing errors are more.
- When the data is repeated, it is difficult to update or delete it. In such a condition it gets difficult to guess, which data has been updated and which data has not been updated.

During the normalization process you can identify dependencies which can create problems while deleting and updating it. Normalization also helps simplify the table structure. The wholly normalized record is made on the following facts –

- A primary key which identifies those elements.
- A set of attributes which describes that entity.

In the process of normalization, data is grouped in the most simplified form so that the changes brought later can affect data structure the least. When many entities are divided in groups, some attributes too take the form of entities. The normalization of these entities in more entities improves the functional smoothness of database management system. The normalization steps have been described in further sections.

FIRST NORMAL FORM

The table comes in the first normal form when there is no repeating group in it. Repeating columns or fields are deleted from the unnormalized table and put into a separate one. These tables depend on the parent table. The parent table is the table from where that special table originated. The key to these tables too should be a part of the parent table so that the parent table and the derived table can remain related to each other.

Employee No.	Employee's Name	Branch Office	Department	Item No.	Item Description	Price
5001	Om Prakash	Ghaziabad	Marketing	A401	Anikspray	105.00
				B100	Baking Powder	55.00
				B101	Bournvita	155.00
5201	Deepak Kumar	Gwalior	Accounts	R001	Razor	15.00
				M101	Milk Powder	60.00
				M001	Mineral water	105.00
4501	Rajesh Dubey	Lucknow	Production	R005	Ribbon	35.00
				P101	Paper	1200.00
				C100	Cartridge	205.00
4112	Dinanath	Mathura	Research	J002	Journal	125.00

Figure : Unnorma-lized file

Isolate the repeating groups from the entity because it is easier to process them in isolation. In figure, there is unnormalized file structure. The first four attributes- the employee no., employee name, branch office, department are fixed. The rest three attributes item no., item description and price contain those data which keep changing and keep repeating with different salespersons. Therefore the repeating groups should be isolated from the salesperson's entity.

The normalized file has been shown in the figure. It is made on two files –

- Salesperson data file which contains the employee no. as the primary key.
- Salesperson item file - In which the employee no. and the item no. are new attributes. After adding both these attributes the record of this file is related to

a salesperson data file. Both of these data attributes are used to access data together. Using both the keys together is called concatenated key.

Employee No.	Employee's Name	Branch Office	Department
5001	Om Prakash	Ghaziabad	Marketing
5201	Deepak Kumar	Gwalior	Accounts
4501	Rajesh Dubey	Lucknow	Production
4112	Dinanath	Mathura	Research

Salesperson Data File

Employee No.	Item No.	Item Description	Price
5001	A401	Anikspray	105.00
5001	B100	Baking Powder	55.00
5001	B101	Bournvita	155.00
5201	R001	Razor	15.00
5201	M101	Milk Powder	60.00
5201	M001	Mineral water	105.00
4501	R005	Ribbon	35.00
4501	P101	Paper	1200.00
4501	C100	Cartridge	205.00
4112	J002	Journal	125.00

Salesperson Item File

* – key

Figure : First Normalized File

SECOND NORMAL FORM

The table enters into the second normal form when all its Non-key fields depend completely on the whole key. It means every field of the table should depend on the entire key. Those which don't depend on the combination key goes to the table on the key of which they depend. Structures which don't have combination keys, automatically come into other normal state.

The second normalization ensures that each non key attribute depends upon some key attribute or on some concatenated key.

If non-key attributes are unable to fulfil this condition they are split into easier entities. In the figure, each attribute of salesperson data file depends upon primary key "Employee no."

In the salespersons item file, the attribute "price" depend upon concatenated key "Employee no. and item no." As the file is set-up "price" is related to the salesperson no. and item no. Besides, the "item description" too is attached with the Item no., in no case, maintains relationship with "Employee no." field. There are many reasons behind it. If any salesperson is transferred, it will be very difficult to maintain his record for when he leaves the "sales person" department, the sales information of his part will halt. This is because sales information (item no., price) is linked with the "Employee no." of sales-person item file.

To solve this problem, we create new independent entities for the "item no." and "price". In one file, along with the item no. keys of the sales-person item file we create an "item description" attribute. The remaining attributes (employee no., item no., price) become the other file or relation. (See figure).

1

* Employee No.	Employee's Name	Branch Office	Department
5001	Om Prakash	Ghaziabad	Marketing
5201	Deepak Kumar	Gwalior	Accounts
4501	Rajesh Dubey	Lucknow	Production
4112	Dinanath	Mathura	Research

Salesperson Data File

2

* Employee No.	* Item No.	Price
5001	A401	105.00
5001	B100	55.00
5001	B101	155.00
5201	R001	15.00
5201	M101	60.00
5201	M001	105.00
4501	R005	35.00
4501	P101	1200.00
4501	C100	205.00
4112	J002	125.00

Salesperson Item File

* Item No.	Item Description
A401	Anikspray
B100	Baking Powder
B101	Bournvita
R001	Razor
M101	Milk Powder
M001	Mineral water
R005	Ribbon
P101	Paper
C100	Cartridge
J002	Journal

Item File

Figure : Second Normalized File

There are several benefits in consequence of making the second relation . The sales items can be linked without relating to any particular sales-person. If the time varies we need only to change the item file. If anyone leaves the sales-person department, no effect will be cast upon the statistics related to the sale of items.

THIRD NORMAL FORM

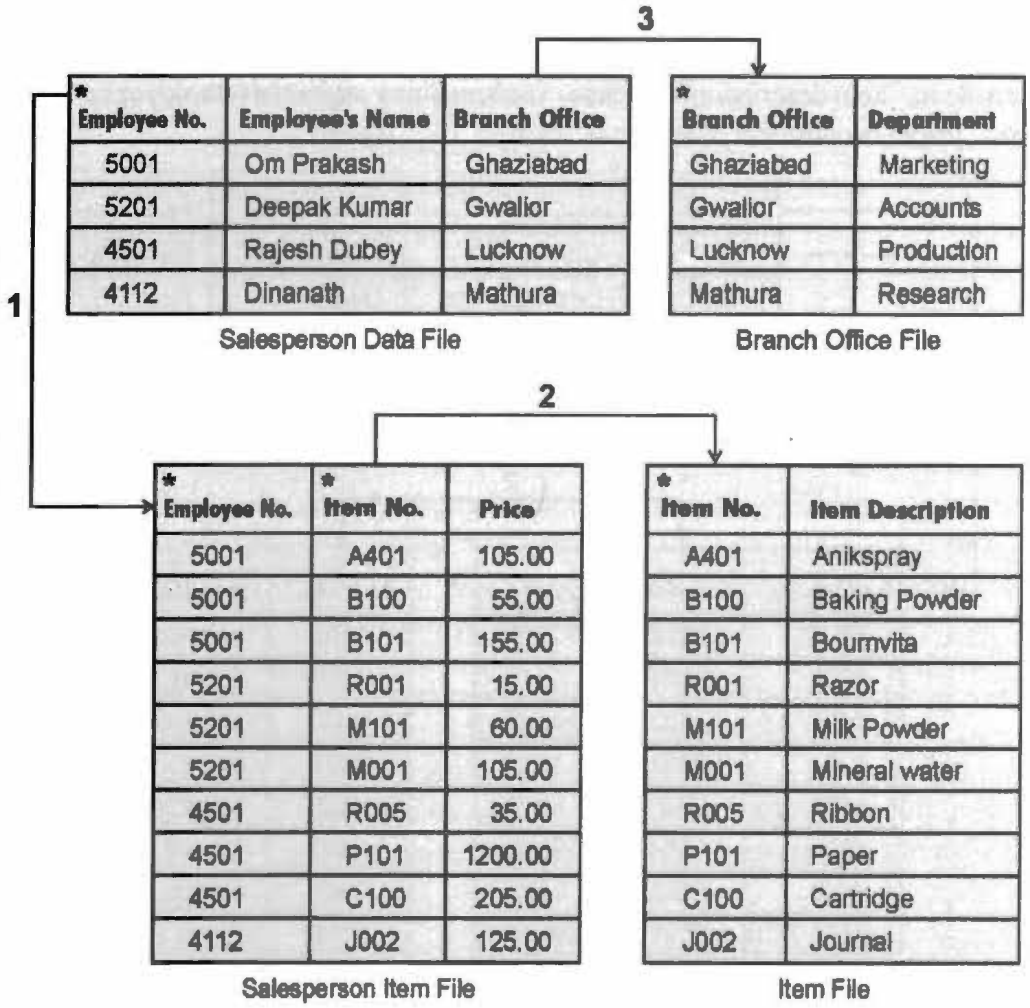
The table is said to be in the third normal form when all non-key fields of the table are independent of all other non-key-fields of the same table, it means there is no dependence of one upon another.

On looking at the second normalization we find that it needs more improvement. In the salesperson data file the attribute named "branch office" is attached with the primary key "employee no. while "department" attribute is linked to "branch office" which is a non-key attribute. To turn "branch-office" into key-attribute it is necessary to establish a new relation by isolating "branch-office" with "department". (See figure)

In the third normalization, we can isolate branch office information from salespersons. Here, we without updating the salesperson record, can bring change into the "department". In such case, normalization simplifies the relations and builds logical link amidst files without damaging the information.

Check Your Progress :

7. What is Normalization?
8. Define Attributes.
9. What is the Role of Database Administrator.



* Employee No.	Employee's Name	Branch Office
5001	Om Prakash	Ghaziabad
5201	Deepak Kumar	Gwalior
4501	Rajesh Dubey	Lucknow
4112	Dinanath	Mathura

* Branch Office	Department
Ghaziabad	Marketing
Gwalior	Accounts
Lucknow	Production
Mathura	Research

* Employee No.	* Item No.	Price
5001	A401	105.00
5001	B100	55.00
5001	B101	155.00
5201	R001	15.00
5201	M101	60.00
5201	M001	105.00
4501	R005	35.00
4501	P101	1200.00
4501	C100	205.00
4112	J002	125.00

* Item No.	Item Description
A401	Anikspray
B100	Baking Powder
B101	Bournvita
R001	Razor
M101	Milk Powder
M001	Mineral water
R005	Ribbon
P101	Paper
C100	Cartridge
J002	Journal

Figure : Third Normalized File

An inherent problem with normalization is data redundancy.

For branch office the system comes through three steps -

- The salesperson item calculates the total sale of every salesperson from the file.
- The employee goes to the data file and sees which department is given to which sales person.
- The branch office collects the sale of each sales-person in a specified field in the file.

This procedure is repeated for every salesperson in the file.

ROLE OF DATABASE ADMINISTRATOR

Database is a shared source. When two or more users use the same database, different problems are created. To solve all these problems, the company appoints a person, who is called Database administrator.

MANAGING DATA ACTIVITIES

The database administrator manages data activities by the standard, control procedures and documentation. The purpose of this arrangement is to save one user from

any sorts of difficulties of the other user. Every database has a standard name, format and a unique strategy of access. For it the reporting and management of database by the administrator simplifies the management control.

In addition to it, an administrator is also related to data access and modification. Who can only access data, in addition to data access, who else is authorised for the modification in data. All this is the responsibility of the administrator. Besides, after the system comes to a halt, the responsibility of its recovery also lies with the database administrator. The database administrator trains the user for the successful recovery of data and maintains the documentation.

MANAGING DATABASE STRUCTURE

This responsibility contains many tasks, such as designing a special program for the control of schema and redundancy, maintaining the control of change request, implementing the change in schema and maintaining the user documentation. In the case of documentation, the database administrator should be fully aware of the change.

MANAGING DATABASE MANAGEMENT SYSTEM

Responsibility as a database administrator, is to compile statistics related to central processing unit and system efficiency and of equiry on C.P.U. time and elapsed time. C.P.U. time is the time taken by the C.P.U. in processing a request. The elapsed time is the time consumed in processing the activities and displaying the output. Most of such time depends upon the nature of activity.

There are some more elements which affect the management of database management system. The database administrator tests the work related complaints of the user and keeps maintaining the capacity of the system as per the user's requirements.

The job of a database administrator is of full time and a lot of responsibilities. In addition to the managerial background a database administrator must have the technical knowledge. If some database administrator is at home in management and technical knowledge as well, it is good for him. The database administrator, besides proper management of the database of the company, gives significant contribution in supervising the user of the system.

Answer of the Check Your Progress

1. We know that the base of gathering information in a computer is 0 or 1. This 0 or 1 is called bit which is an abbreviated form of Binary Digit and a group of 4 bits is called nibble and a group of 8 bits is called byte. One letter of the text we put on the screen through input device, is called byte. It means byte is supposed to be the smallest unit of a file.
2. A file is constituted of the groups of similar records. It means, a file can be described as a group of similar sorts of records. The size of the file has a limit which depends upon the available space in the storage medium used by you.
3. In direct access, data can be obtained in any order. No matter what the order of entering the data is, we through direct access can obtain them in any sequence. To clarify the difference between direct access and Serial access we can take the example of the cassettes used in the stereo systems and gramophone records.

4. Data model is a framework or a mental image of the user's view.
5. There are three types of relationship amidst data which are the following :—
   ⇨ One to One relationship
   ⇨ One to Many relationship
   ⇨ Many to Many relationship
6. Hierarchical structure is also called tree structure. In such structures, there are not more than one entities on one side. In other words, it prepares structure based on 1:1 (One to one) and 1:M (One to Many) relationships.
7. Normalization is a technique that simplifies the relations amidst data elements. With the help of the normalization method the data collection in the record structure is replaced with more simple records which due to being pre-informative and practical, are easily operational.
8. Attributes are stored in physical form as field or data elements. Each attribute has its own unique value.
9. The Role of Database Administration are :–
   a) Managing Data Activities b) Managing Database Manangement System
   c) Managing Data Structure.

EXERCISE

1. Define file structure.
2. Write down different methods of organizing file.
3. Explain database and dbms.
4. Differentiate between direct and sequential access storage.
5. Write down objectives of database.
6. Explain the concept of data structure.
7. Define types of relationship among data.
8. Explain types of data structure.
9. Write a note on entities and attributes.
10. Why normalization is necessary?
11. Write down role of DBA.

14 Implementation And Software Maintenance

The Chapter Covers :

- Introduction
- What is System Implementation ?
- What is System Conversion ?
- Types of Implementation
- Conversion
- Conversion Activities
- User Training
- Combating Resistance to Change
- Post Implementation Review
- Software Maintenance
- Maintenance or Enhancement ?
- Primary Activities of Maintenance Procedure
- Reducing Maintenance Costs

INTRODUCTION

Implementing a new system is an important aspect of system development life cycle. In this stage the system is to be implemented which includes creating files as per the system, installing hardware, installing terminals and making intranet, internet and telecommunication etc. available. After it, the system having started functioning, the solution to its future problems is also a part of life cycle. This chapter will deal with some points of this sort.

WHAT IS SYSTEM IMPLEMENTATION ?

Implementation is the process of system development life cycle where the users bring the developed system in working condition, it means the developed system starts its work and after this it is handed over to the user.

WHAT IS SYSTEM CONVERSION ?

Conversion is that process of completing all works which as a result hands the new system over to the user.

BETTER PERCEPTION

There is a little difference between implementation and conversion. Converting the developed system completely into working condition is called implementation. While conversion is an activity of implementation. Implementation includes several activities besides conversion which contain appraisal after implementation and software maintenance.

TYPES OF IMPLEMENTATION

Implementation are of three types –

- **Implementing the computer system by converting the manual system :** It mainly includes solution the challenges like file conversion, proper creation of files and output testing.
- **Implementing the new computer system by converting the old computer system:** It is a difficult conversion and lack of planning in it, may make causes of several problems. The conversion of large sized computer system takes several months.
- **Implementing the modified system by replacing the old computer system :** Such type of conversion is comparatively easy, provided no big changes have been made in it.

CONVERSION

Conversion stands for replacing one system with another. Its objects are-activating the tested system and minimizing the conversion cost, risks and the annoyance of the user. The main tasks in the process of conversion are to create files in accordance with the computer, to train the operating staff and to install hardware and terminal. An important aspect of conversion is that it should not turn an obstacle in the functions of the organisation.

Conversion is the most important and interesting phase of System Development Life Cycle for here is to come out the result of the actions of the designer group. It is also mentally shocking when either the system gets shut down on account of some problems, or the data files get corrupt, the training packages remain to be completed and the user finds it difficult to understand the task. Such conditions crop up owing to weakness in training and conversion sans planning.

CONVERSION ACTIVITIES

Implementation plan includes three as follows –

- Procedures conversion
- Programs conversion
- Files conversion

Procedures conversion – Usually, the system contains many forms and procedures of the old system, and modification is required to mould it as per the new system. Besides new systems are related to the networks of some other systems, owing to which modification is necessary in the procedures. Those procedures which require modification, should be identified and the user should be familiarised with those changes during the training.

Programs conversion – The new computer system may include some programs of the conversion problems takes place when new equipments are insalled, the input and output of the old program change or the already created programs are not fit for the new enviornment. The old programs are evaluated when the new equipments

The program might have to be created again, if they are not effective enough.For example, several small programs may be replaced with a new one which can accomplish the repeatitive function more effectively. Other computer programs related to the system should also be tested. For this, programming too needs to be reshuffled and newly modified programs must be reinstalled with the earlier ones.

Files conversion – File conversion is the most time taking and expensive phase in the whole project. The importance of this task is often undervalued. For example, many of our records of customer account if placed in magnetic file instead of putting it in the file, this conversion can be expensive. The files created earlier should be changed into the format which is acceptable to computer program and equipment. The duplicate files should be deposited before implementing the new systems and the errors cropping up in them should be rectified. If not done so, many problems can crop up after the implementation of the new system.

The file coversion activities consist of several basic system analysis activities such as fact finding and analysis, form design, procedure writing and computer program designing. We can divide file conversion into three principal activities-

- Collecting file conversion data
- Files conversion
- Investigating converted files

In many circumstances, the file conversion data should be collected from several sources. Some data may already be in mechanical form, but it is almost necessary that to complete the data which have been filed earlier in any form, new data should be created. To transfer the data from the old files to the new ones, form can be designed and procedures can be written.

Verifying data in new files is an important and difficult task. Discrepancies are common. For example, a shared database which is to be collected between the data collected into redundant files, it should be ensured before consolidation which file is correct. Verfication generally requires extensive co-operation of user staff. The analyst should keep it in mind that the new file manager is computer which unlike human file manager is not flexible at all, it means, man not only can find out the errors but also avoid them, while the computer is not capable of doing any such work.

The real file conversion is done with the help of computer program. These programs should be tested before they are required. The program should sort the data,validate the data and a file should be created in the new format with the help of these programs. Though before collecting the data, the real files have been purified, errors may occur during conversion. All the file data should be verified by printing them. Again, the co-operation of the user is required here. The specific file purfication form needs to be designed or converted if a big database is being assembled. The inclusion of the user in file conversion activities is necessary because it helps win the user's trust in new database and computer system.

USER TRAINING

As it has been told in the last sections that conversion consists of many activities such as creating files, training the user and installing hardware. In the analysis of user training, chiefly two factors are stressed, the ability of the user and the nature of the system being installed. The user may be from naive to conscientious. The developmental research presents extremely interesting facts that what inexperienced users think about their first exposure to the new system. They take it as concrete learners. They only want to learn how to use the system and it hardly matters to them which intangible principle determines which system.

Likewise, the requirements of the system may range from very easy to very difficult functions. Those functions, in which the user has to follow a well -defined, direct and step-wise procedure may solve the problems only to a limit, it means the training level is basic and of less time-span. For instance, to teach a person how to deposit money into an automatic teller machine and withdraw from it is an example of direct and physical work. In contrast to it, analysing the situation given to the trainee and translating into a procedure to manipulate the computer is a complicated task, which requires a long and formal training.In both the cases, the training depends upon the ability of the user and the complexity of the system. The detailed information related to training has been given in chapter no.12.

COMBATING RESISTANCE TO CHANGE

Generally, no change within the company is happily accepted by the staff. Specially, when the change is going to influence the whole system, it is natural that it will be resisted. This section will deal with the causes of resistance to the change in a system and how it can be overcome.

As soon as the staff members hear of the change there is a kind of excitement in them. This excitement occurs when they are unware of the result of the catalysed result of the change. They are gripped with the following conflicts-

- A change in the work content
- Lack of thinking capacity in new direction
- A change in the pattern of personal relationship
- The probable damage of related self-respect in the new work
- The fear of losing control with the work content.

Thus, when people feel stress, their reaction also includes the resistance to change. They manifest their reactions in the following way.

- ➪ Ill will against colleagues, disruption in communication, careless in the proper accomplishment of the work.
- ➪ When a new system is implemented, it faces some specific problems. For example, the installation of a new system affects the productivity and job satisfaction of the staff. It,in a way, creates an environment of resistance which lasts after the implementation. The employees, generally try to get comfort by spoling the system for they are unable to understand the function of the system. It occurs because of the communication gap between the user staff and the developer group, which is the root cause of all the problems

or the developer group is unable to eradicate the prejudices from within the user staff. To minimise such resistances there are the following strategies.

- Identifying the loopholes of the current system, get it extensively discussed so that the user staff could himself feel the requirement of the new system.
- The developer group could, honestly, explain it to people how the new system can simplify their worklife.
- Should use all the means of communication between the user staff and the technical staff so that the ill will of the user staff can be removed.
- The user staff and the other staff should be involved in all the steps of conversion and implementation so that they can happily extend their co-operation.

The relation between the user staff and the developer group is very important. The people responsible for this task are often sensitive to these relations and try to minimise the effect of implementation of the system on the user.

POST IMPLEMENTATION REVIEW

Post implementation review is a process in which it is determined to which extent the system is functioning well and is capable of fulfilling the requirements of the users. In addition whether the user of the new system has accepted it completely or not and whether it requires further modification or not, The developer in post implementation review, prepares a questionnaire, which is answered by the user-staff. These questions are the following :-

- Whether the system has improved your user's working capacity?
- Whether the system has the capacity to fulfil the purposes of the organisation?
- Whether the system is capable of finding and checking the errors?
- Whether the system gives you information at the right time?
- Whether the system has helped in making your worklife easier ?
- Whether the system has enhanced your productivity?
- At last, whether the system is working as per your pre-defined facts.

SOFTWARE MAINTENANCE

Software maintenance is the name of the service after sale. As, we purchage any product like refridgerator, computer etc. We get guarantee for it which includes both on- site or off-site services. Similarly, the software sellers accept the responsibility of software maintenance after its implementation, it means the upcoming problems of it are to be solved by the developer groups themselves. A company spends the fair part of its budget on its software maintenance and the system developer is busier in system maintenance than he is in developing the program. The maintenance has some basic problems-

- Maintenance is neither interesting like system development nor is it more rewarding. It is a work of such class which demands neither skill nor experience.
- The user doesn't have much information regarding its maintenance time and cost.

Check Your Progress :

1. What is system implementation ?
2. Write the types of implementation.
3. What do you mean by software maintenance ?

- There are few tools available for maintenance.
- It lacks good test plan.
- Measures, procedures and commands are neither well defined nor well-followed.
- The task of maintenance is allotted to low- level programmers
- The program is generally maintained without structure and documentation.
- Maintenance has minimum standards.

MAINTENANCE OR ENHANCEMENT ?

Maintenance is classified in three ways- corrective, adaptive and perfective. Maitenance stands for improvement in process or function failure. Such sort of maintenance also refers to such changes which had to be made because of some wrong anticipations.

Maintenance stands for changing the program function. The purpose of maintenance is to enhance the work capacity or modify the program in order to fulfil the additional or changing requirements of the user. Of all such types, the money and time which is spent in perfective maintenance is far more than that spent in both corrective and adaptive maintenance.

Maintenance covers a big range of activities which includes correcting the coding, designing the errors, updating the documents and upgrading data testing and user support. Many activities which come in the order of maintenance are, in fact, enhancements. The meaning of maintenance is to restore anything to its real form.

Unlike hardware, software does not diminish. It only needs modification. In contrast to it, enhancement means linking the code, modifying it and redeveloping it to support the alteration in specifications. For it, it is necessary, to maintain an understanding with the changing requirements of the user and the operational environment. Though, unlike hardware the software doesn't diminish, with the due- maintenance the integrity of the program, the documentation and test data get spoiled with the work. As a result, the maintenance of application requires more labour than writing it afresh.

A serious problem with software maintenance is that the nature of its work is labour intensive. It is an error -prone process which is supposed to be a work more costly than writing the program.

PRIMARY ACTIVITIES OF MAINTENANCE PROCEDURE

The maintenance activities begin soon after the conversion. The maintenance is conducted by the same planning and control which is applied in formal system project. The documentation has the same importance in maintenance as it is in system development. In short, after the needed modification is defined, the maintenance personnel is requested for service by the authorised user. The source program and written procedure for the system are obtained from the programming library. The change in the program is tested then and handed over to the user for his approval.After the approval of the user the modified document is filed and put in the library and the notice related to the completion of the project is sent to user which also contains the information about the completion of the user's project.

REDUCING MAINTENANCE COSTS

To control the problems arising out of software maintenance, a solid plan is required. In several management information system institutions, a plan consisting of three phases,has been prepared which is as follows-

- Maintenance management audit which evaluates the quality of maintenance effort through interviews and questionnaire. Some of its queries are as follows:-
  - ➪ How many hours out of those spent on usual work is spent on error-rectification and improvement?
  - ➪ Is there any program in your institution to minimise the maintenance ?

Software system audit which necessitates these tasks :

- An integrated approach on determining system documentation and data files and database and system maintainability, reliabilty and efficiency
- The functional information collected on all programs in the system which determines to what extent the program completes the task successfully. Every program is given an intial ranking value.

Software modification which is based on three steps -

- The re-writing of the program which includes logic simplification, documentation updates and error - rectification.
- System -level update, which completes the task of system level documentation, makes the data flow diagram and system flowchart up to date and cross references the program.
- Re-auditing the low level programs which helps ensure that errors have been rectified.

Such maintenance reduction plans result in more reliable software, less maintenance back-log, time saving in error rectification, enhanced satisfaction of the user and job satisfaction of the maintenance staff.

In summary,the maintenance task hangs heavy upon the capabilities of new programmers. To lead the maintenance task in right direction, one requires skill and experience. The ability of the maintenance programmer to take healthy decisions depends upon his technical skill and his ability to identify the requirements of the user.

The other factor of the maintenance programmer's success is work environment. Usually, the maintenance programmer is paid less wages than other programmers and they get less fame and recognition than other programmers. Little attention is paid to their training.

Considering all these aspects, the maintenance field needs to be paid more priority, and the maintenance programmer should be extended proper training.

Answer of the Check Your Progress

1. Implementation is the process of system development life cycle where the users bring the developed system in working condition, it means the developed system starts its work and after this it is handed over to the user.
2. Implementation are of three types : –
   - Implementing the computer system by converting the manual system
   - Implementing the new computer system by converting the old computer system
   - Implementing the modified system by replacing the old computer system
3. Software maintenance is the name of the service after sale. The software sellers accept the responsibility of software maintenance after its implementation, it means the upcoming problems of it are to be solved by the developer groups themselves.

EXERCISE

1. What is system implementation?
2. What is system conversion?
3. Write down various types of implementation.
4. Explain the concept of conversion.
5. Define conversion activities.
6. Write a note on user training.
7. Explain the concept of post implementation review.
8. Define software maintenance.
9. How to reduce maintenance cost.

15 Hardware/Software Selection and the Computer Contract

The Chapter Covers :

- Introduction
- Supplier and Types
- Software Industry
- Procedure for Hardware/Software Selection
- Major Phases of Selection
- Role of Consultant
- Selection of Vendors
- Post Installation Review
- Software Selection
- Criteria for Software Selection
- Ownership
- Financial Consideration in Selection
- Computer Contract
- Art of Negotiation
- Responsibilities and Remedies
- Hardware & Software
- Delivery and Acceptance
- Warranties
- Finance
- Guarantee fo Reliability

INTRODUCTION

Several types of specific hardware and software are required in system development. The system analyst selects these hardware and software as per the requirement of the system. The wrong selection of hardware and software affects the functional capacity of the system. Understanding its significance, the system analyst should be at home in such selection. In the order of this selection, the system analyst comes across includes many issues of software and hardware vendors which include many things such as the bargaining of products, contract etc. This chapter throws light on these very things.

SUPPLIER AND TYPES

Companies which supply us any object, product etc. are called suppliers. In computer industry we purchase three types of products- software, hardware and service. Therefore, we can put the suppliers in three classes - software supplier, hardware supplier and service supplier.

HARDWARE SUPPLIERS

Hardware suppliers are those from whom we purchase computer, printer, scanner, terminals and other peripherals. The hardware suppliers working in India are- I.B.M, Microtech, H.P., Philips etc. Even, amidst them, there are several classes. One class deals in only the products of one company, such as the authorised dealer of I.B.M. deals in the whole computer system of I.B.M. The second class assembles the parts of different companies and deals in it. Similarly, another class deals in some specific peripherals of computer such as monitor, C.D. drive, printer, scanner etc.

SOFTWARE SUPPLIERS

In all over the world, there are software suppliers many times more than the hardware suppliers and are on toes to establish their product in the market with many more features. Some prominent names among them are- Microsoft, Sun Microsystems etc.

They in themselves,have many classes and many areas. Amidst them, for micro computer, mainframe and mini computers, there are products available with many features. Likewise, several small companies which are working on national level, such as Infosys, Tally Corporation etc. which provide some limited types of softwares. The prices of all types of software are based on their complexity, their functions and the name of the company attached with them.

SERVICE SUPPLIERS

The people supplying services are called servicers. They include the following people :

- **Computer manufacturers** - Computer manufacturers provide various services, such as- system design, programming and hardware maintenance etc.
- **Facilities management furnishers** - These are the people who manage the computers installed by the user. This concept has many benefits. The user has to only pay for the service. The main loophole in it is that the user has to cough up rather big amount for it.

SOFTWARE INDUSTRY

Now a days software has established itself as an industry. The different softwares used for system development can be expressed like this:-

Types of software - Software are classified based on their nature of working. Thus, we can divide them as two types :

- **System software** – This program is made to control system processes and system implementation. For example operating system, database management system (System operation), assemblers and compliers (system implementation).

- **Application program** – By these programs the works defined by the users are done. It includes payroll program, accounts receivable system, online reservation systems etc.

Generally a software has the following features :

- **Concurrence of software** - Concurrence refers to the implementation of different activities at a time. Software, allows different activities to be implemented together. For example the system is reading data from the disk, just at that time C.P.U. is doing some other work, just then somebody presses a key on the keyboard.
- **Resource and Information sharing** – Different programs use the same hardware. Several different users use different programs or different programs use single database. It shows that a system has many interfaces with the outer world.
- **Modularity** – A software is constituted of several modules which keep connected while playing their roles.
- **Multiplexed Operation** – Some software systems use different sources one after another. For example, input/output devices are divided among different users.

The software industry is now on its zenith. It is day by day giving a new direction to the market with new products and is consequently changing its condition. If we glance at few past decades we will see today's software industry having a sea change. From the disc operating system we have stepped into the age of windows 9x, Windows 2000, N.T., Unix and Linux. Disc operating system which is single operating system has textual interface while modern operating system has graphical user interface, contains many well-equipped features and qualities such as multitasking, multiprogramming, time sharing etc. Today the software industry has left the companies of many big products far behind. The reasons of which are the following :

- **Shortage of programmers** – Because of the astonishing demand of the development of computer based system, this industry has faced a severe shortage of programmers. Even today, this industry lacks good computer programmers. With a purpose to control this problem readymade softwares are being used as alternatives. For example, because of the shortage of programmers, many smaller companies are using Tally software.
- **Hardware/Software Cost Reversal** – Though software is getting costlier than hardware, if we think of the capacity and function of a good software, we'll see that its real price is decreasing. To expand the market of the software, the application developer has reduced the minimum requirements to run the softwares and the price too has come down while there is no diminution in the capacity of the software.
- **Economics of Scale** – The softwares are available to users on very low price. The principal reason behind it is the presence of hundreds of vendors in the market. If the user takes software from these vendors, he doesn't have to use his skill which is economically expensive.

In the selection of hardware/software the knowledge of computer and software is very helpful. In today's market the user has a number of alternatives for selecting

hardware/software as per his choice. To findout the most appropriate product special knowlede and a serious approach is required. The problem can be solved with the help of an experienced system analyst or an expert consultant.

PROCEDURE FOR HARDWARE/SOFTWARE SELECTION

Many types of hardware and software are required during system development. Hardware stands entirely for computer and its different peripherals and software refers to those different softwares used for running that specific system (which is being developed) which includes both-application software and system software. The system analyst observes great case in the selection of hardware and software and gathers information about the products of different vendors and selects the most appropriate one. For this the analyst/expert applies many sources. Even little carelessness in the selection of hardware/software hinders the function of the system. While selecting hardware/software, the following factors should be kept in mind -

- The capacity of the computer sould be chosen as per the requirement of the business. Computer has proved its importance in the following fields –
  - ⇨ **Cost Reduction** – Which includes reduction in the inventory, saving of space and the capability of understanding better procedures of business.
  - ⇨ **Cost Avoidance** – Contains quick identification of problems, and expansion of operations without any clerical help.
  - ⇨ **Improved Service** – It includes the capacity to provide quick and accurate information to the users.
  - ⇨ **Improved profit** – shows the most important part of business.
- The hardware and software should be chosen by expressing the magnitude of any problem.
- Mention the magnitude of the problem, it means you should determine whether you have to select some peripherals or the whole computer.
- Have a view of the ability of the house staff.

MAJOR PHASES OF SELECTION

We can see the whole selection process as a project and for it, with the management support, a project team should be formed. In the team of a big project, there are programmer and user, advisors etc. Likewise a selection process is formed with different phases. These phases are the following :

- **Requirements Analysis** – The first phase of the selection process is understanding the requirements of the user well. Only those requirements of the user are paid attention which are related to the objective of the company. While selecting the software, the user decides whether it should be purchased from the market or be developed by a programmer.

  The thing is selected by the user keeping his expectation from the software in mind. Requirements analysis plays an important role in software selection.
- **System Specification** – If the system requirements are not expressed before the final selection, it always results in erroneous achievement. The specification should portray the requirements of the user and provide with

an opportunity to bid for different vendors. These specifications should show the real application run by the system and it should include the system objectives, input-output requirements, file structure cost etc. Through this specification, the user totally clarifies each point of the system.

- **Request for Proposal** – After determining requirement analysis and system specification, the format of the request for proposal is prepared and discussion is held with some particular vendors on bidding. The request for proposal, should, at least contain the following things :
  - ➪ The complete statement of system specification, programming language, price and deadline.
  - ➪ A request to the vendor for the responsibility of conversion, training and maintenance etc.
  - ➪ Warranty and terms of license or contractual limitations
  - ➪ The request for the financial statement of the vendor.
  - ➪ The number of available staff for system support.
- **Evaluation and Validation** – Through this phase, the most suitable vendors, who can fulfil the requirements of the user, is selected. It focuses on different technical assistances and price. Through system validation, different commitments made by the vendor is tested, especially the capabilities of the system.

ROLE OF CONSULTANT

Generally, in small firms, the users seek help from the experts from outside the company. But according to a survey made recently, 50% users have not maintained good relations with the advisers from outside and 25% users have not sought the help of advisers from outside. Therefore, it is clear, an expert should be selected carefully and under a good plan. Generally the experts from outside charge a huge sum. During the last decade, in large organisations, different facts related to internal and external experts have been clarified in the following way :

External Consultants

- The expert is not required for the whole period or he is an additional liability on the budget of the organisation
- The additional help on a project is necessary for a certain period and the internal expert lacks time.
- Internal staffs are not skilful and need exhaustive knowledge for a specific condition.
- A political problem, demands a purpose and impartial advice.
- The internal expert too wishes to have the suggestion of the external expert.

Internal Consultants

- The external consultant is expensive, the internal consultant is comparatively cheaper.

Check Your Progress :

1. What do you know about supplier and name their types.
2. What do you know about hardware suppliers.

- Quick decision can be made easily with the help of the internal consultant.
- An external consultant doesn't understand anything about the internal problems, while the internal consultant is well-acquainted with the internal problems.
- An internal consultant already keeps a combination of a purpose and a technique with him.
- He wishes to have the advice of the external consultant.

SELECTION OF VENDORS

In this phase the vendor is selected. To determine the best vendor, the reputation, service record, training, delivery time, lease/economical conditions and conversion are made standards. Initially, it is decided which vendor is to be contacted. Following are the sources for verifying a vendor.

- Users
- Software houses
- Publication/journals
- List of vendors
- Vendor referral directories
- Trade association
- Universities
- Published directory
- Consultants
- Industry contacts

POST INSTALLATION REVIEW

At times, after the software package is installed, the system is evaluated, the objective of which is to determine to what extent the new system stands true to the plan. The system specification and user requirement is audited and the difference is indicated and then improved.

SOFTWARE SELECTION

The most difficult task of system development is software selection. As it has been already told, the software is either purchased from the market or developed by the programmer. Now a days software is purchased from the market. It has several benefits.

- Reduction in software cost.
- Time saving.
- Involving M.I.S. staff in some other project.
- The softwares purchased from the market are generally reliable.
- The risks related to big system are less.
- One doesnot have to face the problems that take place while developing the software.
- One gets an opportunity to test the capacity of the software before purchasing it.

Following are the losses in purchasing the software from the market :

- Sometimes the software is not capable of fulfilling all the requirements of the user.
- One has to face various difficulties while using the software initially.
- There are no easier ways to evaluate a software.

Surveys reveal that the quality of the software cannot be tested by its price alone. For it an arranged review is required.

CRITERIA FOR SOFTWARE SELECTION

Before the selection of software, the project team prepares criteria for selection. It contains the following points :

- **Reliability** – Reliability stands for a software working without failing. It is an important point for a professional user. For example, for a doctor, who uses a computer to treat his patients, the information must be correct.

  The hardware can be inactive for many reasons such as, design error, construction error, heat, humidity, friction etc. In contrast to it, the software neither gets inactive, nor does it diminish. The cause of the problems related to reliability are the problems cropped up in the process of production and where the hardware failures, to much extent, are sudden and connection failures while the basis of software reliability are preset errors.

  Though reliable software is an optional target, limited experiments have been done to improve it in the last decades. To conceal the unreliability of software a maintenance agreement is reached. Today the purchasers are less attracted to the reliability of a software and more to the service provided by it, which is a point to ponder.

  Software reliability breeds the concept of modularity. Modularity is helpful in the modification of the software. It depends upon whether a package has been designed as a package or it is installed after its real installation for its installation use. The packages with high modularity have the capability of operating several machine configurations.

  With modularity comes expandibility which lays stress on this sensitivity of the software how it arranges the increament in transaction and how it builds a co-ordination with other programs. For it, the following questions should be considered-

  - ➪ Are there any opportunity for the expansion of the real file ?
  - ➪ How easy is it to connect extra fields, records and files ?
  - ➪ How much part of a system is affected out of the failure of one part of a system ?
  - ➪ Can the system come to halt because of the user's mistakes ?
  - ➪ How much recovery system is there in the system ?
- **Functionality** – The facilities, working capacity and other factors desired by the user in a finished product is expressed by the functionality of the software. With it, the functional capacity of a system is measured.
- **Capacity** – Capacity stands for the ability of a software to operate different files, data parts, reports and transactions. All the capacities related to a software is checked.
- **Flexibility** – Flexibility stands for measuring the efforts launched to modify a program. A software should be as flexible as possible.
- **Security** – The word security here stands for secured maintenance of data on a system by the user. It has been discussed in the last chapter.

- **Usability** – Usability refers to operating a program, preparing input or calculating the output. Usability contains the following two points :

  - **Portability** – Portability stands for the capability of a software to work on some hardware or different operating systems.
  - **Understandability** – Understandability means understanding the objects of the software. The reckoner (one who reckons) must have complete information about software.

- **Performance** – It includes the measurement of the performance capacity of a software. To test the performance capacity of a software, that software is checked with maximum load.
- **Serviceability** – This criterion, concentrates on documentation and the co-operation of the vendor. For the enhancement of the software it is necessary to have complete documentation. Documentation contains system description, system logic, flowchart, the description of input/output files.

The co-operation of the vendor includes installation of the software, expansion and maintenance. It is the user who decides the amount of co-operation from the vendor. Generally the user wants co-operation from the vendor in terms of training.

OWNERSHIP

It is a very important question who–whether the vendor or the user– is the real authorised owner of a software after its sale. There happens two things in this regard. The vendor, as per the agreement hands over the software to the user in the fixed timeframe and keeps the source code with him or sells it having charged higher price. But when the source code remains with the vendor, the user might have to come across some problems, especially when the vendor declines the agreement or leaves this field. To control such conditions, the source code can be kept deposited somewhere else so that it can be used further in case of emergency. To explain it, look at the following questions :

- Which rights or the software is the user buying ?
- Can the user sell or modify the software ?
- If the user is developing a software for some special user, then can he sell it to the people of only one specific field ?
- What limits have been imposed by the vendor on the question of copying the software ?

- **Minimum Cost** – While purchasing the software, its cost is a signficant point. Generally the users who give importance to cost, pay attention to the following things :

  - The cost of conversion and development
  - The cost involved in modifying the software.
  - Delivery schedule.
  - The method of using the software, means how long the software can be used.

- **The Evaluation Process** – While evaluating a software the knowledge of the user and the co-operation of the user is sought. In the first phase of

evaluating a software a list of appropriate criteria is made and rank is provided on the basis of its importance. After this the reserved and opted facts are separated.

- **Sources for Evaluation** – Generally three sources are used to evaluate a software:
  - ➪ Benchmark program
  - ➪ Experience of other users
  - ➪ Product Reference manuals
- **Benchmark Program** – Benchmark programs are those programs which are used to evaluate different computers and their softwares. Benchmark includes the following things:
  - ➪ The least number of hardwares required to operate the softwares.
  - ➪ The acceptance test mentioned in the agreement is evaluated.
  - ➪ Testing in an ordinary and then in an ideal environment and then drawing a conclusion.

If benchmarking is applied in detail it increases the cost of evaluation. Since benchmark evaluates only the commitments made by the vendor, the other sources of information are required.

- **Experience of other users** – While evaluating a software the experience of other users is applied. Different users help explain the merits and demerits related to the software. To obtain required information from a user, it is necessary that the user is experienced and knowledgeable.
- **Product Reference manuals** – These manuals help evaluate the capabilities of the system. With the help of these manuals, various reports regarding research and system testing is prepared. These reports explain the information related to the computer products, price and services well.
- **Evaluation of proposals** – Various proposals are evaluated as per the requirements of the user. The proposal which doesn't fulfil the requirements of the user is cancelled. Generally all the proposals are received from the user. After all the proposals are received, any one vendor is selected through the following users :
  - ➪ **Adhoc** – Adhoc means a user favouring a certain vendor. In this method the user favours the vendor he likes.
  - ➪ **Scoring** – In this method, every proposal is granted a rank on the basis of its features and the vendor is selected on the basis of scoring.
  - ➪ **Cost Value** – By this method, that vendor is selected who proposes the least price of the system.
  - **Performance Evaluation** – Evaluating the performance of a system means measuring the performance of hardware and software. The capacity of the hardware is evaluated keeping the following things in mind.
- **System availability** – by what time the system will be available.
- **Compatibility** – How the system replaces the available programs.
- **Cost** – What is the purchasing price of the system ? What is the maintenance and operational cost ?

- **Performance** – What is the capacity of the system ?
- **Uptime** – What is the uptime record of the system and which maintenance program is required?
- **Support** – Is the vendor staff, available for the help of the system or not ?
- **Usability** – How easy is it to use and modify the program ?

To measure the capacity of the software the following things are kept in mind :

- ➪ The programming language and its suitability.
- ➪ Easy to install and training.
- ➪ The limit of enhancement before installation.

Besides the evaluation of hardware and software the quality of the facilities provided by the vendor too is evaluated. The vendor provides the following facilities:

- **Back-up** – Emergency computer back up made available by the vendor.
- **Conversion** – Various programming and installation facilities provided during the conversion process.
- **Maintenance** – The maintenance of the hardware provided by the vendor.
- **System Development** – Providing able analysts and programmers for the development of the system.

FINANCIAL CONSIDERATION IN SELECTION

There are three techniques related to any benefit. It is decided when some software is giving profit. These three techniques are as follows :

- Hiring a software from a programmer.
- Taking a software on lease from a vendor.
- Purchasing from outside.

■ **Rental Option** – Generally the users take the software from the programmer on rent. Its time span is less than a year and the user pays for it every month. Generally the rent is charged on (8 hours × 22 days) basis.

The user likes to hire a system on rent out of the following reasons.

- ➪ Insurance, maintenance and other expenses are included in the rent.
- ➪ The user doesn't have to make a huge investment at a time, he can use his money in some other project.
- ➪ By it, the installment related to some project becomes very little.

The drawback of this system is that a very high amount is charged under the rental agreement.

■ **Lease Option** – A lease system is had from a vendor. A lease system of longer period contains higher degree of risk but the price of lease is very low. In contrast to it, the lease system of short period contains low degree of risk but the price of lease is high.

According to the user, the lease has the following benefits :

- ➪ Finance is not needed.
- ➪ The lease amount is less than the rental amount for the same period.

- Generally the maintenance and installation cost is tagged to the lease.

Lease system has the following losses :

- After the lease comes to an end, the user loses the ownership of the system.
- The lease cannot be ended before the given time without paying the penalty.
- While using one lease system, the user cannot use another lease system.

- **Purchase Option** – There are many benefits and losses in the purchase of a computer. The risks of ownership are tagged because of purchasing a computer for example, tax, technical disorders etc. But on the other hand, the owner receives all those aids and facilities which are not received in the rental or lease system.

  The following are the benefits of the purchase option :

  - You can easily modify the system.
  - The cost of keeping the system for the longer period is very low.

  The purchase options has the following losses also :

  - The expenditure is more at the time of purchase.
  - A risk is always linked to a system.

Thus we can say, that every benefit technique has some merits as well as some demerits.

USED COMPUTER

In what conditions does anyone purchase a used computer ? Generally computers can work well for 5-8 years. Therefore, generally all the organisations change their computers in that period. The principal reason behind purchasing an old computer is their easy availability. Sometimes the delivery of a new system takes a lot of time while old computers get available in one or two days. The vendors who sell old computers, prepare the system again and sell it. Old computers are available for those areas where technical assistance is easily approachable. Usually, the old computers can be obtained from a user. While purchasing an old computer it is wise to know all about it well. The greatest demerit behind using an old computer is its maintenance.

If the maintenance is not easily available, it is hardly good to buy an old computer. Thus we can say that by purchasing the old computer the user extends its life.

COMPUTER CONTRACT

After the decision is taken on purchasing computer software and necessary equipments, the next task is reaching a contract, Generally, the user is not able to fashion this contract. This is a notion that a contract reached with a big firm is not changeable. In contrast to it, every contract is changed to some extent. But users take several weeks in understanding the legal rules.

Operating the primary contract law is called contract law. However this contract can be affected by other laws, such as uniform commercial code. Under this contract an agreement is reached on the requirement of contract and mutual understanding. The success of any contract depends upon fulfilling all the conditions mentioned in the contract.

Check Your Progress :

3. Whar is system software.
4. What are benifits of software selection from market.
5. What are the criteria for software selection ?

ART OF NEGOTIATION

Most users, before negotiating with the selling person or organisation, make some preparations. Negotiating is an art. In it, the time is a delicate factor. Before negotiating, all the policies should be fixed and practised.

Strategies And Tactics

Many strategies and tactics are applied to control the procedure of contracts. The main thing is to control the environment. If the meeting of contract is held at the house or company of the user it helps him explain his point well. Other strategies are the following :

- ⇨ At several times the consultant is painted as a bad man while the user as a good man. The consultant is wise and compromising while the user works on the consent.
- ⇨ One should always be ready with an alternative. It is a transaction work.
- ⇨ Less required objectives are given less priority and important objectives are given more prominence.
- ⇨ One should be ready to discard some points. Some issues should be left to be settled in the next meeting.

RESPONSIBILITIES AND REMEDIES

Computer contract shows ways for avoiding default issues or issues without any achievement. The remedies should begin while preparing the list of those issues upon which both the parties agree. The next task is to prepare the list of responsibilities of the vendor and prepare the user for the remedy against issues without any achievement. Under the rules of such contract, the vendor is responsible to provide only those equipments, which have been mentioned in the agreement.

Three important tactics are the following :

- Special Remedies
- Damages
- Specific Performance

Special tactics are first line of remedy for the user. For example if the vendor does not supply the materials on the agreed date the user can come out of the agreement after giving a notice. If the system doesnot stand true to the requirements of the user, the user expects that the vendor completes the work without charging extra time or money.

Some special tactics help the user without trial. If the vendor hesitates in applying the specific tactics, the user representative can demand for harsh tactics. The real loss is compensated by the party on the basis of the matters shown in the agreement. The vendor tries his utmost not to admit the sudden losses in the contract. If the vendor is unable to supply the system or materials to the user on given time, then determining for the imminent loss is the only way out.

HARDWARE

Objective is determined in a good hardware contract. This agreement makes the system produce result. The importance of a system depends upon the functions taking place in it.

Finding out the whole amount of the contracted equipment and in normal condition, deciding it by putting them on test whether they are fulfilling the conditions shown in the agreement. All the contracts should be set in black and white so that they can be reviewed later.

SOFTWARE

The user should be licensed to use the software package. The software is not considered to be completely sold till the title is transferred to the user. The user has the right to use the software package, he cannot sell that software package to others.

There are many risks in software packages which are as follows :

- **Nonperformance or failure to meet specification** – To ward off this risk, ending the contract is the best remedy.
- **Cost of Modification or Integration** – To avoid this risk the price of the imminent change is fixed.
- **Bankruptcy of the Vendor** – To ward off this risk, the user should be authorised to change the package without any permission.

DELIVERY AND ACCEPTANCE

The main reason behind the failing of the contract is the inability of the vendor to provide the user with the system on time.

In the contract the tactics to ward off such risk should already be determined by mutual talk between both the parties. The contract should include things like the system be first tested by the user and accepted later by him. The user should fix a certain period during which he can use the system in normal condition for some time.

WARRANTIES

Under the rule 2 of the Uniform Commercial Code the vendor provides three warranties under some rules for the saleable goods and other loan facilities. The Vendor has the right to sell the thing, the thing is in saleable condition, and the thing is worthy for the cause it is being taken. The vendor inserts these warranties in the contract-paper.

FINANCE

The financial matters should be included in the contract so that the user may know about them. It is difficult to make any contract after paying some price to the vendor. Under most standard contracts the price is paid only after the stystem is installed.

Since the contract is entered before the system is handed over, the price fixed in the contract helps the user. If the vendor increases the price or time period of the system, the user can cancel the contract and demand penalty from the vendor.

GUARANTEE FO RELIABILITY

It is generally a message written by the vendor which shows the following matters:

- **The everyday minimum utility hours** – It tells the time before the closing of the computer.
- **The interval between the failure** – The time when the system works nonstop.
- **The maximum time of repairing** – The time consumed in repairing the system when it gets out of order.

In comparison to the older time, the matter of patching up has come far of age, and the reason behind is increasing computerisation in the industry. If the vendor doesnot enter into cotnract, the other vendors in the market can attract that user towards them. Another

reason is that today's user has got wiser and able to make right and useful contract. Therefore the vendor cannot befool the user. Standard contract provides security to both the user and the vendor.

Answer of the Check Your Progress

1. Companies which supply us any object, product etc. are called suppliers. In computer industry we purchase three types of products- software, hardware and service. Therefore, we can put the suppliers in three classes - software supplier, hardware supplier and service supplier.
2. Hardware suppliers are those from whom we purchase computer, printer, scanner, terminals and other peripherals. The hardware suppliers working in India are- I.B.M, microtech, H.P., Philips etc.
3. This program is made to control system processes and system implementation. For example operating system, database management system (System operation), assemblers and compliers (system implementation).
4. Now a days software is purchased from the market. It has several benefits.
   - ⇨ Reduction in software cost.
   - ⇨ Time saving.
   - ⇨ Involving M.I.S. staff in some other project.
   - ⇨ The softwares purchased from the market are generally reliable.
   - ⇨ The risks related to big system are less.
   - ⇨ One doesnot have to face the problems that take place while developing the software.
5. The project team prapare critiria for :
   - ⇨ Reliability
   - ⇨ Flexibility
   - ⇨ Portability
   - ⇨ Functionality
   - ⇨ Security
   - ⇨ Understandablity
   - ⇨ Capacity
   - ⇨ Usability
   - ⇨ Performance
   - ⇨ Secviceability.

EXERCISE

1. Explain different types of suppliers and types.
2. Who are hardware suppliers?
3. Who are software supplier?.
4. Differentiate between hardware and software suppliers.
5. Define service suppliers.
6. Write a note on software industry.
7. Explain the procedure for hardware and software selection.
8. Explain the role of consultant.
9. Explain the criteria for software selection.

16 System Security And Disaster Recovery Planning

The Chapter Covers :

- Introduction
- System Security
- System Security is an Important Concern
- Threats to System Security
- Personal Computer and System Integrity
- Risk Analysis
- Control Measures
- Recovery/Restart Requirements
- System Failures and Recovery
- Disaster/Recovery Planning
- Plans
- Team
- Planning Task
- Ethics in System Development
- Ethics Codes and Standards of Behaviour
- Information Systems Misuse - Threats & Countermeasures

INTRODUCTION

The success of each system is measured by the basis of its internal and external security. Since, for any company, its data and information are very important, the loss due to disorder in the system and the wrong use of information because of unauthorised access is an important issue for an institution and even the integrity of the system is based on these things.

The system analyst uses many tactics to prevent the data from damage or loss which include back up facility, the facility of data recovery in the case of system crash and using password and encryption for preventing the unauthorised and illegal access to information. This chapter will deal with system security and recovery planning.

SYSTEM SECURITY

Now-a-days, the newspapers, t.v., magazines all are full of the information regarding the illegal access to the computer, viral attack, the cheating done using the computer, and other events.

For example, very recently, there was an uproar in the BPO industry. Many countries had announced outsourcing in India to be impractical. The reason was, a call-centre executive had withdrawn money from a client's account by the wrong use of his credit card information. Similarly, many items of such news keep coming which raise a finger on the security of computer.

SYSTEM SECURITY IS AN IMPORTANT CONCERN

It is the task of an analyst to design a security system which can prevent loss, mistakes and unauthorised access to data. The level of security in any system depends upon the movement of data, the reliability of the user and the complexity of the system. A rightly designed system in which the control procedure is in use, provides the system with facilities like physical security, the integrity of data and ban on obtaining the data.

An extremely secured system may be expensive but the security provided by it is must for protecting your important data and system. The following are the reasons behind providing security to a system:

- In the modern age, most companies are totally dependent on computers. Therefore it has become necessary to take required steps of security.
- It is necessary to provide security to data which is the capital of a person or a company. However it is very difficult to provide security to the data where it is kept in the centralized computer system.
- Designing and implementing any system and the display of effective security tactics makes a management system extremely efficacious.

In system security we'll study about different methods of bringing the necessary fear to light, giving physical prevention to database from various types of failures.

The problem of system security has been divided into four interrelated topics (security, integrity, privacy and reliability) which find out the ways of getting file structure and data structure.

System Security – In system security the tasks related to prevention of sudden losses occuring due to the pre-set fears are performed by the technical development of hardware and operating system and working process. In contrast to it the work related to the appearance and change, prevention from destruction of data are also performed by system security.

System Integrity – System integrity means the proper functioning of hardware and program in the system, necessary physical security and security from latent fears like external apprehension and fear. Besides, in system integrity it is made sure that the data doesn't change its main form, and it is also ensured how to save the computer from sudden happenings such as sudden closing of the computer.

Privacy – Privacy gives this right to the user and organisation whether they want to share the knowledge or information with each-other. In which way can the organisation prevent the unauthorised persons from accessing data ? All these functions are made available by the system that provides privacy.

Confidentiality – In it, the important sensitive information lying in database are provided security and privacy. This security depends upon the nature and importance of data. Providing such security, is, in technical words, called system security. Both the privacy and security of data are far away from system building. Both of

these are related to social security. Some rules and controls are essential for an organisation which depends too much upon database. These rules and controls are as follows :

- Physical security, security from fire, flood and other calamities.
- Providing integrity to database with the help of database validation technique.
- Encryption of the password, data form, and constant watch of the users. By taking such steps data and organisation both can be secured.

THREATS TO SYSTEM SECURITY

The work process of a system security makes it sure that the system is physically secured, such as providing the capability of recovery/restart, retrieval of the back-up file. If we glance at the list of reasons damaging the integrity and security of the system, we'll find that all the damage work takes place because of the mistakes committed by the user and not following the commands given by the system. The chance of a person causing external damage to a computer is very little, provided the computer is not linked to a network.

The following is the list of some prominent risks which can damage a system.

- Errors and omissions
- Disgruntled and dishonest employees
- Fire
- Natural disasters
- External attack

Errors and omissions are of several types. Some cast astonishing but short time effect, such as in telebanking and banking provided by netbanking, often money is transferred to a wrong person, however in a very short period this error is rectified.

When one database collects too much data, the extremely important data can be copied or stolen. Without permission, any information in the system can be directly written on the system and altered and which can be very difficult to find out. A dishonest programmer can byepass his program control and authorise his transaction. A dishonest employee knows the vulnerabilities of the software system in a better and easier way than the external hackers for he has been accessing that system for longer period and he knows the vulnerabilities of the system. For example an employee looks for that vulnerability which is inherent in the system. If he tackles the inventory he can send the material anywhere.

Such crimes are committed by those internal people who don't care for loyalty and responsibilities. According to a survey, billions of rupees are wasted in all over the world in such computer based forgery and embezzlement and in 75 percent come the internal people. Such lack of ethics has gripped the business and society.

Fire and other man madedisasters can affect the system by hindering system power, air conditions and essential power supply. The right planning of preventing such perils is a complicated task, especially in those organisations where chiefly the whole database system is kept at a place. While designing system facility, generally it is seen that the fire-extinguishing technology is placed where the money is kept, while these technologies should be placed where there are more inflammable materials.

Natural calamities include flood, storm, strike of lightning and other disasters. There are no ways of preventing such occurences, but there are some ways of protecting the computer system. For example, in flood-ravaged areas, computer systems should not be installed in the cellar of the buildings until the necessary arrangements for protection are ensured. System reliability too holds an important place in system design. For example, bug identifying software or drawback in communication network can cause trouble for the user.

PERSONAL COMPUTER AND SYSTEM INTEGRITY

Personal computer is considered to be one step behind with regard to accounting control. The casual operating environment of micro computer causes the change in such accounting systems which need control, comparatively easy. One common thing with micro computer is that anything can put on it without backup. In the off-the-shelf software packages, there is lack of audit trails. It is difficult to rebuild transactions for audit purposes. Ultimately, as most personal computers are linked with the mainframe computer of the company, the remote users, can knowingly or involuntarily reshuffle the data while accessing it. The outcome of all such circumstances cannot necessarily be fatal, however access control should be installed in the form of software so that access can be restricted to the mainframe. The steps taken for it depend upon where and how the micro computer is being used.

Now it is clear that in system installation, personal computer creates security related problems. The use of micro computer in corporate environment enhances the possibility of the wrong use of information. Most of your operating systems are sans password, getting benefitted by which a thief can very easily copy the data. Likewise a person sitting far away with a micro computer who knows how to byepass the code and password, can obtain the information illegally by using the phoneline.

RISK ANALYSIS

Out of the fear of above mentioned system security, the system designer should throw light upon every drawback of the system and remove that so that the fear related to system security can be avoided. The purpose of risk analysis is to find out the probability of the problem cropping up, the cost of every loss, the field of fear and which security plans should be adopted to prevent all these.

First and foremost, the designer, makes a list of all the objectives of the system and evaluates the system working for all that as per its security requirements. In it, the evaluation is done with a view to protect the system from probable risk. The security measures are compared with special risks to know the points of those unacceptable risks. Therefore, for an effective system it is essential to have recovery and other security measures.

Risk analysis is not a successful plan. It only intimates about the users' exposures, their related cost and control measures. A special risk analysis matrix helps determine the steps taken by the designer and how soon these steps should be taken. The first risk lies with the most cost probability product, it is, therefore, given first priority for security. Two principal elements in risk analysis are result of the possible loss and its probabilities. Besides its objective is to sort out those risks which create the possibility of the biggest loss and to provide the security of appropriate level.

CONTROL MEASURES

After evaluating the risks of system security, the next task is to select measures that protect from these external and internal dangers and fears. These measures, generally, are divided into four parts, which are as follows :

● Identification ● Access control ● Audit controls ● System integrity

Identification

There are three ways to identify a person by computer which are as follows :

Password – It is very much in use. It is used to identify the persons and give them authority or permission. The password should not be easily traceable and should be difficult to be remembered. It cannot be withdrawn once it is accepted. Only the person who is aware of the password should know it.

The security is lacking mostly at the time of installing the system. Many users by copying the difficult password or by giving their password to their friends provides them probable unauthorised access. Mostly it has been felt that written password is the chief reason behind the illegal access of the system. If the password is written it can very easily be traced or stolen.

Its second strategy is **picture badge** which takes place with those who join the work. Though it gives precise identification to the bearer of information, the badge is unable to identify whether somebody is authorised to give the work or receive the work from the system.

Some others, such as by voice and fingerprint, persons can be identified. Fingerprints are generally used in law enforcement. This is not good for MIS system. On the other hand, Voice print is now in use to identify the authorised user. In voice print system the persons are identified by comparing their voice with their earlier recorded voice.

Another method is for example, credit card key or special terminal. The magnetic stripes of the terminal identify the operator of credit card reader system. The password with the card can make the identification of the user safer.

Access Control

Many measures have been taken to access computer data. One measure is the use of encoded card system with log keeping capacity. The card is used as key which opens many doors such as tape-storage and other classified areas. The card, really, is a magnetic key and a key-port which works as a lock. When the card is put in the lockport the door opens. The card which also carries the photograph of the bearer can double the staff ID badge.

Encryption : Encryption is an effective method of providing security to data transmission on the telephone lines. The data is scrambled from one computer or terminal to the other computer or terminal during transmission. This process transmits the data in such a way that it becomes completely useless for the unauthorized user. It ends the authentication problem by stopping the determined intruder from inserting wrong data in the channel or modifying the messages. Encryption concept is very normal. A message with a normal text is transmitted on an unsafe communication channel. To prevent the message from unauthorised acquisition it is enciphered in a reversible conversion which makes a cryptogram or a ciphertext. When it reaches to an authorised receiver, it comes back in it its original form.

Check Your Progress :

1. Define system integrity.
2. How will you select measures that protect from external and internal dangers and fears.

Most of today's encryption is based on National Bureau of Standards Encryption Alogarithm which is known as Data Encryption Standard. It is a general technique which was developed in 1977 and it is used in several commercial network security systems. System which is encrypted and decrypted without human interference, is secured from unauthorised access. The encryptions for personal computer are available on equipment chip level or in software. It is designed especially in transmitting the encryptic data. Its use prevents the piracy of software.

Computer control can be created for personnel embezzlement and forgery. For example the use of program should be authorised and documented. Other programs and database files should be stored in the library and accessed when required. The other guidelines to prevent embezzlement and forgery are the following -

- The classified programs should be run with correct password.
- There should always be two people in the computer room.
- The most important form should be kept locked in the safest place and the procedures of its use should be properly maintained.
- To control copying on the other medium the disk programs should be periodically compared.
- The software library should be periodically reviewed so that it can be ensured a complete set of object program and operational documentation is available for all the applications.

Audit Control

Audit Control protects the system from the violation of external security and internal forgery or embezzlement. The resources applied in audit control, should, in any way, be co-ordinated with the sensitivity of the data being reshuffled. One problem with audit control is that unless and until the system is violated or the company officer has been imprisoned, its value cannot be proved. For this reason, aud it ability should be supported on all managerial levels and should be planned in every system.

The most vulnerable point of the system is M.I.S. department. The programmers can pirate, modify and even sell the softwares for their personal benefits. To audit the maintenance process properly, there should be an audit trail from change requests to production programs. Many audit softwares are available to do the work properly. A generalised audit software tests the files and databases with the help of software auditor for consistency, accuracy and completeness. To trace the data flow through a program and activity, there is a program. For example, financial analysis program brings the amount of data in the database to manageable condition by reducing its amount. It, by additional statistical analysis, determines the out of range transactions. In short, neither the user nor the auditor can properly check the system activities. The necessary control means, the programmer and the analyst should create controls in every system. The evolution of corporate auditing policy will ensure that it fulfils the minimum requirement for control and security from forgery and embezzlement.

System Integrity

System integrity is the third step of security which concentrates on the function of operating procedures, hardware, database and supportive software and physical

security. Program error is the most expensive software loss. It is possible to eleminate such mistakes with the proper testing routines. Parallel implementation should be implemented wherever possible. It provides security for hardware safety from database destruction and physical security and documentation through right back-up, provides security from the loss occuring on account of fire, flood, piracy, sabotage and sudden power cut.

Proper use of file library is another security feature. It includes appropriate file backup and reliable staff which, if need be, can operate file documentation. File backup refers to storing the backup of master and other important files in the appropriate environment securing old master files after each update for tape files is a normal procedure. Since this procedure is expensive, to proceed the decision in this direction the files are balanced against the probable loss from destruction.

RECOVERY/RESTART REQUIREMENTS

The lost or destroyed database is generally, retrieved by rollforward or rollback process. In rollforward processes, to create the current version of database, the first acceptable copy of the database is to be updated with the change. Rollback process starts from the current invalid state and create the earlier condition by erasing the records of the activity (rollback). Both the methods depend largely on software to update the backup copy and ensure the cause of failure.

Backup can prove very important in recovery procedure. If the database is physically damaged, rollback is not possible. For it the first acceptable backup copy is required. This procedure can be different in sequential and database environment. For sequential file the grandfather-father-son process of backup (it means first, then another and then another) is used. While, in the database environment, the master file is generally, not copied, because it is updated. To update it, the transaction is directly sent to the file and the real data is installed. In such systems, backup process files are created in such condition, when they are damaged as it happens in a sequential file system.

SYSTEM FAILURES AND RECOVERY

There are three kinds of failures in database environment. These failures are catastrophic, logical and structural. Catastrophic failure is one where a part of database is illegible. It is done by applying the recovery rollforward process.

Logical failures take place, when the database activity is halted (such as power failure) and there is no way to complete the transaction to be implemented in present. When the system gets in order and becomes functional again, it is not known whether the modification is still in the memory or it has been placed in the original data. Though this database is still legible but it is not sure it would be correct. In this condition, it is necessary to rollback the file to the last updated condition of database and connecting all the changes. Many interactive systems of today provide automatic recovery, when the system starts again which replaces the human work from the process. Database has the third type of failure structured damage. Its common example is wrongly stored pointer in the record which indicates unrelated or nonexistent data. If the problem is not solved by software utility, before the damage occurs the database should be recovered to the position of the latest update.

In short, the system should be durable. It should keep running amidst all threats such as machine crash, or program error or the user error. Recovery measures can

cancel database change which should be removed and can perform those changes again which have been ended. The responsibility of recovery lies with both the designer or the project management or with both the designer or the project management or with any one of them, which occurs as per the requirements of the system.

DISASTER/RECOVERY PLANNING

Such companies which are completely based on the computer based system face many disasters, if they undergo any physical loss or system related forgery. Since the whole system of the companies is computerized any hindrance in it affects production, accounting and customer service. As a result, the financial loss of the company can be unanticipated and irreparable. Because of the important data getting damaged, data integrity and business decision might have to be compromised.

Disaster/Recovery planning is a medium to address the issues like system availability, giving priority to the application, designing safeguards in the case of disaster through the identification of the expected exposure. It doesn't mean recovery from a particular disaster. If it is practised, the transaction will not come to a halt because there is a provision of quick recovery with the help of Disaster/Recovery planning.

In Disaster/Recovery planning, the primary role of management is to accept the requirement of contingency plan, selecting alternative arrangement and identifying those benefits which can be gained by setting up Disaster/Recovery planning. The top-management should setup disaster/recovery policy and should get it implemented by the corporate support staff. The user has important roles in it, which are as follows :

- Identifying extremely important application, knowing why it is important and identifying in which way the unavailability of computer will affect this department.
- Accepting the data safety process and ensuring how long and how much the operation will last without data.
- Funding of the backup cost.

PLANS

When the disaster/recovery process is planned, several questions are asked, which are as followings:

- How long will the rebuilding of computer centre take ?
- Which sort of accomodation should be arranged in the backup installation ? How soon is it available ?
- What sort of equipments are required to run the company ?
- How will the report be transmitted to the user ?
- Which utilities (such as air condition, electric power) will be required in the state of disaster?
- Will there be satisfactorily experienced staff for proper recovery ?

When these questions are answered and the management supports this plan, the implementation of the plan starts, which has four phases. (i) Appointing a disaster/

recovery team and team co-ordinator for developing the plan, (ii) Preparing the plan actions, (iii) Compiling disaster/recovery manual, (iv) Duplicate implementation for testing the process.

TEAM

There should be a cross section of design, user and computer operator in the disaster/recovery planning team.

The main function of the team under the leadership of coordinator is to organise the plan observe the progress of the plan and keep an eye on its completion. In periodical meetings, the team decides whether the plan is up-to-date or not, considers the new vulnerabilities and the exposures of scale and implements new technologies and process as per the requirement. The disaster/recovery planning team has the following targets:-

- Securing backup sites for occupation and use
- Hardware for fulfilling the minimum processing requirements.
- Providing working copy of all operating systems and application programs to fulfil the minimum processing requirements.
- Providing communicational facilities so that the report is communicated to the user in no time.
- Making consumable and administrative support available.

PLANNING TASK

The task of disaster/ recovery, like system development, takes place in several phases. The terse description of the work performed in these phases is the following:

- **Definition** - In this phase, the purpose of disater/discovery project is fixed.
- **Requirement** - In this phase, the application is evaluated against the objectives of disaster/ discovery project and it is found out what is to be included in the plan and what things are to be given priority. The team takes the inventory of hardware, software, telecommunication, back up, clerical, utilities and personal assignments.
- **Design** - In this phase the design alternative, the expected customers and price are evaluated and the final design is set.
- **Testing & Implementation** - In this phase, the back up system is implemented and observed. Besides, the results are compared and the mistakes are rectified. While implementing the system the procedure is set in black and white, the site is prepared the maintenance plan is made.
- **Manual** - When the team completes the task, the disaster/ recovery manual is prepared. Its copy is provided to all the members of the team, the team leader and management. If need be all the copies of the manual are ordered.

ETHICS IN SYSTEM DEVELOPMENT

The growing use of computer and increasing dependence on it is enhancing fear, insecurity and imprudence. With the help of the computer employees can very easily

change the data and pirate the private information and saving accounts by just clicking a button. When these computers are linked with a big network, it gets very difficult to prevent the piracy of the required information. Computer crime, system security, ethics all depend upon the system designer and his work.

It is the duty of the system designer that he follows the standard of ethics while creating a system .The discourtesies done by the system designer have been shown in the following examples.

- The analyst is well - acquainted with the requirements of the user, hence instead of installing the right system, implements that one which consumes more cost and time.
- Charging commission for recommending the article made by the vendor by sale.

To prevent piracy, bribe, and unauthorised access to information the computer business needs some ethics code and right and good rules and regulations. This code lays stress upon the right to privacy. This emphasises the requirement of security and prevention and maintaining the privacy of a file.

Now a days many sorts of program are in the market which eleminate these drawbacks and provide security to the computer. For instance, the computer audit program, provides the auditor with information about the transaction done by the computer. Encryption device also prevents the piracy and wrong use of data and provides security to it.

ETHICS CODES AND STANDARDS OF BEHAVIOUR

Many rules have been framed by the professional organisations for the ethical behaviour of the computer analysts and professionals. Amidst these organisations, the three - 'Association for Computing Machinery"."Data Processing Management Association" and "Institute for Certification of Computer Professionals" are prominent.

In the ethics code, the things like honesty, pivacy, skill etc. are studied.

The professional association was in doldrums on what sort of punishment should be inflicted against the violation of these codes. The severest punishment is dismissing the employee. The amount and severity of the punishment depends upon loss caused by the employee to the organisation and system.

MIS professionals hold this opinion that the reason behind misbehaviour is not want of honesty or integrity, but the continuous violation of the rules is the practical problem.

In many ways the ethics is considered without any rule. Therefore, the professional organisations should acquaint their staff with the ideal modes of behaviour .

The ethics code cannot change a misbehaving fellow but can create such an environment around that fellow which will pressurise him not to misbehave.

The main cause of misbehaviour by the analyst and the professional is lack of awareness about ethics and criteria . The computer field has grown very fast. Courses are being conducted in professional institutes now a days to teach how to follow ethics and how to behave so that the analyst can receive training for right sort of behaviour.

Information Systems Misuse - Threats & Countermeasures

In today's world, use of information systems has become mandatory for businesses to perform the day to day functions efficiently. Use of Desktop PC's, Laptops, network connectivity including Internet, email is as essential as telephone at workplace. The employees and networked information systems are most valuable assets for any organization. The misuse of Information Systems by employees however poses serious challenges to organizations including loss of productivity, loss of revenue, legal liabilities and other workplace issues. Organizations need effective countermeasures to enforce its appropriate usage policies and minimize its losses & increase productivity. This paper discusses some of the issues related to Information System misuse, resulting threats and countermeasures

Desktop Dangers

The shift of corporate computing focus from centralized to decentralized, distributed, network computing coupled with drop in hardware prices has empowered the desktop computers with fast processors, more memory, high capacity disks and peripherals such as CD-ROM/Writers. Significant amount of organization's intellectual property now resides on employee's computers. With highly user friendly operating systems such as Microsoft Windows, employees can now easily install software on their office computers from CDs, listen to music, watch videos, play games, store personal data, execute applications that may be inappropriate for business. The paradigm shift to powerful networked desktops necessitates organizations to enforce policy based controls such as defining organizational standard configurations for these workstations that are restrictive enough to curb risk while non-restrictive enough to support vital business functions.

Few years back, web browser was the only tool available to access internet. Today employees can use new breed of applications such as real-time streaming media players, instant messaging (IM) clients and peer-to-peer (P2P) networks over the internet. The use of applications like P2P can have a very little, if any business justification. Chat, Online Purchase, interactive games, gambling, pornography, surfing non business related sites such as sports, entertainment, web based personal email and even searching another job etc. are major contributors to losses organizations suffer due to misuse of corporate desktops. In addition to being potential productivity drainer, corporate desktops can relay company confidential information through instant messaging or emails rapidly over the Internet exposing organizations to legal liabilities.

Security Breaches

Information systems and networks are often inherently insecure because they are designed with functionality not security as its primary goal. Most organizations view security threats as inbound i.e. from outside to inside. However there are major threats to security that are not introduced from external sources but by employees themselves. It is important that organizations understand the inside threats and extend perimeter security controls to local desktops with security measures such as host based intrusion detection system, personal firewall, Antivirus software. With easy availability of hacking tools, motivated employees can find ingenious ways of unauthorized access to corporate confidential data. Security breaches can even happen due to accidental risk of attaching wrong files in email attachment or sending email to wrong recipient. Social engineering attacks can trick legitimate, though

Check Your Progress :

3. Why backup is required?
4. What are the phases for the task of disaster/recovery line system development.

naïve users into providing them with access to corporate systems. Sharing folders on a PC, choosing weak passwords, sharing passwords, leaving important printouts on desk, not locking the screens are some of the examples of lack of sense of security, due care and diligence. Whether incidents are due to malicious intent or inadvertent employee error, the result is the same; loss of revenue, productivity and potential liability.

Bandwidth Bandwagon:

Bandwidth is never enough! Banner advertisements, streaming media, MP3 downloads; P2P file sharing are bandwidth guzzlers that place increasing demands on organization's network resources. While some of the network traffic is easy to classify as non-critical to business much of it including streaming media may or may not be work-related. Internet management policies that block all bandwidth intensive applications at corporate firewall may be counter productive. Organizations need a tool to manage the available bandwidth to be distributed according to organizational preferences and policies, optimize network performance for business applications or else it could lead to a situation where few of the employees watching streaming videos and listening to online music while its CEO is struggling to access critical business webcast.

Legal Battle:

Transfer or display of sexually explicit content via office computer can create hostile work environment. Companies can be held accountable when their employees use the Internet appropriately such as forwarding offensive message. Most employees don't know that their employers are legally liable for damages related to the electronic distribution of offensive material in the workplace. Internet threats such as malicious code, Trojans, spyware, could make desktop vulnerable to leakage of important corporate information. Installation and use of illegal software by an employee can make corporate pay legal damages. Privacy Laws in many countries make it essential that organization control employee behavior and misuse of its information assets.

COUNTERMEASURES:

First Step - Acceptable Use Policy

Organizations need to develop acceptable use policy for desktop usage that must emphasize on what is appropriate and what is inappropriate usage like what kind of applications users can run, what kind of data they can store, what can they surf on Internet, what type of activity is strictly forbidden, what consequences will result if the policy is violated. Employers must make sure that their staff understands not only the rules,, but also the rationale behind the Acceptable Use Policy. As the new avenues for misuse emerge, organizations must review the policy and announce the amendments and communicate among all the employees using IT resources.

Organizations should consider deployment of automated client desktop policy enforcement tools which can provide them centralized monitoring, control and audits in a decentralized, distributed computing environment.

Desktop Controls

Organizations should implement comprehensive desktop security and controls to mitigate risks due to misuse and in appropriate use. Organization should consider enterprise wide standard build desktop roll out that locks down and baselines

system capabilities, implementation of role based access control, centralized automated antivirus solution, patch and update management system, software metering, monitoring system, and enterprise backup solution that covers the desktops. The desktop control initiatives should be pro active rather than reactive with the blend of preventive, detective and corrective.

Training and awareness program

Training and awareness is main preventive control. Employees should be made aware of the emerging threats and how to mitigate the risks, rational of company's NDA policy, legal exposures arising out of employee misuse and how to protect the sensitive data. Appropriate media controls should be in place to handle sensitive computer printouts, floppies and CDs. Employees should be trained to protect their workstations by locking the screens while away from desk, use of screen savers, prevent shoulder surfing etc.

Content Filtering

Content filtering is primarily divided into 2 categories; *Web filtering* and *Email filtering*. Web filtering helps organizations enforce corporate Internet usage policies; allow control of access to non-business related websites, protects organization, staff and network assets and provides tools to monitor web usage. Filtering out non-business content leads to increased employee productivity, increase network efficiency, minimizes bandwidth costs, avoids workplace issues caused by objectionable content and helps to protect the organization from legal liabilities. The web filtering solution typically has categorized database of various website categories, self-learning capability to catch the new websites and usually comes with granular policy manager with real-time monitoring and managing controls. Email filtering solution filter the content based on the organizational policies and preferences. Email filtering allows organization to limit the bandwidth consumption, spam control, antivirus, worm control, and enforce the appropriate email usage policies. Email filtering protects organizations from leakage of company confidential information. Limiting the size and type of email attachments prevents serious attacks such as denial of service.

Mobile Workers

Prevalence of laptops and Internet has only compounded the control problems for organizations. Those mobile workers using laptops at homes without appropriate controls may introduce viruses, worms or offensive content into the corporate network when they connect their laptops at workplace. Use of laptops also pose significant exposure of company confidential information walk out of corporate network,. Organizations must have complimentary mobile computing policies in place to protect their information assets.

Answer of the Check Your Progress

1. System integrity means the proper functioning of hardware and program in the system, necessary physical security and security from latent fears like external apprehension and fear. Besides, in system integrity it is made sure that the data doesn't change its main form, and it is also ensured how to save the computer from sudden happenings such as sudden closing of the computer.

2. These measures, generally, are divided into four parts, which are as follows :
   - Identification
   - Access control
   - Audit controls
   - System integrity.
3. Backup can prove very important in recovery procedure. If the database is physically damaged, rollback is not possible. For it the first acceptable backup copy is required.
4. Defination the phases are :
   - Requirement
   - Disign
   - Testing & implementation
   - Manual.

EXERCISE

1. What is system security?
2. System security is an important concern. explain
3. Write down various threats to system security.
4. Explain the concept of personal computer and system integrity.
5. Define risk analysis.
6. Write a note on control measures.
7. Explain the concept of system failure and recovery.
8. Write down ethics in system development.

17 Business Applications of Information Technology

The Chapter Covers :

- Introduction
- What is Internet Actually ?
- Growth of Internet
- Owner of Internet
- Internet Service Provider
- Anatomy of Internet
- Arpanet and Internet history of the World Wide Web
- Internet Tools
- Basic Internet Terminologies
- Net Etiquette
- Electronic Commerce
- Technical and Organizational Aspects
- Components of E-Commerce
- Internet and E-Commerce
- Constraints to E-Commerce
- IT ACT 2000
- Intranet
- Extranet & Enterprise Solutions

INTRODUCTION

Invention of computer in 20th century is a small step while invention of Internet can be said a giant leap for the information technology. Computers are greatly used in a big range of fields; thanks to the contribution of Internet. It is simply defined as a network of networks, interconnecting thousands of networks and hundreds of millions of users across the world irrespective of geographical boundaries together for the sake of information , business, entertainment and a lot and lot more. This chapter has mainly been dedicated to the incredible and basic facts of Internet.

WHAT IS INTERNET ACTUALLY ?

Internet can be easily defined as a network of networks. However it can be described as different point of views as follows -

The Internet is a device through which millions of people are communicating and sharing their idea and information. They communicate electronically on a one-to-one basis or in groups.

- **From a practical, recreational or commercial point of view**

  The Internet is a vast collection of information that can be searched and retrieved electronically. This collection includes advice on all sorts of topics, data, electronic texts, government information, images, museum exhibitions, scholarly papers, software, and access to commercial activities. Tapping into these resources requires knowing which tools and services to use.

- **From a technical point of view**

  The Internet is a network of thousands of computer networks. Together, the networks making up the Internet consist of over a million computer systems. These computers and networks communicate by exchanging data according to the same rules, even though the networks and computer systems individually use different technologies.

The proper definition of Internet is; **"The Internet is a network of networks that connects people and computers worldwide."**

GROWTH OF INTERNET

Internet started as a government project in the US, has spread all across the world connecting thousands of networks and millions of people is an amazing truth today. Despite a huge organization, Internet is no owner around the world and works on mutual co-operation and spirit of sharing information.

You can float your own views, create discussion forum subject-wise, ask for suggestions and views from every corner of the world. Besides floating your own views you can contribute your thoughts and suggestions on different topics for almost no charge. Because of having such brilliant features, Internet is getting popularity day by day. The growth of Internet can be estimated by the fact that users on Internet were only 124 millions in 2000 while it increased to 175 millions in 2004 only in the United States.

So far growth of Internet in India is concerned, it is also growing fast. The current Internet subscriber base in India is 3.3 million and the user base is 16.5 million. The table 1.1 is indicative of the trends in the Growth of Internet subscriber base in India.

Month & Year	Users (In Millions)	Percentage of World Population
December 1995	16	0.4%
December 1996	36	0.9%
December 1997	70	1.7%
December 1998	147	3.6%
December 1999	248	4.1%

December 2000	451	7.4%
December 2001	513	8.6%
December 2002	587	9.4%
December 2003	719	11.1%
December 2004	817	12.7%
December 2005	1,018	15.7%
December 2006	1,093	16.6%

Table : Growth of Internet subscribers in India

OWNER OF INTERNET

The Internet has no president nor has it a CEO. The constituent networks may have presidents and CEOs, but the Internet as a whole does not have a single controller. The ultimate authority on the Internet is the Internet Society, which is a voluntary membership organization whose purpose is to promote global information exchange through the Internet technology. It appoints a council of invited volunteers called the Internet Architecture Board (IAB). The IAB is responsible for the technical management and direction of the Internet. The Internet works because there are standards for computers and softwares applications to talk to each other. These standards allow computers from different vendors to communicate without problems. IAB meets regularly to formulate standards and allocate resources like addresses. When a standard is required, it considers the problem, adopts a standard and announces it via the Internet.

The IAB also keeps track of information that uniquely identifies every computer connected to the Internet. For example, each computer on the Internet has a unique 32-bit address. No two computers have the same address. The IAB ensures that certain rules are followed in naming each computer.

Internet users express their opinions through meetings of the Internet Engineering Task Force (IETF). The IETF is another voluntary organization that meets regularly to discuss operational and near-term technical problems of the Internet. When it considers a problem important enough to merit concern, the IETF sets up a working group for further investigation. Anyone can attend IETF meetings and become a part of the working group. Working groups recommend whether the IAB should declare a standard in order to circumvent problems.

ABOUT CERN

CERN stands for Conseil Europeen pour la Recherche Nucleaire. It is the European Organization for Nuclear Research, the world's largest particle physics centre. It sits astride the Franco-Swiss border near Geneva.

CERN is a laboratory where scientists unite to study the building blocks of matter and the forces that hold them together. CERN exists primarily to provide them with the necessary tools. These are accelerators, which accelerate particles to almost the speed of light and detectors to make the particles visible.

Founded in 1954, the laboratory was one of Europe's first joint ventures and includes now 20 Member States.

CERN is run by **20 European Member States,** but many non-European countries are also involved in different ways.

The **current Member States** are: Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, The Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

Member States have special duties and privileges. They make a contribution to the capital and operating costs of the CERN programmes, and are represented in the Council, responsible for all important decisions about the Organization and its activities.

INTERNET SERVICE PROVIDER

No one pays for the Internet as a whole, everyone pays for their part. Networks get together and decide how to connect themselves and fund these inter-connections. A college or company pays for their connection to some regional network, which in turn pays a national provider for its access.

A company that provides Internet access is known as **Internet Service Provider (ISP)**. Like any company, an ISP charges for its services. In general, ISPs levy two types of fees:

- A charge for using the Internet
- A charge for a physical connection to the Internet

All customers of an ISP must pay the first type, a charge for Internet use. In most cases the ISP charges each customer a fixed rate per month, independent of the number of minutes a customer uses the service, the destinations with which the customer communicates, or the amount of data transferred. In return for the use charges, the ISP agrees to forward packets from the customer's computer to destinations on the Internet and from computers on the Internet back to the customer's computer.

Although use charges are billed at a fixed rate, ISPs do discriminate among classes of users. For example, an ISP charges more to a business enterprise than an individual, as Internet involved in business purposes transfers large volume of data daily while an individual uses a single computer and uses the Internet casually. In addition, the ISP may make the rate depend on the type of physical connection a customer has - a customer whose connection is capable of transferring larger volumes of data is charged more than a customer with a lower -capacity connection.

The second type, a charge for a connection, applies only to customers who have a separate, dedicated connection between their site and the ISP.

Some of very popular Internet Service Providers are BSNL, Satyam, Reliance, etc.

ANATOMY OF INTERNET

Internet is a system that combines several services. Internet site or website is an electronic document that is written in a language named HTML that stands for Hyper Text Markup Language. Every web page has got a unique address, that, in brief is called Uniform Resource Locator, an acronym of URL. U.R.L. informs you the location of a web page. In a website, there may be one or more than one web pages that are linked mutually and depends upon how it has been designed. Anatomy of contents available on Internet is such that you need not use a sequential way to navigate them. It means that you need not go for an order of 1,2,3,4... rather you

would go on a particular section of the site by clicking on the concerned link. They are interlinked with the help of hyperlink method.

The anatomy of Internet is physically based on your personal computer, web browser software, connection provided by the Internet Service Provider, a server computer that hosts your digital data and equipments like router and switch that direct information flow.

Internet is also called Client Server System as Internet is supposed to be an applied representation of client server architecture. Your computer is a client and the remote computer that stores electronic files is called server. Figure 1.1 illustrates the anatomy of Internet.

ARPANET AND INTERNET HISTORY OF THE WORLD WIDE WEB

Internet, as we know, is a network of networks today, was firstly introduced in the United States as the government project in 1960s during the cold war. The government was tired of mailing magnetic tapes back and forth between computers. Therefore, they decided to devise a way to link computers together using cables.

The first objective the government had, while designing a network, was to ensure if the system was robust. They wanted a design whereby they could connect and disconnect computers without disturbing any of the other computers on the network. In order to manage this huge project, the government created an organization called **Advanced Research Projects Agency** or ARPA. Later, the network was called the ARPANET.

After a few years of random languages to move information over the Internet, a new language was created towards the late 60s that offered a unified manner of transferring information. This was TCP/IP (Transmission Control Protocol / Internet Protocol). This new network language became very popular during the 70s. With the turn of the decade, and the seeming ease of the cold war, this incredible network was losing its financial backing by the US government. At this time the government began to invite science organizations and universities to use the network for their purposes and to share the cost.

In 1969, the US Department of Defense created ARPANet (Advanced Research Projects Agency) for research and collaboration in Computer Science. ARPANet grew more than 50 nodes between Hawaii and Norway, and e-mail was their primary source of communication and productivity. The desire for connectivity quickly spread to other parts of the university community and gave rise to alternative networks which eventually gatewayed into ARPANet to create what we call the Internet today.

In 1973, Transmission Control Protocol/Internet Protocol (TCP/IP) was designed and in 1983 it became the standard for communicating between computers over the Internet. One of these protocols, FTP (FileTransfer Protocol), allows users to log onto a remote computer, list the files on that computer and download files from that computer.

In 1976, AT&T Bell Laboratories created a Unix utility called UUCP (Unix to Unix Copy Program), as an efficient, low cost way of passing files between computers via phone lines. In 1979, two students at Duke University and University of North

California created a way for the people with UUCP connections to discuss their Unix problems by posting letters to a subject area called a newsgroup. People posted and passed the newsgroups via the phone lines in an intricate network of connections called Usenet News (Unix Users Network). Since it used ordinary telephone connections, it was sometimes referred to as the **Poor Man's Arpanet**.

Usenet grew as a grassroot connection between people and produced a culture of sharing information and support. Today there are thousands of newsgroups on topics that range from science fiction to making quilts. Usenet continues to produce collaborations between Unix programmers and developers of the highest quality in computer networking (Hauben 1993). In 1981, the gap between ARPAnet and USEnet was bridged at the University of California and the University of Berkeley. At the same time, in 1981 the City University of New York and Yale University created a network called BITNet (*Because Its Time Network*), based on the IBM protocol. BITNet spread among academic institutions worldwide, particularly in smaller, out of the way institutions often subsidized by IBM. This encouraged the growth of list serve discussion groups (via small) within academics similar to those on Arpanet. In 1983 ARPAnet became a backbone infrastructure to serve as a connection between gateways in order to transfer messages between different networks. It succeeded at this because it adopted TCP/IP (Transmission Control Protocol/Internet Protocol) as its standard for communication. This protocol continues as the standard of the Internet today. In fact it was so successful that everybody wanted to join it and in 1986 ARPANet was phased out and replaced by bigger, faster backbone - the National Science Foundation Network (NSFNet), which became the US backbone for a global network. The link between ARPANet, BITNet, NSFNet and other networks was called Internet. The http protocol gave birth to the World Wide Web that is popular today. In 1989 the first effort to index the Internet was created by *peter* deutsch at McGill University in Montreal who devised Archie, an archive of FTP sites. Another system, WAIS (Wide Area Information Server) was developed by Brewster Kahle of Thinking Machines *Corp.*. Tim Berners-Lee of CERN (European Laboratory for Particle Physics) developed a new technique to distribute information on the Internet, which eventually called the World Wide Web. The Web was based on hypertext which permits the users to connect one document to another at different sites. In 1993, Mosaic was developed by Marc Andreson at the National Centre for Supercomputing Applications (NCSA). It became the dominant navigating system for the World Wide Web.

INTERNET TOOLS

Majority of the plain users understand, the Internet means using only surfing the web and the electronic mail while the truth is that Internet incorporates many sorts of amazing features as being described ahead :

File Transfer Protocol

FTP is an acronym for File Transfer Protocol. The FTP application is used to transfer files between hosts. FTP downloads files to your server from any remote server that is connected to the Internet. Several FTP sites permit you to access their files without establishing an account with them. These sites are called anonymous sites. You generally login to such a machine as anonymous. On being prompted to type in a password, it is considered humble to enter your email address as a password. However, pressing the Enter key is enough. While transferring, it may be necessary to compress files to save transfer time.

Gopher

The second type of information retrieval tool available on the Internet is Gopher. A menu-based interface that provides easy access to information residing on special servers, called Gopher sites. Although Gopher performs primarily the same tasks as the FTP command, its interface is much more user-friendly and it provides additional functions, such as links to other Internet services. By selecting an item on the Gopher menu, users can move, retrieve, or display files from remote sites. The menu also allows users to move from one Gopher site to another, where each site provides different informations. The entire Gopher space (which refers to the interconnected Gopher servers) can be easily expanded by adding more servers.

Electronic mail

E-mail , shortened form of electronic mail, is the most used feature on the Internet. Almost all websites give their users, email account in order to sign in. Email has become very popular because unlike in regular mail, there is no delay. Postage is also not required. Printing e-mail addresses on business cards has become a fashion as common as printing the telephone numbers today.

Telnet

Telnet stands for Telecommunication Network, is a program that connects the user to a remote machine which may be located anywhere on the Internet and the user can then type commands to the remote machine, for example to change directories in search of certain files. While the FTP only allows users to move or transfer files, the services that *Telnet* provides depend on the services provided by the host machine, which may include much more than simple file transfers. For example, some servers are dedicated to the playing of board games, such as Chess.

Newsgroups

Newsgroups are discussions on a range of topics from recreational activities to scientific research. Some of the newsgroups can be accessed by any Internet surfer, while others are more commercial in that you have to subscribe to them and agree not to forward information to others. You can read any article or write articles and post them. You can even post follow up articles and check for new article groups. You can use the e-mail facility to communicate with fellow users. A Newsgroup of interest is comp for computer professionals.

World Wide Web

The world wide web often referred as www is a series of servers that are interconnected through hypertext. Hypertext is a method of presenting information in which certain items are highlighted. By selecting the highlighted text or image, you can obtain more information on the same topic.

The World Wide Web (WWW) is one of the newest and most popular Internet tools. It was designed by Tim Berners-Lee at the European Organization for Nuclear Research (CERN) in Switzerland in 1989 as a tool to help the international group of physicists to exchange findings and information related to their research. What makes the Web so exciting is that you can go anywhere, for example, an FTP site, a Gopher menu, or another document. In addition, the Web offers another very important service - URL or Uniform Resource Locator - which defines a universal locator mechanism for data anywhere on the Net.

Check Your Progress :

1. What do you mean by CERN ?
2. What is ISP ?
3. Define Gopher -

You use a browser software like Mosaic, Netscape Navigator or Internet Explorer to navigate the Web.

Archie

Archie is another Internet search program which helps users locate files and directories on anonymous FTP servers anywhere on the Internet. It was named after the Archie comic book character. It responds to queries based on complete or partial filenames. It is useful for gathering information and indexing widely distributed collections of data. Archie runs as a client program and allows you to retrieve public domain files. Archie sites periodically update their file listings by searching FTP sites locally or around the world. These files can be text-based, graphics-based or sound files. The Archie database can be accessed through a local client, and interactive Telnet session or through electronic mail.

Veronica

Veronica is an acronym for **V**ery **E**asy **R**odent **O**riented **N**et-wide **I**ndex to **C**omputer **A**rchives. It is an index of titles and Internet Gopher items which is updated once every fortnight and provides keyword searches of these titles. A VERONICA search typically searches the menus of hundreds of Gopher servers that are announced on the Internet. Once the files have been located , VERONICA also allows you to browse through them. VERONICA is also very easy to use as it is menu driven.

WAIS

WAIS stands for **W**ide **A**rea **I**nformation **S**ystem. It is another tool that helps you locate text documents. The search is based on the keyword provided. WAIS keeps track of how many times the keyword is found in documents. WAIS identifies documents after calculating which document is most closely related to your topic. WAIS searching is elementary and you cannot use the and/or/not operators in your search. WAIS finds exact matches. In other words , if you are searching for Black, WAIS will find only Black and ignore all like Blackboard, Blackmail and even Blackie.

Whois

This service is used to get information pertaining to Internet users, domain name and organisation. By using it, you can detect E-mail addresses, host computers and domain names. Information related with the organisation and users like name, host computer and name of the organisation are registered in a big registry database.

Internet Relay Chat

Internet Relay Chat or just chat, is a popular way for Internet users to communicate in real-time with other users. Real-time communication means communicating with other users in the immediate present. Unlike e-mail, chat does not require a waiting period between the time you send a message and the time the other person or group of people receives the message. IRC is often referred to as the "CB radio" of the Internet because it enables a few or many people to join a discussion.

IRC is a multi-user system where people join channels to talk publicly or privately. Channels are discussion groups where chat users convene to discuss a topic. Chat messages are typed on a user's computer and sent to the IRC channel, where all users who have joined that channel receive the message. Users can then read, reply to, or ignore that message or create their own message.

BASIC INTERNET TERMINOLOGIES

Intranet

Intranet is an internal computer network that is limited to a specific area and uses Internet standards.

U.R.L

U.R.L. stands for Uniform Resource Locator. This is an address of the resource on the net. Web browser uses URL to locate those Internet resources. URL specifies protocols viz http: for world wide web or ftp: for an FTP site to access resources. In addition, which server the source is located on is also determined by it. For example www.presidentofindia.nic.in is an URL where information resource partaining to the president of India can be found.

Browser

Browser is a software that helps in viewing HTML documents and also in accessing files and softwares related with those documents.

Domain

Domain is a set of websites on Internet that ends with a set of common letters. For instance .com represents sites of commercial nature whereas .org is dedicated to the sites of organisational category. Domain is the last part of an address.

Domain Name

Domain name is the name that identifies a website or a set of websites on Internet.

Domain Name System

Domain Name System is an acronym for DNS. It is a hierarchical system that lets Internet hosts obtain domain addresses (eg. www.sify.com) and IP addresses (eg. 210.18.12.244)

Hyperlink

Hyperlink is a link of an element of a hypertext document eg. a word, phrase, symbol or an image with any other document, file or script. Users click the linked element to activate the link that is actually underline or a different color from the left document. This happens so that users may know this is a linked object. When pointer turns in a hand shape you should assume that you are pointing to a hyperlink.

Hypertext

Hypertext is text stored on a computer system that contains links and takes users from one text or document to the other text or document.

Hypermedia

Hypermedia is a system that connects text to images, audio and video files.

Freeware

Freeware is a kind of computer software that is distributed for free on Internet.

Shareware

Shareware is a kind of computer software that is provided for no charge to the user on test however after a limited timeframe users have got to buy it.

Spyware

Spyware is a software that stealthily gets downloaded with a software downloaded from the net. This software collects your personal information for example which sites you use, what information you feed into an online form and uses these information to create your profile without your consent.

Blog

Blog is an acronym for weblog. This is a sort of website where entries like a diary or journal are made and they are displayed in a reverse chronological order. Blogs often offer commentary or news on some specific topics viz food, politics or local news. Some blogs work extremely private online diaries. An ordinary blog contains text, images and other blogs, links to web pages and other media based on the subject. Most of blogs are mainly textual. However, some are based on photos called photoblog, video called vlog or audio blog called podcasting and are a part of wide network of social media.

Website

Website is a location connected to the Internet where a company or organization or people can store intormation.

Webpage

Webpage is a document that is connected to the world wide web and anybody can see it with an Internet connection and a part of the website.

Home Page

Home Page is the main page created by a company, organization on the net from where connection is made for other pages. Or, home page is the page which you select as the first page after having connected to Internet.

Protocol

Protocol is a set of rules that control the way by which data are sent among computers.

Search Engine

Search engine is a computer program that lets you search information on Internet especially those documents that contain a specific word or a set of words.

Server

Server is a computer program that controls or sends information on several computers connected to a network. Or, Server is the main computer on which server program is run. In brief, the computer that offers something or serves is called a server.

Host

Host is the main computer of a network that controls or sends information on other computers connected to it.

Client

Client is a computer that is connected to a server. In other words, client is a computer that receives services from the server as requested to the server.

Hacker

Hacker is a computer enthusiast that sees information on a computer system without information and find the way to modify it.

Cracker

Cracker is a person that makes a control over security measures of a computer system and accesses unauthorized the system to gain information illegally. Or, a person who uses computer resources in an illegitimate way to obtain his/her ill wishes.

Download

Download is a process to transfer data from a large computer to a small one. Or, it is a process of transferring data from server to client.

Upload

Upload is a process to transfer data from small computers to large ones. Or, it is way of transferring data from client to server.

Portal

Portal stands for electronic portal. Electronic Portal is a website that provides information related with sale/purchase of goods on the website or offers the facility of e-commerce. For example, yahoo.com is a portal that offers facilities of news, advertisements, reservation, auction and competitive participation online.

NET ETIQUETTE

We communicate with people in our society, discuss with them on numerous topics and correspond with them using traditional method. This is the most prominent event prevalent in a society. Do we follow some specific code of conduct while engaging ourselves in these sort of activities? Certainly Yes. When we keep a code of conduct while talking to people with the same region, same country, same civilization, then on Internet when we are talking with people around the globe having different nation, different caste, different faith , different civilization, different culture and might be different mental setup. We correspond and discuss with them. In that case we are in more need of a code of conduct. This code of conduct followed while using Internet is called net etiquette. Net etiquette is also called netiquette. When we keep the code of conduct in mind while using the net we are treated as civilized netizens. The etiquettes we must follow while we are on the net are as follows:

Do not use flaming language

Be very careful while you are sending somebody a message that your language is neither critical nor rough. Some users ' messages carry less information, more criticism and all what people dislike.

Check the Sarcasm

While you are talking to somebody in person , your body language and facial expression support your words i.e. your body language and facial expression ensure what you speak. Unlike all that , when you are text chatting on Internet or sending an email, you express your views with the help of text and graphics. Therefore, you

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must make sure if your purpose is sarcastic. To express yourself in different moods, we use smileys.

Do not misinterpret your identification

Do not mislead your net friends by floating your wrong identification. This is immoral as well as illegal. If you wish , you can have one nick name of yours. It will not let others know who you are exactly nor you have to confront with any sort of embarrassment because of misidentification.

Do not use mean messages

Message should be having standard. It must not be mean. It is better not to send messages than sending mean messages.

Keep in mind, your counterpart online is a person not a computer

Remember your counterpart on the other end is a person who has his/her own sentiments. Means your message should be measured and it must not hurt your net partners' heart.

Use capital letters very rarely

While text chatting or sending an email to your friends, you must be careful of using case i.e. capital or small. Capital letters are supposed offensive. It reflects ill-mannerism. Using capitals letters seems as if you are SHOUTING. So be careful. Your best friend might take it otherwise. To emphasize on a particular word or sentence, enclose them with double quotation marks.

Check for errors before sending

Message full of errors is treated like a junk mail with no use. Since errors in spellings or structure of sentences make a very different sense what it actually contains, it makes the receiver confused. Thus, your personality will be maligned. People would take you as an irresponsible mailer. It is therefore advised to check spelling and grammar carefully before sending to someone.

Learn the rules and abide by them

Newsgroups, chat rooms, mailing lists and channels have some rules and regulations. You are acquainted with these rules and regulations while joining these services. You can enjoy uninterrupted services if you know the rules. However, ignoring the rules may lead to your dismissal from the services.

Do not infringe others' copyright

Do not send material if it is not yours. Never send material of which others have got copyright, to the mailing lists or newsgroups. Plagiarism is not only immoral but a legal offence too. Before you do so, take permission from the organization or person who has its copyright in black and white.

APPLICATIONS

Internet has changed the way people think and work today. No invention has likely ever influenced human lives to this extent. Education, medical, business, government, agriculture, research or talk of any world Internet has got very wider impact. Today with the net facility , you can send a letter to your relatives and friends, can share your feelings with your beloved , perform your business dealing in a few seconds.

Patients can consult the best doctors in the world and get advices. Students can learn from the most prestigious teachers at their doorsteps. Internet , being the biggest encyclopaedia in the world , is a boon for the researchers. Researchers can find a lot of contents on the Internet that help in their subject of research. They spend most of their time on Internet rather than on books. Surprisingly, Internet can help you find your child-days pals who are left unnoticed. Internet may be with you while you are in search of a counterpart of your life of your own choice. With the advent of Internet , an entire industry has been setup in the name of e-commerce. Internet, in addition to all walks of your life, helps the government run good governance and provide some basic services to the citizens with ease and peace.

Internet has got innumerable contributions in making the world full of ease and comfort engaging itself in different fields, quite difficult to mention all those. Here, we are discussing applications of Internet in some special areas as follows:

- Business on the Internet
- Governance on the Internet
- Crime on/through the Internet

Business on Internet

Internet has devised a new industry world which we generally call electronic commerce or e-commerce. Influence of Internet can be estimated when you see business enterprises prefer to float their site URL rather than phone numbers. You open a site and you will see a lot of lucrative advertisements flickering on your screen. A number of desired and undesired mails are waiting for you when you click on your inbox. With the Internet, you can run your business with a small desktop or laptop computer. E-commerce is a combination of net technology and traditional business. Using this, we can operate our entire business process with Internet. Commercial advertisements, order placement, order processing, payment and all other activities a business engages can be done using Internet. For example, going through the sify.com, you can select the item of choice, place your order and even can pay online through credit card or net banking.

Doing business on Internet is very simple and does not require you be a millionaire. You can start you business with a telephone line, internet connection and a computer. Business through/on Internet offers the following privileges:

- Less capital required
- No big infrastructure required. Compared to traditional business infrastructure required in doing e-business is negligible.
- Less Human resources required
- Relief from paper work

Governance on/through Internet

Internet has helped in governance a lot. This has proved a boon for good governance. Several government departments have been linked with computer and Internet in different states of India. Andhra Pradesh in India is such a good example. In this state, people can get their work done from *Panchayat* level to chief ministerial office with the help of Internet. Internet has minimized the problems of getting in the queue for several hours and giving bribes to the clerks and other officials. Internet

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in banks, schools, college, universities, passport offices, administrative offices has facilitated common civic life. In India, National Informatics Centre has developed numerous government sites that connect common man with the Prime Ministerial and Presidential Offices.

E-governance aims at providing all such services at people doorsteps. This is also called G-TO-C means Government To Citizen. E-governance or government for citizens are popular in numerous nations in the world. FIRSTGOV of America, E-ENVOY of Britain, E-TAIWAN of Taiwan, E-CITIZEN of Singapore, E-KOREA, E-MALAYSIA, E-VICTORIA ONLINE OF AUSTRALIA and GOVERNMENT ONLINE of Canada are prominent and have been rewarded. These sorts of projects are even working in India also. Andhra Pradesh government has initiated E-SEWA to provide better services to the people of state. This project is meant for offering all possible services to people under one roof and this could check people wandering from one office to the other for getting their work done. Using E-SEWA people can deposit their bills of water , electricity and telephone with no hassle. Besides they can get birth and death certificates, educational certificates online. This service was started in 1999 and this E-SEWA has 200 running centers, offering 160 different services. According to one estimation, every month, more than five crores people are getting benefited. Through E-SEWA property tax, income tax etc. can also be deposited. Application can be applied for passport. Tickets for train and airplane can be booked. Tickets can be purchased from cinema halls. E-governance is also functioning well in Kerala and Karnatka in India.

E-governance includes the following activities :

Meetings : With the help of Internet, video conferencing facility is available. This facility is used in organizing conference, seminar and meetings. People from one organization can participate in a function using this facility sitting different corners of the world.

Correspondence : Internet is being used as an effective tool of correspondence. Any order, circular, notice can be communicated immediately from head office to its different branches and answer also can be received quickly. Offices use Internet to send their reports. This is quicker, easier and safer.

Registration and Admission : Government and non-government offices now float their registration and admission forms. Students going to that particular site, can register themselves and also get them admitted. They can pay their registration and admission fees online through credit card or net banking. Alternatively, they can also send demand draft after registering themselves.

Impact of Internet on Society : Internet on one hand , has improved the living standard of society, while on the other hand it has brought about some negative impression on the society. The negative aspects of Internet are as follows:

Addiction of Internet : Young generations of this era are crazy about Internet. They have left behind all other means of recreation and become addicted to Internet. Sitting for several hours before Internet , sending mails and talking to their online friends are main hobbies of the youngsters. This hobby adversely affects on their health and mind. Beside they spend a lot in this way and suffer financial crisis also.

Propagation of Pornographic Material : Internet , being the biggest encyclopaedia in the world today incorporates contents from almost all the fields of knowledge and

information. This advantage of Internet is frequently misused by developing pornographic sites where foul pictures and movies are floated. Our young generation watch these things with great taste. This is a fatal aspect of Internet for which administration is also concerned. The administration tries to prevent this game but it can not be checked completely until users become conscious about its ill consequences.

Crime Through/On Internet

Internet being the hub of business and financial activities and a large means of communication, is also a great attraction of the scoundrels. Internet is being widely used to operate militant and anti-social activities. Using email and other services available on Internet, anti-social and terror elements easily can perform their foul activities. With the e-mail facility they can communicate their plan each other irrespective of any geographical boundaries. Likewise, financial fraudulence is common on Internet today. Since people are doing a big amount of transactions using their credit cards etc., Internet frauds using their expertise pick-up their credit card details and perform financial crimes. In addition to all that, even at times information given while creating your e-mail ID is misused and people are targeted for ill-wills. Viewing pornographic sites is one of prominent crimes happening with the help of Internet which is killing our young minds and becoming an important tool for sexual abuse. This powerful tools of communication is also used for spreading hatred and violence. There are a lot of sites that help spread ethnic discrimination. In India, the administration is taking steps to check these things. Hawkish eyes are upon cyber cafes . In metros, it has become mandatory for the owner of cyber cafes to maintain a register of the users' names and addresses and Identity Card has become a must to use net in a cyber café. Wish these measures work and Internet remain a creative tool for all those who are engaged in making the world a better place to live!!

ELECTRONIC COMMERCE

Online business activities of products and services are called electronic commerce or E- commerce. This also means that in this kind of business activities the people who are doing the business are not physically present but do the business through the medium of electronics. E- Commerce is generally concerned with sale and purchase on Internet or use of products through computer and by network or transfer of rights concerning these activities. Though this definition is popular yet, it is not widespread enough to embrace latest developments in the revolutionary business process. There is another definition of E-commerce that seems to be more appropriate. E-Commerce is the use of electronic communication and digital information processing technology in business dealings, which redefine the relationship between people and different organisations or gives it a new set up.

However, some people consider E-commerce and E- business as one, but in reality these are two different concepts. In E-commerce information and communication technology (ICT) in involved in business and exchange between organizations. In E-business the business dealings are held between organisations and the customer. Electronic commerce is like a market place on Internet. Electronic commerce is mainly the name of distribution, purchase, sale, marketing and servicing of the products on electronic systems such as Internet and other computer networks. The information technology industry considers it as an electronic business application, that may suffice the purpose of commercial transaction. It may involve electronic

Check Your Progress :

4. What do you know about browser.
5. Define portal.
6. What do you know about Ecommerce.

fund transfer, supply chain management, e-marketing, online marketing, online transaction processing, electronic data interchange (EDI) , automated inventory management system and automated data collection. In the system cycle the world wide web communication technology is used some where or the other. Although electronic commerce often depends more on other computer technologies such as data base, e-mail as well, than world wide web. However, this also depends on non computer technique such as the transport of the goods purchased through e-commerce .

TECHNICAL AND ORGANIZATIONAL ASPECTS

The organizational and the technical aspects related with e-commerce are as follows

- For e-commerce there should be adequate market research and analysis. E-commerce is not beyond the good planning of business and distribution and fundamental laws of supply and demand. To loose in business is equally true in e-commerce.
- For e-commerce a good management team is necessary. The team should be well conversant with strategies of information technology. The strategy of information technology of the companies should be a part of re-design process of the business.
- To provide a secure and simple way to customers so that they can do their transactions. Credit card is the most popular method for payment on Internet. And in 90% transactions this method is used. Earlier , the card numbers were securely transferred through the medium of independent gateways between the traders and customer. Even today such gateways are being used in small and home trade. Most of the traders make use of their credit cards for dealing with those companies and banks with whom they have the undertakings.
- To provide security and trustworthiness. The parallel server, hardware redundancy, fail-safe technology, information encryption and firewall fulfill the aforementioned requirments.
- To provide complete information of customer relation so that it can be ensured that the employee, suppliers and partners can give complete and common information to the customer .
- To create a solid business model from the view point of the trade.
- To establish such a viable and vibrant organisation that can readily react to any change in economic, social and physical environment.
- To provide an attractive website. In this regards it is essential to be able to make a balance of sober and tasteful colours, graphics, animation, photo , font and the white spaces.
- To provide complete understanding of the products or services that are being offered. In this, the information should not only confine to products but also concerning advisors and selectors.

  Practically, e-commerce vendors should be true to mundane affairs concerning product and its availability. The procedure for despatching of the goods have to be trustworthy . All the complaints should be attended to effectively and efficiently.

In the world of e-commerce the customer is equipped to gather maximum information about the product and the company which is otherwise not possible in ordinary business.

- A successful e-commerce concern should be able to provide the customer with a happy and satisfactory experience. To realise this the following factors may be included.

  (i) To give priority to the customers.

  (ii) To provide service and performance. To provide the customer with the same satisfaction as he or she receives on doing the shopping himself or herself.

  (iii) To provide incentive to the customers : To achieve this aim of sale promotion special offers, coupons and discounts may be provided.

  (iv) To provide personal attention : For this, personalised websites , purchasing suggestions and personalised special offers may prove to be useful. These features can can make it an alternative to the customary method of purchase from distribution centers.

  (v) To give the feeling of a community : Chat room , discussion board, customer input and loyalty programme that are also called affinity programmes may prove to be helpful in this direction.

  (vi) In order to extend self help to the customer such a site may be offered to the customer which he can use without any help. This can only be possible when complete information on product is available including cross sell information, advice on alternatives of the products and information on supplies and accessory selectors.

ADVANTAGES OF E-COMMERCE

Following are the main advantages of e-commerce.

- **E-Commerce serves as an equalizer**- This helps initially the small and medium sized traders to reach to the world market.
- **E- Commerce makes mass customization possible**-E-Commerce applications of this region includes those ordering systems that can be easily used by a customer to select the desired product and order the same .As for example a car manufacturing company that does business under E-Commerce strategy can make a car as per the specifications given by the customer. This would work better if the company has advanced production process and attached with ordering system.
- **E-Commerce allows network production** – Means to send company's production process to all those contractors that though geographically dispersed but connected with each other through computer network. Due to network production not only production cost is reduced but it also provides strategically target marketing. Besides, it helps in sale of additional products and services that are the need of the hour. With network production, a company can send its requirements to factories all over the world that specialize in such fields.

- **E-Commerce is helpful to the consumer**- In C2B transactions, cor sumer/customer gets more importance. They can order goods as per the choice and requirements. There is a provision that can specify the wa products and services are to be delivered thereby broadening options t consumers. E-Commerce allows for a faster and more open process wit customers having greater control. E-Commerce makes information on prod ucts and the market readily available and accessible, and increases pric transparency that enables customers to make more appropriate purchasin decisions in terms of minimum prices.

- **Driving forces behind E-commerce**-There are at least three major force fuelling e-commerce. These are economic forces, customer and marketin interaction forces and technology particularly multimedia convergence.

Economic Force: The most evident benefit of e-commerce is economic efficiency. The basic reasons of economic efficiency of e-commerce are:

- reduction in communications cost
- low-cost technological infrastructure
- speedier and more economic electronic transactions with suppliers
- lower advertising costs
- cheaper customer service

Economic integration is either external or internal. External integration refers to the electronic networking of corporations, suppliers, customers/clients and independent contractors into one community communicating in a virtual environment through the medium of Internet. Internal integration, on the other hand, means networking of different departments within the company. This allows critical business information to be stored in a digital form that may be retrieved instantly and transmitted electronically. The best example of internal integration is corporate intranet. Among the companies with efficient corporate intranets are Procter and Gamble, IBM, Nestle and Intel

Market Force: To launch companies of both small and large size and to control international market e-commerce is a powerful factor. Similarly, the Internet is used as a medium for enhanced customer service and support. The companies can provide their consumers with more detailed product information using Internet.

Technology Force: The development of ICT (Information and Communication Technology) is a key factor in the growth of e-commerce. For instance in technological advances in digitizing content, compression and promotion of open systems technology and in the convergence of communication services into one single platform it has played an important role. Consequently communication has become more efficient, fast, easy and economical.

- **Link customers, workers, suppliers, distributors and competitors:** E-commerce facilitates organization networks wherein small firms depend on

partner firms for supplies and product distribution to address customer demands more effectively. To manage the chain of network linking customers, workers, suppliers, distributors and even competitors an integrated or extended supply chain management solution is needed. Supply Chain Management or SCM is defined as the supervision of materials, information and finances as they move from supplier to manufacture to wholesaler to retailer to consumer. It involves the coordination and integration of these flows both within and among companies. The goal of any effective supply chain management system is timely provision of goods or services to the next link in the chain.

DISADVANTAGES OF E-COMMERCE:

It is relatively difficult to discuss the negative aspect of e-commerce. If its negative aspects had been stronger we would not have seen the shape of electronic commerce what it is today. However directly we can see a few negative aspects. These are-

- **Buyers and sellers do not see each other.** When a buyer purchases goods from a dealer, the two parties cannot see each other. Hence, dealer cannot help the customer and the dealer even cannot entertain any complaint concerned with the product. Therefore, the sale becomes passive. This overlooks an important principle of sale. In case of any need of human conversation regarding the product, it is not possible in e-commerce.
- **Economic and Social Problems.** The entire population would never develop the technical skill for e-commerce. Even no one would have adequate resources. Since in this type of commerce less manpower is needed. Therefore there would be growth in unemployment.
- **Fail to understand taste of customers.** Even a product presented in a tasteful manner fails since the producer and retailer remain unaware of expectations, habits and motivation of customers.
- **Failure to consider competitive situation.** One may have the will to construct a viable book e-tailing business model but may lack the capability to compete with others.
- **Inability to predict environmental reaction.** What will the competitors do? Will they introduce competitive brands or competitive web sites? Will they supplement their service offerings? Will price wars break out? What will the government do? The people dealing in e-business fail to get right answers of these questions.
- **Overestimation of resource competence** Can staff, hardware, software and processes handle the proposed strategy? Have e-tailers failed to develop employee and management skills? These issues can be important for resource planning and employee training.

- **Failure to coordinate**. If existing reporting and control relationships do not suffice, one can move towards a flat, accountable and flexible organizational structure, which may or may not aid coordination.

- **Failure to obtain senior management commitment.** This often results in a failure to gain sufficient corporate resources to accomplish a task. It may help to get top management involved right from the start.

- **Failure to obtain employee commitment.** If the planners do not explain their strategy well to employees or fail to give employees the whole picture, then training and setting up incentives for workers to embrace the strategy may assist.

- **Underestimation of time requirements.** Setting up an e-commerce venture can take considerable time and money and failure to understand the timing and sequencing of tasks can lead to significant cost overruns. Basic project planning, critical path, critical chain or PERT analysis may mitigate such failings. Profitability may have to wait for the achievement of market share.

- **Becoming the victim of organized crime**. Many syndicates have caught on to the potential of the Internet as a new revenue stream. Two main methods are as follows: (1) Using identity theft techniques like phishing to order expensive goods for quick cash;(2)Extortion by using a network of compromised "zombie" computers to engage in distributed denial of service attacks against the target web site until it starts paying protection money.

- **Failure to expect the unexpected.** Too often new businesses do not take into account the amount of time, money or resources needed to complete a project and often find themselves without the necessary components and become failures.

COMPONENTS OF E-COMMERCE

E-Commerce does not refer merely to a firm putting up a Web site for selling goods over the Internet. For e-commerce to be a competitive alternative to traditional commercial transactions and for a firm to maximize the benefits of e-commerce, a number of technical as well as enabling issues have to be considered. A typical e-commerce transaction loop involves the following major players and corresponding requisites:

- **The seller should have the following components:**

  - A corporate web site with e-commerce capabilities(e.g. a secure transaction server)
  - A corporate intranet so that orders are processed in an efficient manner
  - IT-literate employees to manage the information flows and maintain the e-commerce system

- **Transaction partners** includes:
  - Banking institutions that offer transaction clearing services (e.g. processing credit card payment and electronic fund transfers)
  - National and international freight companies to enable the movement of physical goods within, around and out of the country. For business-to-consumer transactions, the system must offer a means of cost-efficient transport of small packages(such that purchasing books over the Internet, for example, is not prohibitively more expensive than buying from a local store); and
  - Authentication authority that serves as a trusted third party to ensure the integrity and security of transactions.
- Consumers(in a business-to-consumer transaction) who:
  - Form a critical mass of population with access to the Internet and disposable income enabling widespread use of credit cards; and
  - Possess a mindset for purchasing goods over the Internet rather than by physically inspecting items.
- Firms/Businesses (in a business-to-business transaction) that together form a critical mass of companies (especially within supply chains) with Internet access and the capability to place and take orders over Internet
- Government
  - To establish a legal framework governing e-commerce transaction (including electronic documents, signatures and the like).
  - To establish Legal institutions that would enforce the legal framework (i.e. laws and regulations) and protect consumers and business from fraud, among others
- Internet, the successful use of which depends on the following
  - A robust and reliable Internet infrastructure
  - There should be a balanced expenditure on purchase of goods on Internet and use of the same. As for example expenditure on the rate of Internet service provider and local phone call should be limited meaning thereby if we use Internet for one hour or 24 hours there should not be difference in these rates.

For e-commerce to grow the above requisites and factors are essential. Any least developed factor is an impediment to the growth of e-commerce as a whole. For instance, a country with an excellent Internet infrastructure will not have high e-commerce growth if banks do not offer support and fulfillment services to e-commerce transactions.

INTERNET AND E-COMMERCE

The Internet allows people from all over the world to be connected inexpensively and reliably. As a technical infrastructure, it is a global collection of networks, connected to share information using a common set of protocols. Also, as a vast network of people and information, the Internet is an enabler for e-commerce as it allows businesses to showcase and sell their products and services online and gives potential customers, prospects, and business partners access to information about these business and their products and services that would lead to purchase. Before the Internet was utilized for commercial purposes, companies used private networks such as the EDI or Electronic Data Interchange- to transact business with each other. That was the early form of e-commerce. However, installing and maintaining private networks was very expensive. With the Internet, e-commerce spread rapidly because of the lower costs involved and because the Internet is based on open standards.

TYPES OF COMMERCE

Depending upon the nature of transaction and parties involved, there are many types of E-Commerce. The major types of E-Commerce are:

- Business to Business
- Business to Consumer
- Consumer to Business
- Consumer to Consumer
- Business to Government
- Government to Business
- Government to Citizen
- Mobile Commerce

- **Business To Business E-Commerce :** Business to business E-commerce is defined as e-commerce between companies. This is the type of e-commerce which deals with relationship between and among business establishments. Most experts predict that business to business e-commerce will grow faster than the business to consumer.

- **Business To Consumer E-commerce :** Business to consumer is a form of electronic commerce in which products or services are sold from a firm or company to a consumer. Business to consumer e-commerce or commerce between companies and consumers involves the following consumers.

  - Customers gathering information
  - Purchasing physical goods such as books or consumer products.

  It is the second largest and earliest form of e-commerce. Its origin can be traced to on line retailing (or e-tailing). Thus the common business to consumer models are the online retailing companies, such as AMAZON.com, ebay.com, etc.

- **Consumer To Business E-Commerce :** Consumer to business transactions involve reverse auctions which empower the consumer to drive transactions. A concrete example of this is that when competing airlines gives a traveler best travel and ticket offer .

- **Consumer To Consumer E-Commerce :** Consumer to consumer e-commerce or C2C is commerce between consumers and consumers. This type of e-commerce is characterised by the growth of electronic market places and online options. Particularly, vertical industries where firms / business can bid for what they want from among multiple suppliers. It perhaps has the greatest potential for developing new markets. Consumer to consumer electronic commerce involves the electronically facilitated transactions between consumers through a third party. A common example is the online auction in which a consumer posts an item for sale and other cosumers bid to purchase it. The third party generally charges a flat fee or commission. The sites are only intermediaries just there to match consumers. They do not have to check the quality of the products that are offered.

- **Bussiness to Government E-Commerce :** Business to government e-commerce or B2G is generally defined as commerce between companies and public sectors. It refers to the use of the Internet for public procurement licensing procedure and other government related operations. This kind of e-commerce has two features. First the public sector assumes a leading role in establishing e-commerce and second it is assumed that the public sector has the greatest need for making its procurement system more effective. Web based purchasing policies increase the transparency of the procurement process and reduces the risk of irregularities. To date however, the size of the B2G e-commerce market as a component of total e-commerce is insignificant since, the governments e-procurement system remains undeveloped.

- **Government to Business E-Commerce :** Government to business E-Commerce is the name of online commercial interaction between local and central government and the commercial business sector. For example, http:// www.dti.gov.uk is a government website where businesses can get information and advice on e business "best practice".

- **Government to Citizen E-Commerce :** Internet is very helpful in governance. It has proved to be a boon in good administration. Many government departments of states of India are linked through computers and Internet. Andhra Pradesh is the best example of this in India. In this state people with the help of Internet can do their work from panchayat level office to office of the Chief Minister. Internet has reduced hours of waiting in the queue and the problem of bribing to the clerks has considerably reduced. Internet has made the common citizen's interactions with banks, schools, colleges, universities, passport offices and administrative offices easy. In India, the National Informatics Centre has developed many government sites that link common people with the offices of President and prime minister.

  E-governance has helped in taking these services to the doorstep of the people. This is also referred to as G-TO-C or Government to Citizen. E-governance or Government for Citizens has become popular in many countries. FIRSTGOV of America, e-ENVOY of Britain, E-TAIWAN of Taiwan, E-CITIZEN of Singapore, E-KOREA, E-MALAYSIA and Canada's Government Online are

in vogue and received accolades. Similar projects are working in India too. Th government of Andhra Pradesh has started E-SEWA for providing better ser vices to the people. The purpose of this project is to bring all the services unde one roof and give relief to the people who visit many offices of the governmen for their work. By using E-SEWA, people can pay their bills of electricity, wate and telephone without any hassle. Besides this, they can also obtain certificate of birth, death and educational achievement on line. This was started in 1991. It provides 150 services through 200 centers of E-SEWA. According to one estimate approximately five crore people are benefited every month. E-SEWA also assists the people in payment of property tax and income tax etc. Applications for obtaining passports too can be submitted. Reservations for air and rail travel, tickets to watch movies are also obtained. E-governance is doing well in Kerala and Karnataka too.

- **Mobile Commerce :** Mobile commerce or M Commerce is sale-purchase of products and services through the medium wireless technology such as handheld instruments e.g. cellular telephone and Personal Digital Assistants. Japan is on the top in this regards.

CONSTRAINTS TO E-COMMERCE

To make a portal or site is not complete e-commerce. You have read about those elements that are essential for e-commerce in the earlier section. To achieve this success the question of infrastructure and mindset of the people too are important. In Indian sub continent even today people prefer to visit shopping malls to purchase their requirements. There are reasons too in this practice. The people get satisfaction since they physically test the goods themselves, get immediate delivery besides accompanied entertainment and outing too are equally important factors. Moreover in India there are scores of people who do not have access to Internet and the people who have access to it, do not have means of payment online such as credit card. The constraints in effective e-commerce in any country are being mentioned as follows :

- **Poor telecommunication infrastructure:** This is the greatest constraint in widespread of e-commerce since telephone line is the backbone of Internet. In our country broadband and other high speed Internet services are still far away from our reach. This is all because of lack of a good system of telecommunication infrastructure.
- **Expensive computer and hardware parts**: Since last decade the computer and hard ware are comparatively cheaper but in the countries of low per capita income, to purchase computer is still a difficult task.
- **Lack of technically efficient personnel:** In any country trained technically efficient personnels are required to manage the e-commerce activities.
- **Poor banking infrastructure:** You have read that commerce and payment are complimentary to each other. You need money to sell products. In the countries where banking infrastructure is not good, to make e-commerce

effective is a difficult task. As for example, even in India there is a large segment of population that does not have a bank account and for those who have, they do not hold credit cards or appropriate instruments for payment. Even today, the banks are not in a position to issue credit card at large scale. There is no credit card system in local banks and there are few that accept payment by credit cards. The cheque clearing system between two banks too is not very good.

- **Lack of credit card users:** When you do not have any means to pay for products and services it is but natural that you cannot be linked with e-commerce. Hence it is the greatest constraint in the growth of e-commerce.

IT ACT 2000

With the aim to have effective control over Internet and the business that is done through it, the Parliament passed Information Technology Bill in both the houses. The then President of India accorded approval for the IT Bill in August 2000. The objective of this act is to provide legal infrastructure to electronic commerce in India. The different perspectives of IT ACT 2000 and the security it provides are summarized here:

- The chapter one of this act provides definitions of several important terminologies.
- The chaper 2 of the act stipulates that any subscriber can authenticate any electronic record. He shall add his digital signature for this. This is also specified in this that any person can examine that electronic record by using subscriber's public key.
- The third chapter of the Act gives details of electronic governance. In this chapter the detail of digital signature's legal identity is also given.
- In chapter four of this act information concerning rights of electronic records, receipt and dispatch of information are given.
- In the chapter five of this act, secured electronic record and digital signature are discussed.
- Chapter six of this act describes management of certifying authority.
- In chapter seven of this act, the focus is on Digital Signature certificate. According to this, any person can apply on prescribed form seeking digital signature certificate from certifying authority. The prescribed fee is up to the limit of 25,000 rupees. The certifying authority has the complete authority to accept or reject such certificates.
- In chapter eight of this act duty of the subscribers are discussed.
- One of the most important chapters of this act is ninth chapter, wherein penalties and adjudications are mentioned. In this, various crimes are discussed. The following points are included in this.

- Without the permission of owner / in charge of computer, computer system or computer network, no person can access nor can receive data. In addition to infecting computer systems with viruses, nobody can even use other means to damage the systems. Nobody can disrupt computer network as well. The penalty for such crime committed on computer, computer system or on any computer network would be up to one crore rupees. In the first section of this chapter, definitions of computer database, computer virus and damage are given. In the next section of this chapter, it is stated that in such situation who would be competent to give judgment. These are as follows:

- Adjudicating officer would be Director of Government of India or any officer of equal rank in the state government who would hold the enquiry according to the guidelines set by the government of India.

- The judge would be the person who has the experience in the field of information technology and judiciary. It is also clarified how the judge would decide. In addition, in case of appointment of more than one judge who would do what and how the quantum of fine would be decided.

⇨ The 10th chapter of this act is based on Cyber Regulations Appellate Tribunal. The chapter of this act mentions about establishment of this tribunal. This states that the central government can establish more than one tribunal and the details of its jurisdiction of this tribunal is also included. The presiding officer will be the one who has the qualification to hold the office of justice of a high court or the person who had been a member of Indian legal system or who had served in this service on the post of first class magistrate. The office of the presiding officer would be for a period of 5 years and his maximum age should be 65 years. This body is mainly established so that appeal can be made against the verdict of the judge.

⇨ In the 11th chapter of this act the offences have been discussed . Some of the details are as below.

- **Tampering With Computer Source Documents**- A person who purposely fiddles with legally secured computer source code, computer programme, computer system and computer network would be fined to a maximum of rupees 2 lakhs and will be subjected to 3 years imprisonment.

- **Hacking Computer System**- Here the definition of hacking is given. Any attempt to sabotage the computer source is considered hacking for which there is a provision of 3 years imprisonment or a fine of rupees 2 lakhs or both.

Similarly in this chapter crime and punishment in relation to publication of any objectionable material in the electronic form is discussed. There are two kinds of punishments for such crimes. If a person publishes the objectionable material for the first time he can be penalised with 5 years of impris-

onment or fine up to 1 lakh rupees. If the same person is again found guilty then the imprisonment period will be extended to 10 years along with a fine of rupees 2 lakhs. In this chapter the crimes such as breach of secrecy, wrong publication of digital signature certificates , publication with a wrong motive etc. and measures to correct these have been discussed. It has also been described that no officer below the rank of deputy police superintendent would enquire into such crimes.

- In **chapter 12** it is stated that under this act for any crime service provider will not be held responsible and in chapter 13 the power of police officer and other miscellaneous issues are mentioned.

The main effort of I.T Act 2000 is to change the obsolete laws and to counter act the cyber crimes. We needed the laws so that we can deal on Net with credit cards without worrying about its misuse. This act provides long awaited legal framework so that no legal aspect of the information is ignored since, it is not in electronic record form.

In view of growth of business through the medium of electronic record this act gives power to the government departments so that the official documents can be filed , created and retained in the digital format and accepted too. This act has proposed a legal frame work for origin and authentication of electronic records / communication through digital signature.

In the perspective of e-commerce, there are many positive aspects of I.T Act 2000. Firstly, in India now e-mail communication is an accepted and legal document, which can be presented in any court of law. The companies now under this act can use the legal infrastucture and do electronic commerce more efficiently. Under this act the corporate companies can make digital certificate by forming certifying authorities. Under this act the government can issue notification on web and can enhance e-governance. After promulgation of this act, the companies can submit applications in the prescribed forms in the government offices.

This act also addresses those security issues that are important in electronic dealings. This act has given a definition to the concept of secured digital signature. Under the provision of I.T Act 2000 now, the companies have a legal recourse that can help them against sabotage or theft of data from their computer system network. The victimised companies can fine the guilty person or company to a tune of 1crore rupees.

INTRANET

Intranet is the generic term for a collection of private computer networks within an organization. An intranet uses network technologies as a tool to facilitate communication between people or workgroups to improve the data sharing capability and overall knowledge base of an organization's employees.

An **intranet** is a private computer network that uses Internet Protocol technology to securely share any part of an organization's information or network operating

Check Your Progress :

7. What are disadvantage of Ecommerce.
8. What are types of Ecommerce.
9. What is Mcommerce.

system within that organization. The term is used in contrast to *internet*, a network between organizations, and instead refers to a network within an organization. Sometimes the term refers only to the organization's internal website, but may be a more extensive part of the organization's information technology infrastructure. It may host multiple private websites and constitute an important component and focal point of internal communication and collaboration. Any of the well known Internet protocols may be found in an intranet, such as HTTP (web services), SMTP (e-mail), and FTP (file transfer protocol). Internet technologies are often deployed to provide modern interfaces to legacy information systems hosting corporate data.

Intranets utilize standard network hardware and software technologies like Ethernet,WiFi, TCP/IP, Web browsers and Web servers. An organization's intranet typically includes Internet access but is firewalled so that its computers cannot be reached directly from the outside.

A common extension to intranets, called extranets, opens this firewall to provide controlled access to outsiders.

Many schools and non-profit groups have deployed them, but an intranet is still seen primarily as a corporate productivity tool. A simple intranet consists of an internal email system and perhaps a message board service. More sophisticated intranets include Web sites and databases containing company news, forms, and personnel information. Besides email and groupware applications, an intranet generally incorporates internal Web sites, documents, and/or databases.

The business value of intranet solutions is generally accepted in larger corporations, but their worth has proven very difficult to quantify in terms of time saved or return on investment.

USES OF INTRANET

Intranets are fast and cost-effective channels for internal business communication. They are especially suitable for situations in which a company needs to offer the same information or news simultaneously to the entire staff at various company locations despite geographic distances and time differences. But, communication via intranet is not uncomplicated, and certain issues may be critical to the intranet's success within multinational companies, including access, language, and content.There are numerous functions that an Intranet can provide. Some of these include:

Human Resources Intranets

- Job Postings
- Policies
- Career Development and Training
- Employee Directories
- Payroll and Benefits Data, Enrollment & Change Forms
- Company Information Center
- Corporate Financial Information
- News
- Ethics and Values statements

- FAQ or Information Requiests
- Employee Handbook
- Pay and Performance
- Job Description
- Community
- Calendar of Events with Registration
- World Wide Web Links

Sales & Marketing Intranets

- Links to Search Engines for Market Research
- Information on How to Search Effectively
- On-Line Catalogues
- Pricing Information
- Onlines Sales Brochures & Materials
- Product Demos & Scripts
- Contact Management
- Sales Feedback
- Prospecting
- Sales Training
- Collaboration Tools

Corporate Office Intranets

- Policies
- Corporate Events
- Internal Departmental Information
- Meeting Minutes
- Stock Market Analysis / Tracking
- Online Corporate Tools & Resources
- Tax and Legal
- Surveys
- Document Libraries & Document Management
- File Sharing
- Collaboration Tools
- Project Management

EXTRANET & ENTERPRISE SOLUTIONS

An **extranet** is a computer network that allows controlled access from the outside for specific business or educational purposes. Extranets are extensions to, or segments of, private intranet networks that have been built in many corporations for information sharing and ecommerce. Extranets are not limited to people logged on to a specific network. A good example is a company that hosts a website for clients to order from but you must actually be a client to order using this method. Extranets are a cross between the Internet and Intranets. It is a network that allows traffic from outside of the network, but on a limited controlled level.

During the late 1990s and early 2000s, several industries started to use the term extranet to describe central repositories of shared data made accessible via the web only to authorized members of particular work groups. However, many publications

consider Michael Ferro, founder and CEO of Click Commerce, to be the "Father of the Extranet". Some applications are offered on a Software as a Service (SaaS) basis by vendors functioning as Application service providers (ASPs).

Specially secured extranets are used to provide virtual data room services to companies in several sectors (including law and accountancy).

For example, in the construction industry, project teams may access a project extranet to share drawings and documents, make comments, issue requests for information, etc. In 2003 in the United Kingdom, several of the leading vendors formed the Network for Construction Collaboration Technology Providers (NCCTP) to promote the technologies and to establish data exchange standards between the different data systems. The same type of construction-focused technologies have also been developed in the United States, Australia and mainland Europe.

Relationship to an Intranet

Intranet is a network that is not available to the world outside of the Intranet. If the Intranet network is connected to the Internet, the Intranet will reside behind a firewall and, if it allows access from the Internet, will be an Extranet. The firewall helps to control access between the Intranet and Internet to permit access to the Intranet only to people who are members of the same company or organisation.

In its simplest form, an Intranet can be set up on a networked PC without any PC on the network having access via the Intranet A key requirement in today's business environment is the ability to communicate more effectively, both internally with your employees and externally with your trading partners and customers.

An intranet is a private - internal - business network that enables your employees to share information, collaborate, and improve their communications.

An extranet enables your business to communicate and collaborate more effectively with selected business partners, suppliers and customers. An extranet can play an important role in enhancing business relationships and improving supply chain management.

An Extranet is actually an Intranet that is partially accessible to authorised outsiders. The actual server (the computer that serves up the web pages) will reside behind a firewall. The firewall helps to control access between the Intranet and Internet permitting access to the Intranet only to people who are suitably authorised. The level of access can be set to different levels for individuals or groups of outside users. The access can be based on a username and password or an IP address.

Advantages of extranet

- Exchange large volumes of data using Electronic Data Interchange (EDI)
- Share product catalogs exclusively with trade partners
- Collaborate with other companies on joint development efforts
- Jointly develop and use training programs with other companies

- Provide or access services provided by one company to a group of other companies, such as an online banking application managed by one company on behalf of affiliated banks.

Disadvantages of Extranet

- Extranets can be expensive to implement and maintain within an organization (e.g., hardware, software, employee training costs), if hosted internally rather than by an application service provider.
- Security of extranets can be a concern when hosting valuable or proprietary information.

Answer of the Check Your Progress

1. CERN stands for Conseil Europeen pour la Recherche Nucleaire. CERN is a laboratory where scientists unite to study the building blocks of matter and the forces that hold them together. CERN exists primarily to provide them with the necessary tools. These are accelerators, which accelerate particles to almost the speed of light and detectors to make the particles visible.
2. A company that provides Internet access is known as Internet Service Provider (ISP). Like any company, an ISP charges for its services. In general, ISPs levy two types of fees:
   - A charge for using the Internet
   - A charge for a physical connection to the Internet
3. TheGopher is a information retrieval tool available on the Internet. A menu-based interface that provides easy access to information residing on special servers, called Gopher sites. Although Gopher performs primarily the same tasks as the FTP command, its interface is much more user-friendly and it provides additional functions, such as links to other Internet services.
4. Browser is a software that helps in viewing HTML documents and also in accessing files and softwares related with those documents.
5. Portal stands for electronic portal. Electronic Portal is a website that provides information related with sale/purchase of goods on the website or offers the facility of e-commerce. For example, yahoo.com is a portal that offers facilities of news, advertisements, reservation, auction and competitive participation online.
6. Online business activities of products and services are called electronic commerce or E- commerce. This also means that in this kind of business activities the people who are doing the business are not physically present but do the business through the medium of electronics
7. Disadvantage of e-commerce are below :
   - Buyers and sellers do not see each other.
   - Economic and Social Problems.

- Fail to understand taste of customers.
- Failure to consider competitive situation.
- Inability to predict environmental reaction.

8. The major types of E-Commerce are:
   - Business to Business
   - Business to Consumer
   - Consumer to Business
   - Consumer to Consumer
   - Business to Government
   - Government to Business
   - Government to Citizen
   - Mobile Commerce
9. Mobile commerce or M Commerce is sale-purchase of products and services through the medium wireless technology such as handheld instruments e.g. cellular telephone and Personal Digital Assistants. Japan is on the top in this regards.

EXERCISE

1. What do you mean by Internet ? Describe the evolution of the Internet.
2. Discuss the anatomy of Internet.
3. What are the different tools of Internet ? Describe them.
4. Write an account on growth of Internet.
5. What do you mean by Internet Service Provider? Name some Internet Service Providers.
6. Internet has no owner. Justify it.
7. What is World Wide Web?
8. What do you mean by netiquette? Write some etiquettes you should follow while on the net.
9. What are the applications of the Internet ?
10. Write short notes on the followings-
    (a) CERN (b) Spyware
    (c) Hyperlink (d) Cracker
    (e) Hypertext
11. Explain IT Act 2000.
12. Write a note on extranet.

18 Information System for Business Operations

The Chapter Covers :

- E-Business
- Components of E-Business Model
- E-Business Trends
- Information system for strategic advantage
- Information System for Managerial Decision Support
- Management Information systems
- Decision Support System (DSS)
- Other Information systems

All businesses should have both long-range and short-range planning of operational systems to ensure that the possibilities of computer usefulness will be seized in a reasonable time. Such planning will project analysis and costing, system development life cycle considerations, and specific technology planning, such as for computers, databases, and communications. There must be computer capacity planning, technology forecasting, and personnel performance planning. It is more likely that those in the organization with entrepreneurial vision will conceive of strategic plans when such basic operational capabilities are in place and are well managed.

Most information systems are looked on as support activities to the business. They mechanize operations for better efficiency, control, and effectiveness, but they do not, in themselves, increase corporate profitabiliy. They are simply used to provide management with sufficient dependable information to keep the business running smoothly, and they are used for analysis to plan new directions. Strategic information systems, on the other hand, become an integral and necessary part of the business, and directly influence market share, earnings, and all other aspects of marketplace profitability. They may even bring in new products, new markets, and new ways of doing business. They directly affect the competitive stance of the organization, giving it an advantage against the competitors.

NOTES

The three general types of information systems that are developed and in general use are financial systems, operational systems, and strategic systems. These categories are not mutually exclusive and, in fact, they always overlap to some. Well-directed financial systems and operational systems may well become the strategic systems for a particular organization.

Financial systems are the basic computerization of the accounting, budgeting, and finance operations of an organization. These are similar and ubiquitous in all organizations because the computer has proven to be ideal for the mechanization and control or financial systems; these include the personnel systems because the headcount control and payroll of a company is of prime financial concern. Financial systems should be one of the bases of all other systems because they give a common, controlled measurement of all operations and projects, and can supply trusted numbers for indicating departmental or project success. Organizational planning must be tied to financial analysis. There is always a greater opportunity to develop strategic systems when the financial systems are in place, and required figures can be readily retrieved from them.

Operational systems, or services systems, help control the details of the business. Such systems will vary with each type of enterprise. They are the computer systems that operational managers need to help run the business on a routing basis. They may be useful but mundane systems that simply keep track of inventory, for example, and print out reorder points and cost allocations. On the other hand, they may have a strategic perspective built into them, and may handle inventory in a way that dramatically impacts profitability. A prime example of this is the American Hospital Supply inventory control system installed on customer premises. Where the great majority of inventory control systems simply smooth the operations and give adequate cost control, this well-know hospital system broke through with a new version of the use of an operational system for competitive advantage. The great majority of operational systems for which many large and small computer systems have been purchased, however, simply help to manage and automate the business. They are important and necessary, but can only be put into the "strategic" category it they have a pronounced impact on the profitability of the business.

All businesses should have both long-range and short-range planning of operational systems to ensure that the possibilities of computer usefulness will be seized in a reasonable time. Such planning will project analysis and costing, system development life cycle considerations, and specific technology planning, such as for computers, databases, and communications. There must be computer capacity planning, technology forecasting, and personnel performance planning. It is more likely that those in the organization with entrepreneurial vision will conceive of strategic plans when such basic operational capabilities are in place and are well managed.

Operational systems, then, are those that keep the organization operating under control and most cost effectively. Any of them may be changed to strategic systems if they are viewed with strategic vision. They are fertile grounds for new business opportunities.

Strategic systems are those that link business and computer strategies. They may be systems where a new business thrust has been envisioned and its advantages can be best realized through the use of information technology. They may be systems where new computer technology has been made available on the market, and planners with an entrepreneurial spirit perceive how the new capabilities can quickly gain competitive advantage. They may be systems where operational management people and Information Services people have brainstormed together over business problems, and have realized that a new competitive thrust is possible when computer methods are applied in a new way.

E-BUSINESS

Electronic Business, or "E-Business", may be defined broadly as any business process that relies on an automated information system. Today, this is mostly done with Web-based technologies.

The term "E-Business" was coined by Lou Gerstner, CEO of IBM.

Electronic business methods enable companies to link their internal and external data processing systems more efficiently and flexibly, to work more closely with suppliers and partners, and to better satisfy the needs and expectations of their customers.

In practice, e-business is more than just E-Commerce. While e-business refers to more strategic focus with an emphasis on the functions that occur using electronic capabilities, E-Commerce is a subset of an overall e-business strategy. E-Commerce seeks to add revenue streams using the World Wide Web or the Internet to build and enhance relationships with clients and partners and to improve efficiency using the Empty Vessel strategy. Often, E-Commerce involves the application of knowledge management systems.

E-business involves business processes spanning the entire value chain: electronic purchasing and supply chain management, processing orders electronically, handling customer service, and cooperating with business partners. Special technical standards for e-business facilitate the exchange of data between companies. E-business software solutions allow the integration of intra and inter firm business processes. E-business can be conducted using the Web, the Internet, intranets, extranets, or some combination of these. Following figure shows E-Business cycle :

When organizations go online, they have to decide which e-business models best suit their goals. A business model is defended as the organization of product, service and information flows, and the source of revenues and benefits for suppliers and customers. The concept of e-business model is the same but used in the online presence. The following is a list of the currently most adopted e-business models:

- E-shops
- E-malls
- Virtual Communities
- Third-party Marketplaces
- Value-chain Service Providers
- E-procurement
- E-auctions
- Collaboration Platforms
- Value-chain Integrators
- Information Brokerage

While some use E-Commerce and e-business interchangeably, they are distinct concepts. In E-Commerce, information and communications technology (ICT) is used in inter-business or inter-organizational transactions (transactions between and among firms/organizations) and in business-to-consumer transactions (transactions between firms/organizations and individuals). In e-business, on the other hand, ICT is used to enhance one's business. It includes any process that a business organization (either a for-profit, governmental or non-profit entity) conducts over a computer-mediated network.

A more comprehensive definition of e-business is:

"*The transformation of an organization's processes to deliver additional customer value through the application of technologies, philosophies and computing paradigm of the new economy.*"

Three primary processes are enhanced in e-business:

- **Production processes**, which include procurement, ordering and replenishment of stocks; processing of payments; electronic links with suppliers; and production control processes, among others;

- **Customer-focused processes,** which include promotional and marketing efforts, selling over the Internet, processing of customers' purchase orders and payments, and customer support, among others; and
- **Internal management processes**, which include employee services, training, internal information-sharing, video-conferencing, and recruiting. Electronic applications enhance information flow between production and sales forces to improve sales force productivity. Workgroup communications and electronic publishing of internal business information are likewise made more efficient.

The Internet economy pertains to all economic activities using electronic networks as a medium for commerce or those activities involved in both building the networks linked to the Internet and the purchase of application services such as the provision of enabling hardware and software and network equipment for Web-based/ online retail and shopping malls (or "e-malls"). It is made up of three major segments: physical (ICT) infrastructure, business infrastructure, and commerce.

E-business uses the new family of technologies available on the internet. These technologies enable people to communicate in new ways, provide new business models, permit businesses to operate more efficiently and take advantage of the new global network economy.

The understanding and use of e-business models is essential in an increasingly dynamic and uncertain business environment for the following reasons:

- The process of modeling social systems or an ontology – such as an e-business model – helps identifying and ***understanding*** the relevant elements in a specific domain and the relationships between them.
- The use of formalized e-business models helps managers easily ***communicate and share*** their understanding of an e-business among other stakeholders.
- Mapping and using e-business models as a foundation for discussion facilitates ***change***. Business model designers can easily modify certain elements of an existing e-business model.
- A formalized e-business model can help identifying the relevant ***measures*** to follow in an e-business.
- E-Business models can help managers ***simulate*** e-businesses ***and learn*** about them. This is a way of doing risk free experiments, without endangering an organization .

Components of E-Business Model

An E-Business model must have following components :

- A **shared digital business infrastructure**, including digital production and distribution technologies (broadband/wireless networks, content creation technologies and information management systems), which will allow business participants to create and utilize network economies of scale and scope;
- A **sophisticated model for operations,** including integrated value chains-both supplies chains and buys chains;
- An **e-business management model,** consisting of business teams and/or partnerships; and
- **Policy, regulatory and social systems**-i.e., business policies consistent with E-Commerce laws, teleworking/virtual work, distance learning, incentive schemes, among others.

E-Business Trends

As E-Business has taken off over the past few years the different associated do-

mains and technologies have also evolved. We will take a look at some of the major trends associated with E-Business:

- **Commoditization of Application Servers**

  Application servers provide a base platform for a number of E-Business applications. They provide the plumbing and core set of infrastructure services like session management, transaction management, user management, security, logging, auditing, scalability solutions and ways of encapsulating business services. The J2EE specification is embodied in a number of application servers from vendors like IBM, BEA, Sun, ATG as well as open source solutions like JBoss . Similarly Microsoft has encapsulated a number of services in its .NET framework that provide similar capabilities. The past few years has seen fierce competition in the J2EE application server space with the clear frontrunners being IBM and BEA. However, with the maturity of the underlying specifications, there is very little differentiation that the application server vendors can provide. They are looking to add custom extensions to demonstrate additional value but that could tie you down to a particular vendor. With the recent advances made by the open source frameworks many enterprises are choosing to use JBoss or Tomcat in place of the more costly WebSphere or WebLogic. Understanding the scalability and performance metrics of your E-Business application portfolio is a key factor in deciding which application server to choose.

- **Content Management**

  There is plenty of information residing in any organization. A good content management and access strategy is one of the key E-Business initiatives that an organization should undertake. Such a strategy should involve process, technology and above all re-use of content. The consumers of the content may be internal, like, employees seeking information on the organization's policies or external, like, customers and partners seeking information about an organization's products. It is all about giving the right information at the right time to the right consumer irrespective of where that information resides in an organization. Many vendors offer a comprehensive content management suite that allows an enterprise to organize the content, define processes and roles in managing the content and provide means for publishing and presenting the content via different channels. Some of the vendors offering such suites include Interwoven, Vignette, Microsoft and IBM. Open source solutions like OpenCMS and Mambo have also found favor amongst organizations that are looking for entry level content management solutions. With majority of the application server vendors realizing the key role of content in any E-Business initiatives, the application servers and content management suites have started to merge over the years. As such vendors like IBM, BEA and Microsoft are offering a comprehensive stack that covers the full series of infrastructure, content and personalization aspects of an E-Business initiative. Taking the content management mantra to an extreme, many organizations end up having multiple repositories for different kinds of content or assets. In such cases, repository consolidation and access to multiple content repositories via an integrated solution becomes a key necessity for new E-Business initiatives.

- **Open Source Frameworks**

  Far from being a collaboration of some geeks around the world, the open source movement has entered the mainstream in the past few years. Many projects have been launched by OSI (Open Source Initiative) and a comprehensive suite of products and solutions are part of the open source environment including (but not limited to):

  - Apache which is one of the most popular Web engines

- Application server and infrastructure solutions like JBoss and Zope
- Linux a Unix-like operating system which has been deployed on almost all commercially available platforms. Linux has strong backing by the likes of IBM and HP, which see it as a good counter-balance to the dominance of the Wintel platform.
- Programming environments like Ruby and Python
- Integrated development environments like Eclipse
- Content and collaboration tools like OpenCMS, Red Hat CMS, Wiki and Mambo
- Database solutions like MySQL

The attraction of free and widely available software may be quite high for an enterprise to refuse. However, before adopting open source solutions as a part of the E-Business initiative, an organization should consider the following aspects:

- ***Support :*** Unlike commercially available software, open source software may not have the requisite support available that is needed for key E-Business initiatives. Things have started to change with vendors like Red Hat and Covalent providing support for some of the most popular products like Linux and Apache.
- ***Licensing and Modifications :*** Different open source products come with different licensing mechanisms. Even though most would allow modifications, organizations should be careful in how they modify the software keeping the future upgrades and redistribution of the modifications in mind. Most E-Business initiatives necessitate a comprehensive view of data and functionality across the enterprise. With multiple applications, databases and information silos deployed in an enterprise, integration across the multitude of such applications remains a chief concern for a CIO. Solutions from vendors like webMethods, Tibco, SeeBeyond, Vitria, IBM and Microsoft allow for such integration. A comprehensive enterprise application integration suite would encompass data transformations, reliable messaging, business process mapping, monitoring, workflow and adapters for connecting to various legacy technologies. As this market has matured, various standards have been established . Most vendors are starting to support such standards in addition to the proprietary solutions that they had originally evolved. With the distinct overlap between an integration server and an application server many of the original "pure play" vendors have started offering solutions that encompass the entire infrastructure and integration needs of an E-Business application (Example BEA, IBM and webMethods). Enterprises embarking on an E-Business initiative should evaluate best-of-breed versus full-suite strategy to see which one serves their needs better.
- ***Skills and Training :*** Many open source software products provide only the basic set of documentation and training by 3rd parties is only available for the most popular products.
- ***Service Oriented Architectures and Web Services :*** Services oriented architectures have been around for a while. Web services are one form of implementing a service-oriented architecture (SOA). Due to the widespread agreement around the base Web services standards, SOA has been brought into the mainstream via Web services. Many organizations have already deployed Web services within the enterprise and is now moving to build collaborative applications with business partners using Web services. The applications include a wide range like providing access to legacy systems to front ending business functionality and collaborating with business partners

to fulfill orders. Major software vendors like Oracle, SAP and Microsoft are introducing or architecting their products around a SOA-based architecture with Web service implementations. SOA will be a prevailing software engineering practice, ending the 40-year domination of monolithic software. Any new E-Business initiative must encompass SOA as the base architecture for its implementation.

- ***Collaboration - A Key For Successful E-Business Initiatives :*** With teams being distributed around the globe, the different aspects of collaborative software in the form of instant messaging, Web conferencing, application sharing, white boards, virtual workspaces for teams etc. play an important role in successful delivery of E-Business initiatives. Equipping a team with the right set of collaborative tools ensures that they are able to better share ideas and come out with a more comprehensive and quality solution. The infrastructure for net messaging and Web conferencing improves, team-based real-time collaboration will enter mainstream usage.
- ***Grid Computing :*** Just as the electric power grid led to availability of a cheap and reliable source of power, the computational grid has the potential of changing how we utilize and rely on computational assets as a set of shared resources across a distributed network (like the Internet). Grid computing can be defined as a set of standards and protocols that allow a set of collaborating computing resources in a network to work on a single problem at the same time. An organization may have a set of underutilized resources like Unix servers or File servers; grid computing would allow them to work as a single, highly available unit to solve complex computational problems. Related to the ideas of grid computing is the concept of "utility" computing which promises to deliver on-demand computing capability. Many applications only need high-end computational capability at distinct points in time. The idea would be for an application to be given the amount of resources it requires at a particular point in time via the help of self managing and configurable computational assets. Although grid computing is still in its early adoption phase, it has the potential of fundamentally changing how we utilize computing resources for different applications. Instead of deploying high-end servers to meet a specific application's peak demands, organizations would choose to work with clusters of shared servers and storage devices that are configured at run-time-to serve the needs of multiple applications.
- ***Mainframes :*** Mainframes have played a crucial role in servicing many mission critical applications across a number of organizations. The computational paradigm was generally batch-oriented or tightly controlled by applications that were mostly used by internal users. Many E-Business applications that have been developed still rely on the functionality of the mainframe applications for the business rules. They access the mainframe applications via some gateway or veneers like Web services and provide a friendly user interface to the end user. On the one hand it has given a new lease on life to the Mainframe but it has also exposed a hitherto tightly guarded computational resource to the whims of an Internet user (or a 3rd party application). Consider a hotel reservation system that runs on a mainframe and was mainly used by reservation agents. An E-Business application is developed that exposes the same functionality to users on the Web. This also allows for the number of requests to the mainframe to multiply many-fold and could start impinging on crucial applications sharing the same set of resources. Organizations are dealing with such scenarios by introducing middleware the throttles the number of requests being sent by E-Busi-

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ness applications to such mainframes. It also means that functionalities that were originally implemented on the mainframes are slowly being migrated out to ***open systems*** that can be more easily scaled to meet the unpredictable demands of E-Business applications.

INFORMATION SYSTEM FOR STRATEGIC ADVANTAGE

Information technology can change the way businesses compete. For this reason, you should view information systems strategically, that is, as vital competitive networks, as a means of organizational renewal, and as a necessary investment in technologies that help an enterprise achieve its strategic objectives. The strategic role of information systems involves using information technology to develop products, services, and capabilities that give a company strategic advantages over the competitive forces it faces in the global marketplace. This creates strategic information systems, information systems that support or shape the competitive position and strategies of an enterprise. So a strategic information system can be any kind of information system (TPS, MIS, DSS, etc.) that helps an organization.

Information technology can be used to implement a variety of competitive strategies. These include the five basic competitive strategies (differentiation, cost, innovation, growth, alliance), as well as other ways that companies can use information systems strategically to gain a competitive edge. For example:

1. Lower Costs
2. Differentiate
3. Innovate
4. Promote Growth
5. Develop Alliances
6. Improve quality and efficiency
7. Build an IT platform
8. Other strategies - use interorganizational information systems to create switching costs that lock in customers and suppliers. - use investments in IT to build barriers to entry against industry outsiders. - use IT components to make substitution of competing products unattractive.

Information systems can improve the value chain by reducing the cost of primary and support activities. Information systems can change the way an organization reacts to its competitive forces in following ways:

- By changing the bargain power of suppliers
- By building closer ties with customers
- By increasing or decreasing barriers to entry in a market
- By serving as the basis for new products and/or services

Four approaches lead to ***sustainable*** competitive advantage

- Create barriers to entry through patents, monopoly, or technical expertise
- Be the first to develop systems with high switching costs
- Develop the technologies that change the underlying nature of the industry
- Cultivate and hire people with excellent information systems management skills

According to Michael Porter, a firm can survive and succeed in the long run if it successfully develops strategies to confront five competitive forces that shape the structure of competition in its industry. These include:

1. Rivalry of competitors within its industry
2. Threat of new entrants
3. Threat of substitutes

4. Bargaining power of customers
5. Bargaining power of suppliers

A variety of competitive strategies can be developed to help a firm confront these competitive forces. These include:

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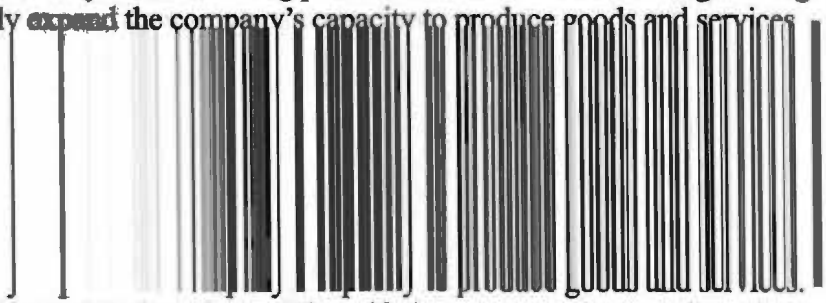
- Cost Leadership Strategy - Become a lowcost producer of products and services - Find ways to help suppliers or customers reduce their costs - Increase the costs of competitors.
- Differentiation Strategy - Develop ways to differentiate products and services from competitors. - Reduce the differentiation advantages of competitors.
- Innovation Strategy - Find new ways of doing business: a) develop new products & services b) enter new markets or marketing segments. c) establish new business alliances d) find new ways of producing products/services e) find new ways of distributing products/services Growth Strategies - Significantly expand the company's capacity to produce goods and services



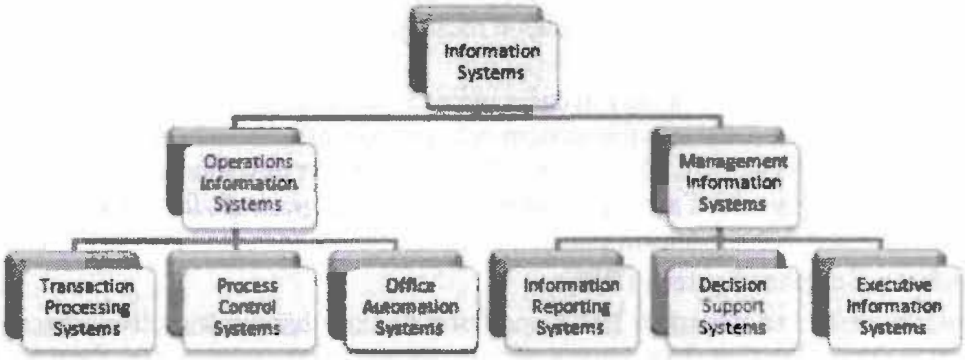
Expand into global markets - Diversify into new products and services - Integrate into related products and services. Alliance Strategies Establish new business linkages and alliances with customers, suppliers, competitors, consultants and other companies (mergers, acquisitions, joint ventures, forming virtual companies, etc.).

INFORMATION SYSTEM FOR MANAGERIAL DECISION SUPPORT

Today it is the competitive, fast business world most organizations start with data processing system that support transaction processing and evolve to management information system which support tactical and strategic level decision making .The opinion is that computer based systems are very valuable for transaction processing and support of operational level decision making. Computers play an important role in providing significant support for tactical and strategic level decision making especially for unstructured and unanticipated decisions.

Information Systems are consisted of two basic components :

- Operational Information Systems, supporting daily activities
- Management Information System, supporting Managerial Decision Making



Role and necessity of information for management decision making and role of controlling

For example, in staffing process historical data are being used to determine levels of skills of employee had on certain job position for asking same skills of new candidate that applies for the same job. Based on this information managers can conclude also which skills former employee did not had and to ask them from new candidate. In addition they use data from external sources to determine do candidates exist and which candidates best fit into required criteria.

Volume and type of information depands on management level and to type of decisions. For example top management that basically generates strategic decisions demands aggregated, non-planed and fast projections. Based on such information they can scan company status and to direct company. Top management needs short reports that will not consume too much time for analysis and understanding.

On a contrary to top management, low management has a strong need for pre defined and detailed (even daily) reports in order to compare with past data to make short-term plan for daily and monthly business. Tactical and operative (low) management is focused on middle and short-term plans and for this reason need detailed reports for right on time corrective actions on spoted deviations. In all phases information have crucial role and that is the reason of deployment and implementation of Management Information systems.

Management Information systems

As already stated, information are basis for any management decision and strong need for information is main cause of development of Management Information Systems, system with task to provide right on time of adequate information for management decision making.

Starts of Management Information Systems are in 60s years of 20-th century. Information provided by those information systems were not adequate for management decision making purposes. Systems developed till 1960 were based on electronic processing of data from accounting, sales and other services. This data were gathered and stored on media. Unfortunately, this data were not adequate for management as final data customer in time when changes on market were more and more frequent. Information was not adequate and of high quality.

Changes in environment and raising demand for information pushed management to demand information system for its own needs. This was the trigger for development of Management Information System (MIS). In scope of this system special reports were generated whose prime reason was to provide needed information to management. In this phase MIS functions as Information Reporting System (IRS) from where reports for management decision making are being made of data from different departments.

This system was sufficient only in cases were projections, information about future, were not required. Reason is this system only process data about historic events and delivers it to management. Oil crisis in 70s caused further development of MIS. IRS is used at lower levels of management (operative management), for daily decisions and for tracking of short term plans.

Decision Support System (DSS)

Environment development in 1970s and faster market changes stimulated management to demand further development of management information system form information reporting system toward Decision Support System. Unlike IRP, Decision Support System is a system that allows management interactive modeling to support decision making. This system uses data from internal and external company environment to show management possible impact on company performance. Analytic models, specialized data bases, thoughts and opinions of decision makers and interactive models based on information are support for making structured and half structured management decisions.

In the past few years a new type of system called Decision Support System has gained a great deal of popularity in the information system. We are sure that for some characteristics of organizations decision support system are very useful. Decision Support System supports individual decision making - a major component of managerial work.

According to a recent survey, computer-based DSS are widely applied in both profit making and non-profit organizations. In corporate functional management fields, production and operations management contain the largest number of application articles, followed by management information systems, marketing, finance, strategic management and multifunctional areas.

DSS is the primary means by which businesses can gain competitive advantage through analyzing and using the information stored in their computerized systems.

Decision Support Technologies

- Management Information Systems (MIS)
- Decision Support Systems (DSS)
- Enterprise (Executive) Information Systems (EIS)
- Enterprise Resource Planning (ERP) and Supply-Chain Management (SCM)
- Knowledge Management Systems
- Expert Systems (ES)
- Artificial Neural Networks (ANN)

Online Analytical Processing (OLAP) is a capability of management, decision support, and executive information systems that enables managers and analysts to interactively examine and manipulate large amounts of detailed and consolidated data from many perspectives. Basic analytical operations include

- Consolidation: aggregation of data
- Drill-Down: display detail data
- Slicing & Dicing: produce different views from database

Decision Support Systems are computer-based information systems that provide interactive information support to managers during the decision-making process. DSS use:

- Analytical models
- Specialized databases
- Decision makers' own insights and judgements
- Interactive, computer-based modeling processes to support the making of semistructured and unstructured decisions by individual managers
- **Data mining** → analysis of large pools of data to find patterns and rules that can be used to guide decision making and predict future behavior

Using a DSS involves four basic types of modeling activities:

- **What-if Analysis** → an end user makes changes to variables, or relationships among variables, and observes the resulting changes in the value of other variables
- **Sensitivitiy Analysis** → a special case of what-if analysis—the value of only one variable is changed repeatedly, and the resulting changes on other variables are observed.
- **Goal Seeking Analysis** → sets a target value for a variable and then repeatedly changes other variables until the target value is achieved

Check Your Progress :

1. What is E-business.
2. What are components of E-business Model.

- **Optimization Analysis** → the goal is to find the optimum value for one or more target variables, given certain constraints

Decision making process are playing important role in the Global Business Environment. Decision Support System supports not only for the decision making but also communication among individuals. Further technology development and growing inforatization lead to new systems, systems that support business decision making.

Other Information systems

Late 80's of the 20th century with raised information and environment complexity management urged for new systems to support management. One of them is Executive Information system that was product of need to develop further DSS. EIS goal is to provide strategic information to top management about critical performance indicators as information that show fulfillment of strategic company goals. While in old information systems, information processing and analysis were made within group for data processing.

Answer of the Check Your Progress

1. Electronic Business, or "E-Business", may be defined broadly as any business process that relies on an automated information system. Today, this is mostly done with Web-based technologies.
2. • A shared digital business infrastructure,
   • A sophisticated model for operations,
   • An e-business management model,
   • Policy, regulatory and social systems.

EXERCISE

1. How can you use information system in business?
2. Explain e-business.
3. Write down three primary process in e-business.
4. Write down components of E-business model.
5. Write a note on information system for strategic advantage.
6. Explain information system for managerial decision support.

19 Advance Concepts in Information Systems

The Chapter Covers :

- Enterprise Resource Planning
- Components of ERP
- Supply Chain Management
- E-Supply Chain Management
- Major Trends in E-SCM
- Architecture of E-Supply Chain
- E-SCM Process Integration
- Customer Relationship Management Concepts
- Electronic Customer Relationship Management
- E-CRM Goals
- E-CRM Business Models
- Technologies for e-CRM
- How Technology can help in CRM
- E-CRM Solutions
- Contact Management Software
- Advantages of E-CRM
- E-CRM Capabilities
- Implementing an E-CRM System

ENTERPRISE RESOURCE PLANNING

ERP i.e. Enterprise resource planning is a business management system that integrates all facets of the business, including planning, manufacturing, sales, and marketing. ERP relates to the *integrated software infrastructure* that supports the entire company business process.ERP refers to a view of a company and all its parts as *connected whole*, rather than small silos of activity. As the ERP methodology has become more popular, software applications have emerged to help business managers implement ERP in business activities such as inventory control, order tracking, customer service, finance and human resources.

It is a company-wide computer software system used to manage and coordinate *all the resources,information*, and *functions of a business* from **shared data stores.**

The term of ERP is originally derived from Manufacturing Resource Planning (MRP II) and Material Requirements Planning (MRP). MRP evolves into ERP when *capacity planning* activity and *routing* become a part of the standard software activity. ERP system typically handles company's accounting, logistic, distribution, shipping, manufacturing, procurement and sales order.

ERP software can aid in the control of many business activities such as sales, marketing, finance management, inventory management, delivery, production, quality management and so on. Today the most ERP software provide Business Intelligence feature for leveraging ERP database into Decision Support System because the decision makers need to analyse company's performance to prepare appropriate actions. In many cases, this feature prompts the executives, including your boss, to implement ERP system.

ERP systems typically include the following characteristics:

- An integrated system that operates in real time (or next to real time), without relying on periodic updates.
- A common database, which supports all applications.
- A consistent look and feel throughout each module.
- Installation of the system without elaborate application/data integration by the Information Technology (IT) department.

COMPONENTS OF ERP

- Transactional database
- Management portal/dashboard
- Business intelligence system
- Customizable reporting
- External access via technology such as web services
- Search
- Document management
- Messaging/chat/wiki
- Workflow management

ERP (enterprise resource planning) is an industry term for the broad set of activities that helps a business manage the important parts of its business. The information made available through an ERP system provides visibility for key performance indicators (KPIs) required for meeting corporate objectives. ERP software applications can be used to manage product planning, parts purchasing, inventories, interacting with suppliers, providing customer service, and tracking orders. ERP can also include application modules for the finance and human resources aspects of a business.

NOTE

Vendor
SAP
Oracle Applications
Infor Global Solutions
The Sage Group
Microsoft
Unit 4 Agresso
CDC Software
Lawson Software
Epicor
Visma
Industrial and Financial Systems (IFS)
Comarch
QAD
Cincom Systems
COA Solutions Ltd
NetSuite
ABAS Software
Ramco Systems
SIV.AG
Technology One
Pronto Software
Plex Systems
Consona Corporation
CMiC
Syspro
Openbravo
OpenERP
A1 ERP
Dolibarr
ProfitKey International
Global Shop Solutions
WorkBook Software A/S

ADVANTAGES OF ERP

The fundamental advantage of ERP is that integrating the myriad processes by which businesses operate saves time and expense. Decisions can be made more quickly and with fewer errors. Data becomes visible across the organization. Tasks that benefit from this integration include:

- Sales forecasting, which allows inventory optimization
- Order tracking, from acceptance through fulfillment

- Revenue tracking, from invoice through cash receipt
- Matching purchase orders (what was ordered), inventory receipts (what arrived), and costing (what the vendor invoiced)

ERP systems centralize business data, bringing the following benefits:

- They eliminate the need to synchronize changes between multiple systems—consolidation of finance, marketing and sales, human resource, and manufacturing applications
- They enable standard product naming/coding.
- They provide a comprehensive enterprise view (no "islands of information"). They make real–time information available to management anywhere, any time to make proper decisions.
- They protect sensitive data by consolidating multiple security systems into a single structure.

DISADVANTAGES OF ERP

- Customization is problematic.
- Re–engineering business processes to fit the ERP system may damage competitiveness and/or divert focus from other critical activities
- ERP can cost more than less integrated and/or less comprehensive solutions.
- High switching costs increase vendor negotiating power vis a vis support, maintenance and upgrade expenses.
- Overcoming resistance to sharing sensitive information between departments can divert management attention.
- Integration of truly independent businesses can create unnecessary dependencies.
- Extensive training requirements take resources from daily operations.

SUPPLY CHAIN MANAGEMENT

Competition is becoming acute and customers are becoming choosy. The emphasis is on building "Value to the customer". Supply Chain concepts are being practiced with increasing frequency by companies, not only in FMCG and Automobile sectors but also in other sectors like steel, cement, etc.

Supply chain management - delivering the right product to the right place, at the right time and at the right price - is one of the most powerful engines of business transformation. It is one of the leading cost saving and revenue enhancement strategies in use today.

An important aspect of long-term competitiveness is the ability to adapt to a changing environment. Once new conditions are identified companies need to adapt to stay competitive. When changing conditions demand a shift of technology in important product lines, companies are likely to adopt this new technology. The implementation of new technologies is an always-recurring process.

The information and communication technologies (ICT) have the potential to transform the competitive landscape in many industries, while at the same time, creating whole new industries. Taking into consideration, as an example, the Internet: it is a

low cost standard with fast interactivity that exhibits network externalities, moderates time, has a universal reach, acts as a distribution channel, and reduces information asymmetries between transacting parties. Internet plays a critical and profound role in the way firm activities (internal or external) are coordinated, how commerce is conducted, how people and machines communicate, what defines communities and how they interact, and how and when goods are made and delivered.

Supply Chain Management (SCM) plays an important role in the management of processes that cut across functional and departmental boundaries. SCM goes beyond organizational boundaries, reaching out to suppliers and customers.

Organizations increasingly find that they must rely on effective supply chains, or networks, to successfully compete in the global market and networked economy. In Peter Drucker's management's new paradigms, this concept of business relationships extends beyond traditional enterprise boundaries and seeks to organize entire business processes throughout a value chain of multiple companies.

In the 21st century, there have been few changes in business environment that have contributed to the development of supply chain networks. First, as an outcome of globalization and proliferation of multi-national companies, joint ventures, strategic alliances and business partnerships were found to be significant success factors.

Supply chain management (SCM) is the process of planning, implementing, and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently as possible. Supply chain management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption. The term supply chain management was coined by consultant **Keith Oliver,** of strategy consulting firm Booz Allen Hamilton in 1982.

Supply Chain Management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies.

Components of E-Supply-Chain Management Software

Manufacturing

Engineering and product configuration, production planning and cost management, production execution and quality management.

Logistics

Purchasing and order management, distribution, inventory and warehousing.

Financial

General ledger, payable and receivables, billing, budgets and asset management.

Marketing

Advertising, sales, order management, customer service and support and market research and strategy.

HRM

Payroll management, time and labour management benefits administration, and pension administration.

SCM Issues

Supply chain management must address the following problems:

- **Distribution Network Configuration:** Number and location of suppliers, production facilities, distribution centers, warehouses and customers.
- **Distribution Strategy:** Centralized versus decentralized, direct shipment, Cross docking, pull or push strategies, third party logistics.
- **Information:** Integrate systems and processes through the supply chain to share valuable information, including demand signals, forecasts, inventory and transportation etc.
- **Inventory Management:** Quantity and location of inventory including raw materials, work-in-process and finished goods.

Supply chain execution is managing and coordinating the movement of materials information and funds across the supply chain. The flow is bi-directional.

SCM Functions

Supply chain management is a cross-functional approach to managing the movement of raw materials into an organization and the movement of finished goods out of the organization toward the end-consumer. As corporations strive to focus on core competencies and become more flexible, they have reduced their ownership of raw materials sources and distribution channels. These functions are increasingly being outsourced to other corporations that can perform the activities better or more cost effectively. The effect has been to increase the number of companies involved in satisfying consumer demand, while reducing management control of daily logistics operations. Less control and more supply chain partners led to the creation of supply chain management concepts. The purpose of supply chain management is to improve trust and collaboration among supply chain partners, thus improving inventory visibility and improving inventory velocity.

Supply chain activities can be grouped into strategic, tactical, and operational levels of activities.

Strategic

- Strategic network optimization, including the number, location, and size of warehouses, distribution centers and facilities.
- Strategic partnership with suppliers, distributors, and customers, creating communication channels for critical information and operational improvements such as cross docking, direct shipping, and third-party logistics.
- Product design coordination, so that new and existing products can be optimally integrated into the supply chain, load management
- Information Technology infrastructure, to support supply chain operations.
- Where to make and what to make or buy decisions
- Align overall organizational strategy with supply strategy

Tactical

- Sourcing contracts and other purchasing decisions.
- Production decisions, including contracting, locations, scheduling, and planning process definition.
- Inventory decisions, including quantity, location, and quality of inventory.
- Transportation strategy, including frequency, routes, and contracting.
- Benchmarking of all operations against competitors and implementation of best practices throughout the enterprise.
- Milestone payments

Operational

- Daily production and distribution planning, including all nodes in the supply chain.
- Production scheduling for each manufacturing facility in the supply chain (minute by minute).
- Demand planning and forecasting, coordinating the demand forecast of all customers and sharing the forecast with all suppliers.
- Sourcing planning, including current inventory and forecast demand, in collaboration with all suppliers.
- Inbound operations, including transportation from suppliers and receiving inventory.
- Production operations, including the consumption of materials and flow of finished goods.
- Outbound operations, including all fulfillment activities and transportation to customers.
- Order promising, accounting for all constraints in the supply chain, including all suppliers, manufacturing facilities, distribution centers, and other customers.

E-SUPPLY CHAIN MANAGEMENT

E-Supply Chain Management (E-SCM or e-SCM or eSCM) refers to the flow of physical goods and associated information from the source to the consumer with the help of new technologies like internet, intranet , communications technologies etc. . Key eSupply chain activities include purchasing, materials management, distribution, customer service, and inventory forecasting. Effectively managing these processes is critical to the success of any online operation.

The Internet supply chain will be a means of communicating and doing business with suppliers and customers. Fractured, unpredictable supply chains have become less and less tolerable primarily because customers will not absorb the associated costs and long lead times. Its important to bear in mind that the your customer is just a mouse click away from your competitors.

Web-Enabled supply chains assist companies to optimize business processes both within and outside the four walls of the enterprise and to more efficiently deliver the new products customers want, when they want them and where they want them.

Companies are looking at how to provide greater flexibility in moving parts globally. In a quest for greater efficiency and lower costs, there's been growing importance

given to managing the supply chain effectively for the benefit of all parties.

The traditional vision of Supply Chain management (SCM) represents only one dimension of a business environment that is growing increasingly multidimensional. Modern day Supply Chain Management is the e-commerce of manufacturing.

Technologies such as the Internet, electronic data interchange, transportation and warehouse management software, including software that manages plant scheduling, demand forecasting, procurement, make SCM a versatile strategy to adopt.

In the new business models, competition is no longer simply viewed as company vs company, but as supply chain vs supply chain. Hence the ability to manage the different models of SCM becomes crucial.

E-SCM Chain

Supply chain has been viewed as an inflexible series of events that somehow managed to get products out the door. It often involved questionable inventory forecasts, rigid manufacturing plans and hypothetical shipping schedules.

The Internet has changed all that. It has transformed this old-fashioned process into something closer to an exact science. An Internet-enabled supply chain helps companies:

- Avoid costly disasters
- Reduce administrative overhead
- Reduce unnecessary inventory (thereby increasing working capital)
- Decrease the number of hands that touch goods on their way to the end customer
- Eliminate obsolete business processes
- Reap cost-cutting and revenue-producing benefits
- Speed up production and responsiveness to consumers
- Garner higher profit margins on finished goods

Effective integration of an Organizations supply chain can save millions, improve customer service and reduce inventories.

The key to getting optimum value out of automating your supply chain is to make sure you have your internal systems working well before you start extending them out over the Internet.

Evaluating a E-SCM Initiative

Here are a few tips to bear in mind while evaluating an E-SCM initiative:

- **Get Perspective** - One should envision the business as a whole including its current strategy and where it wants to go. Supply chain strategy is increasingly being integrated with overall corporate strategy.
- **Don't Underestimate Learning Costs** - The cost of training people to use new software should not be underestimated. Sending information around the world takes lesser time than it takes to get into someone's mind.
- **Link to existing architecture** - Supply chain applications must link to existing enterprise resource planning applications. ERP serves as the nerve center of the organization. Ideally, it should be a single point of visibility for inventory and order taking.
- Think Global, Start Local.

Components of Modern E-SCM

SCM has three key processes :

- Planning
- Execution
- Performance measurement

Firm are shifting from a purely functional view to a more process-oriented view. To take a more process-oriented view, firms must shift from one-time transactions to shared on-line processes.

Planning systems : Planning systems focus on having the right product at the right place and at the right time. These systems facilitate order taking and information gathering from the customer and orchestrate the flow of information along the entire supply chain, from initial to raw material procurement to final consumption.

Execution systems : Execution systems facilitate the physical of goods and services through a supply chain. This focus traditionally includes some application based such as (customer) order fulfilment, inventory control and manufacturing and logistics. Execution systems focus on operational efficiency, which entails finding new way to streamline and automate day-to-day business operations to reduce costs and improve productivity. This first step towards improving operational efficiency is to upgrade key business applications to a single, integrated system that can run the entire business. This enables firm to efficiently move their products through the supply chain.

Performance measurement systems : Performance measurement process keeps track of the health of the supply chain. This is necessary in order to make more informed decisions and respond to changing market conditions. Here, accounting and financial management systems are the real focal point. These applications utilize electronic commerce tools such as data warehousing to allow for effective information auditing and analysis.

Supply-chain management takes isolated business functions-marketing, materials management, purchasing, manufacturing and distribution-and allows them to function in tandem.

MAJOR TRENDS IN E-SCM

With the growth of Internet, more and more companies are dedicated to e-business. SCM has been deemed as one of the useful tools for business to promote their competitiveness, and to build up their trust relationship with up and down stream businesses. In order to link the whole value chain, Informations technology (IT) applications has already been essential for enterprises. So, it is possible to adopt a database-oriented approach which uses a server side program, (Eg., Java servlets), to manage a web-based inventory management system. Electronic Supply Chain Management (E-SCM) system to win competitive advantage. Usually, it may take couple of year to build an integrated ERP (Enterprise Resource Planning) system and E-SCM system. It provides a more efficient way to build the system.

E-commerce has been booming for a while. More and more businesses are dedicated to www business. However, a well designed website is not enough. Competition is more intense in the E-commerce age. Supply Chain Management (SCM)

Check Your Progress :

1. What is ERP ?
2. What do you know about supply chain management ?

is important issue in this new age. And the true power of E-Commerce rests in the strategy that relationship between a company and its suppliers has been changed since the process of supply and demand became electronic.

Supply Chain Management (SCM) has broad scope that includes suppliers, manufactures, retailers and customers. SCM covers the management of material, information and cash flows.

The Early Stage of SCM : For a single product, the raw material is procured from suppliers, transformed into finished goods from manufacturers in a single step, and then transported to retailers and customers. The whole supply chain involves marketing, manufacturing, distribution, planning and purchasing activities. Traditionally, these activities are generated independently by differnet organizations. These organizations have their own objectives and these are often conflicting. The difficulty of these factors is that there is not a single, integrated plan for the organization, there are many plan as businesses. Clearly, there is a need for a mechanism through which these different functions can be integrated together. SCM is a strategy through which such integration can be achieved.

The importance of IT in the supply chain will continue to grow. As supply chains become more global and more complex and as customers and competitions become more demanding, companies will need the supply chain capabilities that only sophisticated IT systems can give them. Therefore, the importance of IT to a supply chain can only increase. The future role of IT in the supply chain however is very difficult to predict. There are three main trends that will influence the supply chain software industry in the near future.

1. Best of Breed Versus Single Integrator

- A battle is occurring nor just among the developers within a category of software, but also among developers of different types of software.
  - The most vivid example is the conflict between the ERP and analytical applications developers.
  - Developers of analytical applications strive to build a package that is the best at solving problems for that particular function within a stage in the supply chain.
  - ERP providers build a system that allows a single, integrated view of many different functions in a supply chain stage.
  - Analytical applications must integrate with some ERP or legacy system in order To get the data they analyze.
  - The two types of systems thus naturally complement each other. However there is conflict between the groups as the ERP players develop their analytical applications and begin to complete directly with the analytical developers.
- Those who believe that the "best of breed" approach is the preferred solution pick the best application for each individual function or stage in the supply chain.
  - These applications are the best of the breed of that function.
  - Companies then wind up with several different types of systems that they must integrate to achieve global scope of the supply chain.

- This integration can be quite difficult because individual parts of the system come from different software firms and they may not be designed to work well together.
- The advantage is that a company does get the best solutions if it can overcome these problems.

- Those who favour the "Single integrator" approach look at the difficulties of integrating all of the different best of breed applications and opt instead for one single company's package to be used for all functions and potentially even all stages of the supply chain.
  - The idea is that if all the modules come from a single firm, they will be designed to work well together and therefore getting them up and operational should be much easier than the best - of - breed approach.
  - Of course, this ease of operation comes at the expense of being able to pick the best analytical tool for a particular problem a firm is facing.
  - In addition, single sourcing of IT could cause the same problems that single sourcing from any supplier can create.
- It is unclear which idea will win this battle or even if a clear winner will emerge.
  - However, analytical applications have proven difficult to develop for those firms with little experience.
  - And with regard to the acquisition strategy it has now worked out well for the ERP players, either.
  - In the end it is likely that both ideas will coexist, each serving those industries that are best suited to their particular attributes.
  - For instance, in industries in which having the best inventory planning can be a competitive advantage, we might expect to see companies choose the best - of - breed solution so that they can take advantage of the absolute best inventory solutions.
  - In industries in which one particular function does not offer a large advantage, we would expect to see companies choose single integrators because the ease of illustration and operation would likely outweigh any gain from a more advanced analytical system.

2. Shifts in platform technology

A supply chain IT systems have moved from legacy to ERP and analytical systems, there has been a shift in technology from mainframes to client / server platforms. Currently, two technologies are taking over the client / server technology that was the dominant platform for supply chain IT applications.

- The first technology is the browser-based internet application.
  - Users of this application only need access to the internet and a browser on their computers.
  - These users utilize the browser to log into the IT system over the internet.
  - Any information or analysis they need is available over the browser.

- Calculations and storage take place on a central server.
- This technology is compelling, as it requires no costly software upgrades on the user's computer.
- Avoiding this expenditure and being able to easily use the latest application version make this option quite attractive.
- At this writing, just about major software player discussed here is trying to take advantage of this technology by modifying products to make them internet accessible.

- The second technology is the whole new business model of Application Service Providers (ASPs).
  - ASPs do not develop software themselves but rather host software developed by others and rent the use of the software to companies
  - The ASP is then responsible for running (generally remotely) the applications for rent.
  - The ASP business model turns the traditional software model on its head in that customers pay a monthly subscription fee to use the software rather than a large up-front fee to acquire a license to the software
  - ASPs began by focusing on smaller businesses that lacked the capital to invest to expensive system installations.
  - The benefits of ASPs, such as ease of upgrading and little up front investment, may eventually win over some large companies, although penetration in larger companies is likely to be much lower than with small companies.
  - ASPs exist not only as stand-alone companies but also within software developers (such as ORACLE) that have begun offering their own ASP service.
  - This trend toward a service based model is very likely to continue and will significantly alter the way the software industry is structured.
  - Leading ASPs include US internet working and curio.

3. Convergence of Supply Chain Management and Business-to-Business exchanges

Business-to-business (B2B) exchanges are electronic market places on the internet where suppliers and buyers interact to conduct transactions. Many B2B exchanges sprung in 1999 and 2000, each generally focusing on an industry vertical, such as electronic components, plastics, or auto parts. Most of these B2B sites have focused their energy on developing a web site and pulling in the potential buyers and sellers within their vertical industry.

These exchanges provide the opportunity for huge value creation, through the reduction in transaction costs, improved supply chain visibility and the more efficient allocation of supply and demand.

- These B2B exchanges have fostered many types of transactions.
  - At their most basic level, exchanges create an efficient market place to make spot purchases or sales of goods.

- These can be done through a variety of transactional means such as auctions (one seller, multiple buyers), reverse auctions (one buyer, multiple sellers), fixed price transactions (one buyer, one seller), and bid/ask auctions (in which multiple buyers and sellers bid).
- Some of these transactions, such as auctions, are often best suited to short-term relationships.
- For long-term relationships between a buyer and a seller, in which tight integration is beneficial, exchanges can provide even more value.
- Exchanges not only produce efficiencies in the transaction process and the creation of a market but they also enable tight collaboration between buyers and sellers.

  For example, exchanges can enable the sharing of demand forecasts between buyers and sellers so that sellers can more accurately manage their production.
- Exchanges can also allow the efficient combination of purchasing goods with the logistics services needed to fulfill an order.

- As the exchanges have become operational, it has become increasingly clear that the key to exchanges creating value lays in this collaboration between buyers and sellers that an electronic market can enable.
  - What exchanges need to perform these functions are the supply chain IT applications discussed previously.
  - As those involved in B2B exchanges realize they need this capability, they are seeking the services of the supply chain software developers discussed here.
- At the same time, the supply chain software companies are realizing that they hold the key to successful B2B exchanges and in addition to partnering with existing exchanges, are also starting their own exchanges.
  - This is creating a convergence of the B2B exchanges and the supply chain companies, in which each offers a range of products that encompass both B2B and SCM.
  - This convergence creates a whole new set of opportunities for supply chain software developers.
  - It also brings a whole new set of competitors into the supply chain software world, which will alter the competitive landscape.

EXAMPLE OF E-SCM

A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request The supply chain not only includes the manufacturer and suppliers, but also Transporters, warehouses, retailers and customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in filling a customer request These functions include, but are not limited to, new product development, marketing, operations, distribution, finance and customer service.

- Consider a customer walking into a Wal-Mart store to purchase detergent.

- The supply chain begins with the customer and his need for detergent.
- The next stage of this supply chain is the Wal-Mart retail store that the customer visits.
- Wal-Mart stocks its shelves using inventory that may have been supplied from finished goods warehouses that Wal-Mart manages or from a distributor using trucks supplied by a third party.
- The distributor in turn is stocked by the manufactures.
- The Procter and Gamble (P&G) manufacturing plant receives raw material from a variety of suppliers, who may themselves have been supplied by lower-tier suppliers
- For example, packaging material may come from Tenneco and Tenneco might receive raw material to manufacture the packaging from other suppliers This supply chain is illustrated in Fig. 4.3.

This example illustrates that the customer is an integral part of the supply chain The primary purpose for existence of any supply chain is to satisfy customer needs, in the process generating profits for itself. Supply chain activities begin with a customer order and end when a satisfied customer has paid for his purchase. The term supply chain conjures up images of product or supply, moving from suppliers to manufacturers to distributors to retailers to customers along a chain.

ARCHITECTURE OF E-SUPPLY CHAIN

Models

The consumer need-based business model is forcing a fundamental shift from traditional manufacturing push-based model (also called build-to-stock) to pull-based model (build-to-order).

Typical Aim :

Optimize the production process for cost and efficiency.

Typical Characteristics :

Manufacturer-led new product development.

Poor data integration through limited use of technology,

Long cycle and response time, and high inventory levels.

Use of IS :

Independent data management by supply chain members, limited use of EDI.

Typical Aim :

Enhance product and service quality.

Typical Characteristics :

Market research driven, technology used to achieve research and data integration, short cycle and response times, low inventory levels.

Use of IS :

Integrated internal system, information sharing between supply chain members. Extensive use of EDI and e-commerce, often through B2B exchanges and intermediates.

E-SCM PROCESS INTEGRATION

Companies are using Internet technologies to manage their customers and their supply chain transactions, and find that these applications can offer a great return on investment. Companies realized that to build their own business globally, they had to find better ways to serve their customers, and had to work more efficiently with their suppliers. This is often the first step of a virtual integrated supply chain.

In order to reach this goal a new technology has to be implemented. In other words, a technology has to be absorbed by the organization that is involved in the implementation process. During internet based technologies implementation process users of information and communication technologies (ICT) systems are obliged to overcome the failures and the problems that inhibit the complete "absorption" of the technology, making it difficult to let it become part of the usual managerial routine. Therefore, there are two key entities that characterize the implementation process: the organizations involved and the technology implemented.

Successful E-SCM requires a change from managing individual functions to integrating activities into key supply chain processes. An example scenario: the purchasing department places orders as requirements become appropriate. Marketing, responding to customer demand, communicates with several distributors and retailers, and attempts to satisfy this demand. Shared information between supply chain partners can only be fully leveraged through process integration.

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. According to Lambert and Cooper - operating an integrated supply chain requires continuous information flows, which in turn assist to achieve the best product flows. However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes stated by Lambert are:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management
- Supplier relationship management
- Product development and commercialization
- Returns management

One could suggest other key critical supply business processes combining these processes stated by Lambert such as:

a) Customer service management
b) Procurement
c) Product development and commercialization
d) Manufacturing flow management/support
e) Physical distribution
f) Outsourcing/partnerships
g) Performance measurement

(a) Customer service management process

Customer Relationship Management concerns the relationship between the organization and its customers. Customer service provides the source of customer information. It also provides the customer with real-time information on promising dates and product availability through interfaces with the company's production and distribution operations. Successful organizations use following steps to build customer relationships:

- Determine mutually satisfying goals between organization and customers
- Establish and m: in customer rapport
- Produce positive feelings in the organization and the customers

(b) Procurement process

Strategic plans are developed with suppliers to support the manufacturing flow management process and development of new products. In firms where operations extend globally, sourcing should be managed on a global basis. The desired outcome is a win-win relationship, where both parties benefit, and reduction times in the design cycle and product development is achieved. Also, the purchasing function develops rapid communication systems, such as **electronic data interchange (EDI)** and Internet linkages to transfer possible requirements more rapidly. Activities related to obtaining products and materials from outside suppliers. This requires performing resource planning, supply sourcing, negotiation, order placement, inbound transportation, storage and handling and quality assurance. Also, includes the responsibility to coordinate with suppliers in scheduling, supply continuity, hedging, and research to new sources or programmes.

(c) Product development and commercialization

Here, customers and suppliers must be united into the product development process, thus to reduce time to market. As product life cycles shorten, the appropriate products must be developed and successfully launched in ever shorter time-schedules to remain competitive. According to Lambert and Cooper , managers of the product development and commercialization process must:

- ❖ Coordinate with customer relationship management to identify customer-articulated needs;
- ❖ Select materials and suppliers in conjunction with procurement, and
- ❖ Develop production technology in manufacturing flow to manufacture and integrate into the best supply chain flow for the product/market combination.

(d) Manufacturing flow management process

The manufacturing process is produced and supplies products to the distribution channels based on past forecasts. Manufacturing processes must be flexible to respond to market changes, and must accommodate mass customization. Orders are processes operating on a **just-in-time (JIT)** basis in minimum lot sizes. Also, changes in the manufacturing flow process lead to shorter cycle times, meaning improved responsiveness and efficiency of demand to customers. Activities related to planning, scheduling and supporting manufacturing operations, such as work-in-process storage, handling, transportation, and time phas-

ing of components, inventory at manufacturing sites and maximum flexibility in the coordination of geographic and final assemblies postponement of physical distribution operations.

(e) Physical distribution

This concerns movement of a finished product/service to customers. In physical distribution, the customer is the final destination of a marketing channel, and the availability of the product/service is a vital part of each channel participant's marketing effort. It is also through the physical distribution process that the time and space of customer service become an integral part of marketing, thus it links a marketing channel with its customers (e.g. links manufacturers, wholesalers, retailers).

(f) Outsourcing/Partnerships

This is not just outsourcing the procurement of materials and components, but also outsourcing of services that traditionally have been provided in-house. The logic of this trend is that the company will increasingly focus on those activities in the value chain where it has a distinctive advantage and everything else it will outsource. This movement has been particularly evident in logistics where the provision of transport, warehousing and inventory control is increasingly sub-contracted to specialists or logistics partners. Also, to manage and control this network of partners and suppliers requires a blend of both central and local involvement. Hence, strategic decisions need to be taken centrally with the monitoring and control of supplier performance and day-to-day liaison with logistics partners being best managed at a local level.

(g) Performance measurement

Experts found a strong relationship from the largest arcs of supplier and customer integration to market share and profitability. By taking advantage of supplier capabilities and emphasizing a long-term supply chain perspective in customer relationships can be both correlated with firm performance. As logistics competency becomes a more critical factor in creating and maintaining competitive advantage, logistics measurement becomes increasingly important because the difference between profitable and unprofitable operations becomes more narrow. The firms engaging in comprehensive performance measurement realized improvements in overall productivity. According to experts internal measures are generally collected and analyzed by the firm including

- ❖ Cost
- ❖ Customer Service
- ❖ Productivity measures
- ❖ Asset measurement, and
- ❖ Quality.

External performance measurement is examined through customer perception measures and "best practice" benchmarking, and includes:

1) Customer perception measurement, and
2) Best practice benchmarking.

CUSTOMER RELATIONSHIP MANAGEMENT CONCEPTS

Customer Relationship Management (CRM)

can be defined as the strategies, processes, people and technologies used by companies to successfully attract and retain customers for maximum corporate growth and profit. CRM initiatives are designed with the goal of meeting customer expectations and needs in order to achieve maximum customer lifetime value and return to the enterprise. The use of customer relationship management products, CRM software and CRM solutions enhance the effective implementation of CRM in an organization.

Customer Relationship Management (CRM) is a way to identify, acquire, and retain customers - a business' greatest asset. By providing the means to manage and coordinate customer interactions, CRM helps companies maximize the value of every customer interaction and in turn improve corporate performance.

Understanding the concept of CRM helps in decisions relating Customer relationship management product, CRM software and CRM solutions.

In simpler terms, CRM is the technique of establishing and maintaining long-term business relationships with your customers. CRM involves utilizing the data collected during your customer interactions to determine the demographics and future needs of each customer. Customers and relationships with them have always existed right from the birth of the 'buying and selling concept'.

Competition, driven by globalization and the internet has turned things around. Customers have a variety of choices and most importantly, they have become more knowledgeable and demanding. It is no myth that they are King. With this scenario, companies have realized that it's not just enough to satisfy and delight them but also build genuine relationships in a way that would benefit them.

CRM can help gain a greater share of a loyal customer's business.

Customers can be divided into three zones:

1. *Zone of defection* where customers are extremely hostile and have the lowest level of satisfaction .
2. *Zone of indifference* where customers are not sure. They have a medium level of customer satisfaction and customer loyalty towards the company.
3. The third levels of customers are in the *zone of affection* described as "Apostles". CRM focuses on bringing customers from level 1 to level 3 and retaining apostle customers.

ELECTRONIC CUSTOMER RELATIONSHIP MANAGEMENT

Electronic Customer Relationship Management (E-CRM or e-CRM or eCRM) has become the latest paradigm in the world of Customer Relationship Management. E-CRM is becoming more and more necessary as businesses take to the web. No longer can web-enabled companies rely on the traditional brick & mortar strategies that have gotten them to where they are today. Such organizations have to evolve with the market instead of behind it.

Electronic commerce relies on customer interactions via a computer and telecommunications infrastructure for the purpose of advertising, promoting, and selling products and services online. Electronic commerce replicates most of the physical

activities that take place in the market place to the point where increasing electronic commerce usage are shifting companies from those traditional market places to new market spaces. The traditional market places emphasize "customer satisfaction" as a way to earn consumer loyalty and attract new customers.

E-CRM is a business strategy that utilizes the power of technology to tie together all aspects of a company's business with the goal of building long-term customer loyalty. E-CRM, in practical terms, is the management of customer interactions at all levels, channels, and media.

According to Hansen : E-CRM is defined as "a process of acquiring, retaining and growing profitable customers. It requires a clear focus on the service attributes that represent value to the customer ant that create loyalty."

E-CRM, or Electronic Customer Relationship Management, is an integrated online sales, marketing and service strategy that are used to identify, attract and retain an organization's customers. It describes improved and increased communication between an organization and its clients by creating and enhancing customer interaction through innovative technology.

Electronic-CRM (E-CRM)is not just customer service, self-service web applications, sales force automation tools or the analysis of consumer buying behavior on the internet. E-CRM is all of these initiatives working together to enable an organization to more effectively respond to its customers' needs and to market to them on a one-to-one basis.

E-CRM gives the internet users the ability to interact with the business through their preferred communication channel and allows the business to offset expensive customer service agents with technology. So the value is the largest one of improved customer satisfaction and reduced cost through improved efficiency.

Some of the major players in the Customer Relationship Management (CRM) industry are ICT Group, Oracle, PeopleSoft, Amdoc, Converges, CSG Systems, SAP, Pivotal, Siebel Systems etc.

E-CRM Software

E-CRM software provides profiles and histories of each interaction the organization has with its customers, making it an important tool for all small and medium businesses.

E-CRM software systems may contain a selection of the following features:

- **Customer management :** Provides access to all customer information including enquiry status and correspondence.
- **Knowledge management :** A centralized knowledge base that handles and shares customer information.
- **Account management :** Access to customer information and history, allowing sales teams and customer service teams to function efficiently.
- **Case management :** Captures enquiries, escalates priority cases and notifies management of unresolved issues.
- **Back-end integration :** Blends with other systems such as billing, inventory and logistics through relevant customer contact points such as websites and call centres .

NOTES

- **Reporting and analysis :** Report generation on customer behaviour and business criteria.

E-CRM GOALS

The goals of E-CRM can be categorized in two parts:

Transactional Goals

- Facilitation of consumer search
- Decision-making support for standardized products
- Convenience in ordering
- Delivery tracking
- Limited personalization
- Asynchronous electronic communication (E-mail)
- Technical support for routine issues

Relational Goals

- Understanding customer and segment needs unobtrusively (data mining)
- Interactivity (synchronous communication, etc.)
- Third party E-CRM
- Enterprise Resource Planning

The link between loyalty and profitability is explained by the lower cost of serving loyal customers as well as the increases in revenue through increased patronage and positive word-of-mouth of such loyal customers. At the same time, it is also assumed that loyal customers are not price sensitive, thereby allowing firms to charge higher prices for added benefits and services provided to them.

E-CRM BUSINESS MODELS

Technology of DOT COM interfaces, such as order fulfillment, organizational business processes, and incentives, must be exploited by enterprises to remain competitive. There are six *value imperatives which* are vital for companies to execute:

(1) **Perfect one's logistics :** supply chain management; operating resource management; win–win trading partner collaborations and electronic outtasking.

(2) **Perfect one's long-term customer relationships:** repeat business generation; customer self-management; community collaboration; massive cross-selling and lifetime relationship-focus.

(3) **Harmonize one's channels:** "seamless" links between the Internet, call centers, and physical channels; and strengthening distribution channels, while simultaneously strengthening your own brand.

(4) **Build a powerful portal/hub brand:** incentives for customers to routinely "park" on sites; aggressive customization and personalization; and revenue generation through hosting and selective use of give-it-away-free.com.

(5) **Transform capital and cost structures:** move toward negative working capital; slashing general selling and administrative costs; leverage cash flow generation on minimal physical balance sheet "assets"; reduce cost of capital by building a price/vision premium in market evaluation; and use the valuation advantage to buy needed capabilities at low capital dilution.

(6) **Build value-adding intermediation:** provide a hub with reliable information and advice to link buyers with sellers; offer more efficient transaction processing between trading partners; and build win–win relationships along an entire business chain.

These above imperatives involve developing a business model that stresses E-CRM.

Management of Customer Relationship in Business Media (MCR-BM)-concept:

This concept is defined as "*The Management of Customer Relationship in Business Media comprises the design, development and application of holistic concepts in order to manage relationships to economically valuable current or future customers*".

The MCR-BM concept therefore offers a basic framework for the design of business models to meet the challenges posed by the digital economy. The MCR-BM model consists of seven interrelated building blocks listed below with some key associated issues:

(1) **Customer interaction:** informational content and channels; value-added through non-standard information; pull and push mechanisms; customer communication channel choice.

(2) **Customer added value:** mass customization and personalization; economic incentives.

(3) **Customer profiling:** collection and analysis of customer information; value-added exchange for information.

(4) **Trust:** *strong branding*; sensitive use of customer profiles; security precautions.

(5) **Virtual communities:** information exchange about products and interests; market segment profiling.

(6) **Processing:** cuts across blocks from 1 to 5; internal and external; interface and ease of use.

(7) **Controlling:** cuts across all other blocks.

TECHNOLOGIES FOR E-CRM

Passive

- Cookies
- Chat rooms
- Bulletin boards and fan clubs
- Mailing lists
- News groups
- Observation studies through virtual reality and simulated environments
- Product-related discussion groups and lists

Active

- Chat rooms (hosted by Seller)
- Bulletin boards (hosted by Seller)
- Forums (hosted by the Seller)

- ❖ Internet surveys
- ❖ Product-related discussion groups and lists
- ❖ Recommender software

Interactive

- ❖ E-mail
- ❖ Forums
- ❖ Online focus groups
- ❖ Interactive online interviews
- ❖ Survey panels
- ❖ Auctions
- ❖ Online trade shows
- ❖ Shopping agent

Following figure presents our input-process-output model that serves as a theoretical framework for the study of some of the variables that influence e-CRM processes and outcomes.

The model consists of five input variables, representing each of the five areas, and e-CRM processes and outcomes. The combination of these five input variable categories captures the human participation, economic environment, strategic considerations, technical infrastructure, and intellectual capital components of e-CRM. e-CRM processes are continuous and evolutionary in nature, just as are the relationships they attempt to foster and manage for mutual gain. Feedback loops illustrate that e-CRM outcomes can result in learning for both customers and enterprises. Both types of outcomes – performance and non-performance – are important. Non-performance outcomes may have significant negative or positive impacts on performance outcomes.

HOW TECHNOLOGY CAN HELP IN CRM

The Internet has been both a boon and a bane for customer relationship management. On one hand, the lowered costs of market entry (or the creation of an additional communication and/or sales channel) increases the competition for customer attention and sales, while concurrently reducing seller margins through reductions in buyer search costs as well. This places additional pressures on firms to seek out their most valuable customers and devise programs and strategies to retain them. Fortunately, the Internet also helps firms pursue such objectives. Firms can now understand customer needs better, develop more customer-centric programs for satisfying needs, and offer enhanced value through managing customer information and needs, and providing customized products and services.

The Internet as a technological tool adds greater value to CRM, primarily through making the various stages/strategies of CRM more cost-efficient as well as enabling a host of other activities that would have otherwise been either impossible or arduous.

The Internet enables ready identification of the customer/visitor, cost-efficient data collection, personalization, customization, and interactivity in the CRM process. These enhanced value-creating activities also expand the abilities of firms to "establish, nurture, and sustain long-term customer relationships than ever before" While

traditional CRM activities remained distinct from web-enabled CRM, or E-CRM, in the early years of the "dot-com" era, it is being increasingly recognized that web-enabled CRM is now the norm rather than the exception. This is due to the fact that most firms now view the Internet as an additional channel either for communication or sales, or both, and that firms are recognizing that open-standard Internet TCP/IP protocols, XML, and Internet telephony are not only cost-efficient but also enable better contacts with customers.

But the core concern over technology-based CRM remains the inattention to human factors in the development and nurture of the buyer-seller relationship. These human factors go beyond the user-friendly design and deployment of CRM. It involves building and sustaining trust in the relationship, developing emotional and structural bonds with customers, and demonstrating sincerity and commitment in the relationship-all of which find only partial and imperfect solutions when left to technology alone. For example, Internet based CRM approaches, while recognizing the importance of trust, view trust in the very limited context of providing and guaranteeing privacy and security when dealings with customers through websites CRM strategies must be based on a detailed evaluation of the loyalty-profitability link as well as the real nature of the bond between the firm and the customer.

E-CRM SOLUTIONS

Once a CRM plan has been developed, with key objectives and goals identified, eCRM deployment can begin. There are two main options available for small and medium size businesses to deploy eCRM:

CONTACT MANAGEMENT SOFTWARE

Easy to install CRM software for small organisations which comprise a directory of customer details and allows sales and activity reports to be generated. The following organisations provide this type of eCRM Software

- **Contact Business Communications** (*www.contactsoftware.com)*
- **ACT** *(www.act.com)*
- **Act Today** (*www.acttoday.com.au)*
- **Maximizer** *(www.maximizer.com.au)*
- **Legrand CRM** *(www.legrandsoftware.com.au)*
- **Vital Software** *(www.vitalsoftware.net)*

Customized CRM solutions

Customised CRM solutions for medium size businesses often require enterprise software, service and support from external providers. There are a wide range of software vendors and consultants that provide CRM solutions. These vary from simple applications to the implementation of comprehensive software, hardware and customer relationship ideologies. Some key providers include:

- **Siebel(** *www.siebel.com)*
- **Frontrange Solutions (Goldmine)** *(www.frontrange.com.au)*
- **SalesLogix (** *www.saleslogix.com)*
- **SalesForce (** *www.salesforce.com/au)*

ADVANTAGES OF E-CRM

Implementation of an E-CRM system enables an organization to streamline processes and provide sales, marketing and service personnel with better, more complete customer information. The result is that E-CRM allows organisations to build more profitable customer relationships and decrease operating costs.

Direct benefits of an E-CRM system include:

- **Service level improvements**

  Using an integrated database to deliver consistent and improved customer responses.

- **Revenue growth**

  Decreasing costs by focusing on retaining customers and using interactive service tools to sell additional products.

- **Productivity**

  Consistent sales and service procedures to create efficient work processes.

- **Customer satisfaction**

  Automatic customer tracking and detection will ensure enquiries are met and issues are managed. This will improve the customer's overall experience in dealing with the organization.

- **Automation**

  E-CRM software helps automate campaigns including:

  ✓ Telemarketing
  ✓ Telesales
  ✓ Direct mail
  ✓ Lead tracking and response
  ✓ Opportunity management
  ✓ Quotes and order configuration

  Across every sector and industry, effective CRM is a strategic imperative for corporate growth and survival:

- Sales organisations can shorten the sales cycle and increase key sales-performance metrics such as revenue per sales representative, average order size and revenue per customer.
- Marketing organisations can increase campaign response rates and marketing driven revenue while simultaneously decreasing lead generation and customer acquisition costs.
- Customer service organisations can increase service agent productivity and customer retention while decreasing service costs, response times and request-resolution times.

E-CRM CAPABILITIES

Customer Relationships have been extensively investigated in the marketing and strategic management literature.

The present research draws on the theory of dynamic capabilities, the resource based view and the E-CRM literature to develop a research model which conceptualizes E-CRM in an SME context.

Dynamic capabilities describes an organization's ability to use ICT and complementary organizational resources for develop unique, change - oriented capabilities that enable organizations to respond to the market. ICT provides the building blocks to form capabilities, and an organization's ability to enhance these capabilities leads to superior performance integrating dynamic capabilities theory with the CRM.

The capabilities of E-CRM can be categorised in two forms -

Traditional CRM Capabilities

- Load Management
- Surveys Management
- Knowledge Base
- Compaign Management
- Marketing Encyclopedia
- Forecast
- Service Automation
- Product History
- Task Management
- Literature Fulfillment
- Analytics
- List Management
- Sales Process Automation
- Pipeline Management
- Support Automation
- Quality Assurance

Web CRM Capabilities

- Online lead capture
- Online literature fulfillment
- Online configuration
- Email-based support
- Online profile management
- Online surveys
- E-commerce
- Web self-help
- Online product registration

EXAMPLE OF E-CRM

Information Management

- CRM software helps sales marketing, and service professionals fetch and track relevant data about every past and planned contact with prospects and customers, as well as other business and life cycle events of customers.
  - Information is fetched from all customer touch-points, such as telephone, fax, e-mail, the company's website, retail stores, kiosks and personal contact.
  - CRM systems store the data in a common customer database that integrates all customer account information and makes it available throughout the company via Internet, Intranet, or other network links for sales marketing, service and other CRM application.

Sales

- A CRM system support sales representatives to manage their sales activities, and optimise cross selling and up selling.

Check Your Progress :

3. What E-SCM stands for.
4. Name the components of modern ESCM.
5. What is CRM.

For example :

Sales prospect and product information, product configuration and sales quote generation capabilities are provided.

- CRM also gives them real time access to a single common view of the customer enabling them to check on all aspects of a customer's account status and history before scheduling their sales calls.

For example :

A CRM system would alert a bank sales person to call customers who make large deposits to sell them premier credit or investment services. Or it would alert a salesperson of unresolved service, delivery, or payment problems that could be resolved through a personal contact with a customer

Marketing

- CRM systems help marketing professionals accomplish direct marketing campaigns by automating such tasks as qualifying leads for targeted marketing and scheduling and tracking direct marketing mailings, then the CRM software helps marketing professionals capture and manage prospect and customer response data in the CRM database, and analyse the customer and business value of a company's direct marketing campaigns.
- CRM also assists in the fulfilment of prospect and customer responses and requests by quickly scheduling sales contacts and providing appropriate information on products and services to them, while capturing relevant information for the CRM database.

Customer Service and Support

A CRM system provides common customer database shared by sales and marketing professionals CRM helps customer service managers create, assign and manage requests for service by customers Call Centre software :

1. Routes calls to customer,
2. Supports agents based on their skills and authority to handle specific kinds of service requests.
3. Web-based self-service enables customers to easily access personalized support information at the company website, while giving them an option to receive further assistance online or by phone from customer service personnel.

Customer Retention

- More efforts are required to sell to a new customer than to sell to an existing one.
- A typical dissatisfied customer will do bad publicity about his or her experience.
- A company can boost its profits 85 percent by increasing its annual customer retention by only 5 percent.

- The odds of selling product to a new customer are 15 percent, whereas the odds of selling a product to an existing customer are 50 percent.

  That's why enhancing and optimising customer retention and loyalty is a major business strategy and primary objective of customer relationship management.

IMPLEMENTING AN E-CRM SYSTEM

When approaching the development and implementation of eCRM there are important considerations to keep in mind:

- **Define customer relationships**

  Generate a list of key aspects of your customer relationships and the importance of these relationships to your business.

- **Develop a plan**

  Create a broad Relationship Management program that can be customised to smaller customer segments. A suitable software solution will help deliver this goal.

- **Focus on customers**

  The focus should be on the customer, not the technology. Any technology should have specific benefits in making customers' lives easier by improving support, lowering their administrative costs, or giving them reasons to shift more business to your company.

- **Save money**

  Focus on aspects of your business that can contribute to the bottom line. Whether it is through cutting costs or increasing revenue, every capability you implement should have a direct, measurable impact on the bottom line.

- **Service and support**

  By tracking and measuring the dimensions of the relationship, organizations can identify their strengths and weaknesses in the relationship management program and continually fine tune it based on ongoing feedback from customers.

Answer of the Check Your Progress

1. ERP i.e. Enterprise resource planning is a business management system that integrates all facets of the business, including planning, manufacturing, sales, and marketing. ERP relates to the integrated software infrastructure that supports the entire company business process.
2. Supply chain management - delivering the right product to the right place, at the right time and at the right price - is one of the most powerful engines of business transformation. It is one of the leading cost saving and revenue enhancement strategies in use today.
3. E-Supply Chain Management (E-SCM or e-SCM or eSCM) refers to the flow of physical goods and associated information from the source to the consumer with the

help of new technologies like internet, intranet, communications technologies etc.. Key eSupply chain activities include purchasing, materials management, distribution, customer service, and inventory forecasting.

4. SCM has three key processes :
   - Planning
   - Execution
   - Performance measurement
5. CRM can be defined as the strategies, processes, people and technologies used by companies to successfully attract and retain customers for maximum corporate growth and profit.

EXERCISE

1. Explain Enterprise resource planning.
2. Write down components of ERP.
3. Write down advantages of ERP.
4. Write down disadvantages of ERP.
5. Explain supply chain management.
6. Write down Components of Modern E-SCM.
7. Explain major trends in E-SCM
8. Write an example of SCM.
9. Explain Architecture of E-Supply Chain Models
10. Explain CRM.
11. Write down technologies of E-CRM.
12. How Technology can help in CRM.
13. Write down advantages of E-CRM.
14. Write down an example of E-CRM.