

Computer Applications in Travel and Tourism Management

PG Diploma in Travel and Tourism Management

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Post Graduate Diploma in Travel and Tourism Management

Computer Applications in Tourism and Travel Management

Syllabus

Unit 1 :

Data, Information and Knowledge – Tourism and information, types of information, properties, organization as an information processing unit, MIS and data processing, information needs for decision making – role of computers in management – computer aided decision making

Unit 2:

Introduction to computers, evolution of computers – computer hardware, software, networks, classification of computers, applications software networks - types of networks- topologies – LAN and WAN network management

Unit 3 :

MIS – Introduction – Anthony framework for understanding computer, Management functions and Decision making

Unit 4 :

Information Technology and tourism, travel services and computers and tour services and computers. Media as an information tool to tourism. Internet- browsing internet.

Unit 5:

Social and legal dimensions of computerization, impact of computers on living styles – computer and organization – computer and the society, computers and law – legal aspects and computers, privacy and confidential Information.

Reference books:

1. O'Brien – Management Information System
2. Murdick – Management Information System
3. World Tourism Organization 1988, Guide lines for the transfer of new technologies in the field of Tourism.

CONTENTS

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2. Tourism & Information, Types of information, properties
3. Conceptual Foundations of Information Systems
4. Role of Computers in Management and computer Aided Decision Making
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13. Information Technologies and Tourism
14. Tour and Travel Services and Computers
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17. Social Dimensions of computerization
18. Computers and Organization
19. Computers and Society
20. Legal Aspects of Computers

PG DIPLOMA IN TRAVEL AND TOURISM MANGEMENT
MODEL PAPER
PAPER – V Titled Computer Application In Travel and Tourism Management

Time: Three Hours

Maximum : 100 Marks

PART A – (3*20=60 Marks)
Answer any Three Questions

1. Explain characteristics and inter relationships between data, information and knowledge?
2. Explain the function of various units in the block diagram?
3. What do you understand by computer hardware and computer software?
4. Discuss about tour services and computers?
5. Explain the differences between beneficial impacts and harmful impacts?

PART B – (4*5=20 Marks)
Answer any Four Questions

6. Explain types of Information?
7. Discuss about MIS and Data Processing?
8. Explain some advantages of Computer Basic Managerial Decision Making?
9. Explain the characteristics of storage?
10. What are the reasons for popularity of micro computers?
11. Explain about LAN Management?

PART C – (10 * 2 = 20 Marks)
Answer ALL the Questions

12. Explain the Characteristics of a computer?
13. What is the purpose of storage?
14. Explain different types of computers?
15. Explain different types of digital computers?
16. Discuss about various levels of MIS?
17. Give various categories of planning?
18. Explain various stages of decision making?
19. Discuss about tour services and computers?
20. What do you understand by IRS?
21. Give some harmful impacts of individual and the computers?

Lesson 1: Data, Information and Knowledge

Objectives

Objectives of this lesson are primarily to introduce the basic computer terminology.

- The distinctive characteristics and interrelationships of data, information and knowledge,
- Examine the meaning of data and describe their types, nature and properties,
- Examine the scope of data in different fields.

Structure of the Lesson:

- 1.1 Introduction
- 1.2 Information: Theory and Definitions
- 1.3 Meaning of Data
- 1.4 Nature, Properties and Scope of Data
- 1.5 Data, Information and Knowledge
 - 1.5.1 Characteristics and Interrelationships
 - 1.5.2 Comparative Study
- 1.6 Summary
- 1.7 Technical Terms
- 1.8 Model Questions
- 1.9 References

1.1. Introduction

From the primitive days of human civilization to the present day, information has always been a component of growth and improvement in living standards. In modern societies however, information is closely interlocked with growth and development which is reflected in many ways, as seen in the growth of economic, political, social, occupational, cultural and other sectors. But the concept of information has to be understood in its relation to many other associative concepts such as data, facts, observations, intelligence, skills, knowledge, experience, wisdom and similar others to perceive the impact of information on modern societies. All these concepts, indeed, are very much the creation of the human mind. It is, in fact, the combination of these concepts and their application for human resource development that, in effect, contribute to the growth and prosperity of a society. Information and knowledge are, therefore, deliberately being created to meet a variety of challenges posed to human living. A sea change is taking place in society due to the application of information and knowledge for development. Information technology with all its spectacular advances has been, in fact, the chief

instrument of these revolutionary changes, leading society to an information age. Creation of new knowledge and information, their processing, storage, retrieval, dissemination, etc. have become critical areas for industrial investments. Today, information Technologies are emerging as a major group among modern industries.

Being aware of these fast and the sweeping changes taking place in society, tourism organizations are making efforts to meet the new challenges of obtaining, handling, upgrading and servicing information. In this lesson, we shall study these aspects with particular focus on the characteristics, interrelationships and comparative utility of data, information and knowledge.

A study of this lesson will also be useful in getting yourself acquainted with the meaning of data, their types, nature and properties. It will also enable you to assess the scope of data in different fields of knowledge and to recognize how to importance is to acquire data in order to enrich tourism services.

In this lesson, information is studied as formatting a link in a communication chain, which integrates the source that generates it, the channel employed to transfer it, the receiver who finally reviews it and the medium through which it is communicated. We shall also give a brief resume of the literature on the nature, definitions and concept of information.

As there is no single definition for information, there can be no single set of characteristics for the classification or grouping of information into its types. The basis of such grouping or classification of information has to be in relation to the information transfer process that link sources, media, channels recipients and needs which are inseparable.

The qualities and properties of information while depending upon all different types, have their own attributes, some of which are universally recognized and accepted. There are also quite a few barriers that obstruct the free flow of information.

1.2. Information Theory and Definition:

In this section, we are presenting a quick resume of the literature on the discussions on the definition of information as there are too many formal definitions and none is accepted universally.

But, before we consider the information's of information, let us briefly sketch the theory of information by Shannon /weaver.

Information Theory:

This theory pertains more accurately to the communication process of signal transmission and has an extremely sophisticated mathematical base for examining the effects of transmission messages. When communication engineers use the word "information", they are not concerned with contents but with signal transmission. They do not deal with the contents that are to be communicated but the instructions that the sender, by signals, conveys to the receiver to select a particular message from the given ensemble of possible messages. Therefore, in this narrow sense of the term, information is the statistical probability of a sign or signal being selected from a given set of signals or signs.

The model has been simplified into a flow model:

Source → Message → Channel → **Receiver**

This model recurs implicitly or explicitly in many of the information transfer systems that have been evolved dealing with contents of information as well.

Definitions of Information:

Most writers take the position that the word 'information' is used with many different connotations and single precise definition encompassing all its aspects cannot in principle be formulated. Whatever be definition of the basis concept of information it would be useful to give a brief review of discussion on the definitions rather than giving the different formal definitions of information.

1) Belkin

In an elaborate study on the information concepts for information science Belkin makes the distinction between definition and concepts. The distinction is that while a definition presumably defines the phenomenon, the concept, is looking at or interpreting the phenomenon. By accepting the idea of a concept, it becomes easier to look for a useful concept rather than attempting a universal definition of information.

Belkin postulates three approaches to the determination of the requirement of an information concept:

- Methodological - having to do with the utility of the concept;
- Behavioral - having to do with the phenomena which the concepts must account for, and
- Definitional - having with to do with context of the concept.

With these postulates, the following eight requirements are enumerated which would be relevant and operational to developing a structure of Information Science:

- i. It must refer to information within the context of powerful, meaningful communication,
- ii. It should account for information as a process of social communication among human beings,
- iii. It should account for information being requested or desired,
- iv. It must account for the relationship between information and state of knowledge of generator and of recipient,
- v. It should account for the varying effects of messages presented in different ways,
- vi. It must be generalisable beyond the individual case, and
- vii. It should offer a means of prediction of the effect of information.
- viii. Requirements 1 to 6 pertain to relevance of information to user communities; the rest two are operational requirements to design and develop useful models of information systems.

2) Wersig and Neveling

Wersig and Neveling consider information much more comprehensively, adopting six different approaches:

- i. **The structural approach** (matter oriented) in which information is seen as structures of the world or static relations between physical object which may be perceived or not.
- ii. **The Knowledge approach** which records knowledge that is built up on the basis of perception of the structure of the world. This approach is not recommended because knowledge and information are used as synonyms.

- iii. **The message approach** in which information is recorded as symbols oriented in a physical carrier. This approach is used by those concerned with the mathematical theory of communication.
- iv. **The meaning approach** where the semantic content of messages is accepted as information.
- v. **The Effect approach** or the **Recipient- oriented approach** which states that information occurs only as a specific effect of a process.
- vi. **The process approach** where information is seen as a process which, for example, occurs in the human mind when a problem and useful data are brought together.

The substance of these approaches is that information is a social process and can be understood only if it is defined in relation to needs either as reduction of uncertainty caused by a communication data or as data used for reducing uncertainty.

3) Brookes

Brookes, the eminent British Bibliometrician and Information Scientist, takes yet another stand. According to him, knowledge is summation of many bits of information which have been organized into some sort of coherent entity. This relationship is expressed in a simple equation which he calls the fundamental equation of Information Science.

$$K(S) + \Delta I = K(S + \Delta S)$$

Where K is knowledge structure and (S + Δ S) is the modified knowledge structure, caused by the absorption of the increment of information Δ I to K(S). But Brookes is still inconclusive, as the equation defines the unknown in terms of another unknown and is symbolized by a vicious circle of very small radius. He, however, believes that the fundamental problem of information science is to interpret this equation and thereby to explain the information process.

4) Bell's Approach

A more pragmatic view of information is given by **Daniel Bell** suggesting information to be data processing in the broadest sense; the storage, retrieval and processing of data becomes the essential resource for all economic and social exchanges. These include:

- i) **Data processing of records:** payrolls, government benefits (e.g., social security), bank clearances, credit clearances and the like.
- ii) **Data bases:** characteristics and features of population as shown by census data, market research, opinion surveys, election analysis and the like.
- iii) **Data processing for scheduling:** airline and railway reservations, production scheduling, inventory analysis, document delivery priorities in libraries and information centers, and the like.

Knowledge is an organized set of statement of fact or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form. Knowledge consists of new judgments (research and scholarship) or presentation of

older judgment as exemplified in text books, teaching and learning, and collected as library and archival material.

1.3. Meaning of Data:

The word 'data' is Latin in origin, and literally, it means anything that is given. Different sources have defined the word in different ways. Webster's Third New International Dictionary defines data as "something given or admitted; facts or principles granted or presented; that upon which an inference or argument is based, or from which an ideal system of any sort is constructed". According to Oxford Encyclopedic English Dictionary data are "known facts or things used as a basis for inference or reckoning". These dictionaries also state that even though data is the plural form of datum, it is often treated as a singular collective noun. Hence, its treatment as a singular noun is equally acceptable. For the sake of consistency, however, the word is used in this Lesson as the plural form of datum.

UNESCO defines data as facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing by human or automatic means". Dictionary of Modern Economics defines data as "Observations on the numerical magnitude of economic phenomena such as national income, unemployment, or the retail price.

While another definition of data in science is obtainable from CODATA (Committee On Data for Science and Technology) as quoted by Luedke. CODATA defines data as a "crystallized presentation of the essence of scientific knowledge in the most accurate form".

In social Sciences, data are stated as values or facts, together with their accompanying study design, code books, research reports, etc., and are used by researchers for the purpose of secondary analysis. At one extreme, economics and demography have been heavily quantitative in orientation. At the other extreme, anthropology is concerned with qualitative materials or observations. Sociology and, more recently political Science falls between these two extremes. The change in research orientation in the subject can be seen with changing data, especially with data relating to public opinion. In Information Science, Shuman defines data as "quantitative facts derived from experimentation, calculation, or direct observation".

To understand further, we can say that data or facts have no shape that is relevant to a particular view point. It must be given relevance, arrangement, coherence, usefulness within a definite framework of meaning, intent or interest. This is how data is to be looked upon or used in tourism, either for planning, research or business operations.

1.4. Nature, Properties and Scope of Data:

As you have read in the earlier Section data is given relevance by the persons sorting the data. To be able to give some relevance to data, one should know more about the properties and scope of data.

1) Nature of Data :

To understand the structure of data, we must recall, what are data?

And what are the functions that data should perform on the basis of its classification? The first point in this is that data should have specific items which must be identified. Secondly, specific items of data must be organized into a meaningful form. Thirdly, data should have the functions to perform. Furthermore, the nature of data can be understood on the basis of the class or category that it belongs to, whether the data is required for Science, Social Science, and Management decisions and so on to which it belongs. However, these are not mutually exclusive. There is a large measure of cross-classification, e.g., all quantitative data are numerical data, and most data are quantitative data. The nature of data can be described as:

- i) **Numerical data:** All data in Sciences are derived by measurement and stated in numerical values. "Most of the time their nature is numerical". Even in semi quantitative data, affirmative and negative answers are coded as '1' and '0' for obtaining numerical data, except in the cases of qualitative, graphic and symbolic data, and so on.
- ii) **Descriptive data:** Some qualitative data in Sciences are expressed in terms of definitive statements concerning objects. These may be viewed as descriptive data. Here, the nature of data is descriptive.
- iii) **Graphic and Symbolic data:** Graphic and Symbolic data are modes of presentation. They enable users to grasp data by visual perception. The nature of data, in these cases, is graphic.

Likewise, It is possible to determine the nature of data as either enumerative or descriptive in nature. Whenever the data are derived by enumeration, their nature is enumerative. The data that describe the phenomena are descriptive.

- i) **Enumerative data:** Most data usually used in Social Sciences are enumerative in nature. However, they are refined with the help of statistical techniques to make them more meaningful. They are known as statistical data. This explains the use of different scales of measurement whereby they are graded.
- ii) **Descriptive data:** All qualitative data usually used in Social Sciences can be descriptive in nature. These can be in the form of definitive statements. However, if necessary, numerical values can be assigned to descriptive statements which may then be reduced to numerical data. Having seen the nature of data, let us now examine the properties which the data should ideally process.

2) Properties of Data:

Following are the properties of data:

- i) **Amenability to use:** From the dictionary meaning of data it is learnt that data are facts used in deciding something. In short, data are meant to be used as a basis for arriving at definitive conclusions. They are not required, if they are not amenable to use. The use may differ with the context. Amenability to use nevertheless remains a characteristic of data.
- ii) **Clarity:** According to the CODATA definition, data are a crystallized presentation. This means data should necessarily display clarity, so essential for communicating the essence of the matter. Without clarity, the meaning desired to be communicated will remain hidden.
- iii) **Accuracy:** Data should be real, complete and accurate. Accuracy is an essential property of data. Science data offer a basis for deciding something; they must necessarily be accurate if valid conclusions are to be drawn.

- iv) **Essence:** Many times, large quantities of data are collected which can not be presented, nor is it necessary to present them in that form. They have to be compressed and refined. Data so refined can present the essence or derived qualitative value, of the matter. Data in Sciences consists of observations made from Scientific experiments; these are all measured quantities. Data thus are always the essence of the matter. **Besides the above four properties three more properties are also evident.** They are the properties of being aggregated, compressed and refined.
- v) **Aggregations:** Aggregation is cumulation or adding up. For example, monthly data are added up to form a consolidated annual cumulation. Cumulative percentage are always worked out in data, presented on a variable in tabular form. For instance, production figures, tourist arrivals, export and import statistics and census data are cases of aggregation.
- vi) **Compression:** Large amounts of data are always compressed to make them more meaningful. To present the essence of the matter, it is necessary to compress data. Compressed data are manageable and can be grasped quickly. There exist a number of techniques to compress data to a manageable size. Graphics and charts are some examples of compressed data.
- vii) **Refinement:** Data require processing or refinement. When refined, they are capable of leading to conclusions can be drawn only when data are processed or refined.

3) Scope of Data:

Scope of the data can be studied from the following points of view:

- i) **Utility of data:** Data have great utility as their use in the growth of knowledge. No research, investigation, experiment, etc. is possible without reference to data already existing. Nor does any research end without generating new data. No decision making system can work, nor can a problem be solved, without adequate use of data. No planning is conceivable without enough data. For want of sufficient data research results or conclusion drawn from an enquiry are automatically rendered untenable. Data also alters concepts and removes uncertainty. Data, then, are indispensable in research and in planning and decision making. Data is equally important in tourism so as to understand the emerging trends of tourist flow, tourism planning and strategic planning by tourism organization to carry on their business. It is also used for future projections.
- ii) **Size of Data:** Size of the data involves the converge of the subject under study, data elements, and data population covering documents, data banks, and field survey methods (questionnaire interview, observations etc.) . In Sciences what already exists is in the form of data. According to an Aslib statement, scientific data include:
 - The properties and attributes of an individual entity,
 - The values of one property over many entities,
 - Variations of one property on one entity under different conditions,
 - Classification of entities based on properties, and
 - Quantitative relations between two or more entities.

There are equations and formulate, properties and values, actions and relations and conditions variations. All these, when stated, form data. There also exist numerous data banks, e.g.,

Chemical Formulary and British Pharmacopoeia. The scope of data in Science is, thus, very vast. All governments are involved in socio-economic upliftment. Most applied research all over the world, therefore, is being conducted now-a-days at the behest of the state. Every government has established its own data system for collecting and organizing data in their respective fields, e.g., Indian Meteorological Department, Survey of India, Indian Statistical Organization, National Sample Survey, Census of India, Tourism Statistics and several others. Governments cannot frame policies and formulate plans unless large amounts of data are available as a basis. This explains the establishment of National Informatics Centre. There also exist international bodies like International Monetary Fund, International Labor Organization, World Tourism Organization and scores of others. UN agencies collect and organize data as an indispensable aid in policy research. Management and administrative data called operational data are gathered by institutions, either public or private, national or international, in the performance of their without a supportive data system. Thus, data are pervasive in all human endeavour in all fields of knowledge.

- iii) **Period of Data :** Data collection for any research problem must indicate the time span. It should be clearly stated whether data period is current or cumulative. In Science the interpretations and conclusions are mainly drawn keeping in view the whole text of the subject. In Social Science and Humanities, however, the cumulative period is not taken into account for data collection.

Tourism department also uses a vast amount of data to keep track of changes and emerging trends. The Foreign Exchange is also calculated from data. It is seen that there exists no field of knowledge, no human activity where data can be dispensable. All investigations begin and end with data. In intellectual pursuits data are all pervasive, only their nature varies with the event.

1.5. Data Information and Knowledge:

Data, Information, knowledge and wisdom are the products of the mind that are created, acquired and perfected. They are not of equal value in terms of utility and application. Rather, they (Data, Information, and Knowledge) are evaluated in an ascending scale of values, data having the least value, wisdom the greatest. These concepts in their totality constitute valuable human intellectual assets. They serve as the most precious human capital in all developmental processes.

1.5.1. Characteristics and Interrelationships:

Data is usually an observed fact, obtained on the basis of a systematic survey or study, relating to a certain activity. For example, social data with reference to urban life and civic amenities, government statistics relating to trade, excise duties, taxes, etc., statistics relating to number of beds in hotels, number of inbound and outbound tourists, foreign tourists, domestic tourist flows and similar others. These have value with reference to studies on subjects connected with these data. These data are analyzed and synthesized to derive indicators, provide projections and arrive at valid inferences with references to any event or activity.

Information is obtained through processing of data. The storage, retrieval and processing of data become the essential resource for all economic and social exchanges. The include:

1. **Data processing of records:** payrolls, government benefits (e.g. social security), bank clearances, credit clearances and the like.
2. **Data bases:** characteristics and features of tourists as shown by tourist data, market, research, opinion surveys, election analysis, bibliographic data and the like.
3. **Data processing for scheduling:** airline and railway reservations, production scheduling inventory analysis document delivery priorities in libraries and information centers, and the like.

Knowledge on the other hand, is an organized set of statements of fact or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form. Knowledge consists of new judgments (research and scholarship) or presentation of older judgments as exemplified in text books, in teaching and learning, and collected as library and archival materials. The interrelationship of the three concepts could well be understood from the chart-2.

CHART-2

Data	Raw Material	Cotton: destination
Information	Intermediary	Yarn: tour operator
Knowledge	Finished Product	Cloth: conducted tour

Note: These examples of cotton and cloth and destination and conducted tour are given here merely to illustrate the interrelationship of data, information, and knowledge. The raw material, intermediary and the finished product may vary as per the context.

It must be clear from the above description of data, information and knowledge, that these three concepts are interrelated, in the sense that one is the building block of the other. Data is the building block for information and information is building block of knowledge.

Much of the confusion arises because these distinctions are ignored in common and popular usage of these words. They are used interchangeably, very often information standing for knowledge or data. But as tourism professionals we have to understand their distinction and interrelationships and serve them according to the needs of users.

Comparative Study:

Information is news, facts, statistics, reports of contemporary events and activities, legislation, tax codes judicial decisions and the like.

Knowledge is interpretation in context, relatedness, conceptualization and forms of argument. The results of knowledge are theories; the effort to establish relevant relationships or connection between facts, data and other information in some coherent form and to explain the reasons for these generalizations.

Both in everyday use and in the usage of these words among specialists, however, knowledge is universally regarded as a much wider concept than information or data. Knowledge is a summation or many bits of information or data, organized into some sort a coherent entity. Comprehension and understanding results from the acquisition of information.

Fritz Machlup, the well known scholar in this field, says the information is process a flow of messages involving, the act of telling or being told, and knowledge is a state or sense of knowing, an accumulated stock. So we talk of flow of information and stocks of Knowledge.

CHART-3

Information:

Is piecemeal, fragmented, particular;

Is timely, transitory, perhaps even Ephemeral; and

Is flow of messages.

Knowledge:

is structured, coherent and often of Enduring significance;

is stock, largely resulting from the Flow, inputs of information; and

May effect the stock of knowledge By adding to it, restructuring it or Changing it on any way.

None of these distinctions relate to practical usefulness; neither information nor knowledge needs to be useful or valuable in all contexts.

Wisdom is an individual trait which comes to one through acquisition of sound knowledge and the related virtues by age and experience. The trait among others may comprise ability to see fat ahead into the future, have a vision of things to come and judgment in selecting the right alternatives among several others available for making a decision and so on. While this is the highest form of knowledge, this knowledge cannot be transferred; it is only acquired.

1.6. Summary

In this lesson, information is studies as formatting a link in a communication chain, which integrates the source that generates it, the channel employed to transfer it, the receiver who finally reviews it and the medium through which it is communicated. We shall also give a brief resume of the literature on the nature, definitions and concept of information.

To understand further, we can say that data or facts have no shape that is relevant to a particular view point. It must be given relevance, arrangement, coherence, usefulness within a definite framework of meaning, intend or interest. This is how data is to be looked upon or used in tourism, either for planning, research or business operations.

1.7. Technical Terms

CODATA : Committee on Data for Science and Technology.

KNOWLEDGE: is an organized set of statement of fact or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form.

DATA is Latin in origin, and literally, it means anything that is given.

1.8. Model Questions

1. What is meaning of data? Explain nature, properties and scope of data?
2. Explain about information theory?
3. Compare data, information and knowledge.
4. Explain characteristics and inter relationships between data, information and knowledge.

1.9. References

Quality Information and Knowledge Management by Kuan-Tsae Huang, Yang W. Lee, Richard Y. Wang.

Fundamentals of Information Technology by Alexis Leon and Mathews Leon

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Lesson 2: Tourism & Information, Types of Information, Properties

Objectives:

Objectives of this lesson is

- Get a good overview of the nature and definitions of information,
- Obtain a clear insight into the types and kind of information

Structure of the Lesson

- 2.1 Tourism and Information
- 2.2 Types of information
- 2.3 Properties of information
- 2.4 Summary
- 2.5 Technical Terms
- 2.6 Model Questions
- 2.7 References

2.1. Tourism and Information:

It would not be an exaggeration to say information is key to tourism. From individual tourists to tourism organizations, tourism planning to tourism development, designing tourism products, marketing tourism products, etc. everything is based on information.

Every tourist decides about going to a destination on the basis of information and this information the tourist collects from a variety of sources which include word of mouth or oral communication, brochures, travel write-ups in magazines, newspapers, journals, etc. , internet and so on. Many tourists seek information to plan their own holiday and the type of information they gather is related to attractions at the destinations, accommodation, modes of travel, prices and tariffs, sources of entertainment, etc. Computerized reservations systems, electronic media, electronic communications and Internet not only provide them with information but also help them in planning their itinerary and making necessary reservations. Hence, information and information technology, today, have an impact on the destination choice, accommodation choice and modes of travel.

From the point of view of suppliers, both tour operators and travel agents design their products and services on the basis of information. A tour operator packages a holiday tour which includes travel, stay,

site seeing, entertainment, etc. and for this he or she needs information on each of the aspects in order to make a viable package. Not only this, the tour operator's entire marketing whether it is search for new markets, profiling of tourists, market segmentation, target marketing and ultimately the designing of the product is based on information in the form of data available from various tourist generating markets as well as destinations. Similarly the entire operations of travel agency are based on the information and data related to airlines, car rentals, tourist transport, tariffs, fairs, travel routes, etc. and again the travel agency has to look for different sorts of data, analyze it and then carry out its own operations. Similarly, a hotel or an airline also has to do such exercises.

When it comes to destination planning and development or formulating the tourism policies of the national, regional or local tourism organizations, information again is the starting point for that. What type of tourism is to be promoted, what kind of facilities are to be planned and in which direction the tourism policy should go will depend on the analysis of the data either available or to be generated on these aspects. The World Tourism Organization place a major role in this regard. Government tourism organizations, travel agencies, tour operators, hotels, tourist transporters, etc., i.e., all the players in the tourism not only seek information but they also generate and provide information either to the consumers or to the retailers or to the principle suppliers. Various kinds of information needed for tourism planning and operations flows from various sources but generally the most crucial in this regard are be destination databases, tourist databases and computerized reservation systems. Besides these the print media and electronic media facilitate the information seeking process along with the first hand information and experience which is sought through familiarization tours. Needless to say that the travel writers are important components of information seeking, assimilation, storage, analysis and dissemination in tourism.

2.2. TYPES of Information

We have so far been discussing the nature, concept and definition of information in general. But these discussions also have to seen a long with the different types of information to get a view of all its dimensions. We shall examine, in this section, the fuller dimensions of information with reference to its different manifestations.

Just as we have seen that the world 'information' has no signal universally accepted definition, there is no signal way we can group or classify information, In fact, the types of information could be grouped using different characteristics depending upon the purpose of such a classification, keeping these in view, let us choose a set of characteristics on the basis of modified Shannon/weaver model of information transfer with an added one, viz., information needs. These are:

- Source is the mode of communicating messages through signs, symbols, text or graphics.
- Channel refers to the established carriers that disseminate information or knowledge or any type of their surrogates.
- Media is physical media that carry messages or contents of information.
- Recipient is the ultimate receiver of information who may also generate or create information.
- Information needs indicate the type of information that is normally communicated to those who seek the different types of information relevant to their needs. The scope to divide information in this way, however, is almost unlimited

1) By Source

Using Source as characteristic, information can be grouped as follows:

- Signal, Message in the form of signs, symbols, words and numbers, e.g., mathematical formulae, statistical and factual data, etc.
- Text matter, carrying larger amount of message or information, e.g., News, Research papers, Reports, etc.
- Graphics of various kinds, e.g., photograph pictures, Graphs, etc.

It may be worth while repeating here that in this context source connotes the way in which information is communicated, i.e., in the form of signals, textual matter or graphics, irrespective of the persons or groups who generate information.

2) By Channel

Using Channel as a carrier that disseminates information for grouping information, we have the following in terms of literature, information organizations and institutions and agencies that distribute them.

- Literature: primary, secondary and territory channels. The different characteristics of those three channels with examples are given in **Chart – 1**

CHART - 1

Primary		
Characteristics		Examples
1) New, Original or new interpretation of Known facts and ideas,		Journal Articles, Research Reports.
2) Unorganised and unrelated, each unit being A separate.		Conference papers and proceedings, Official publications.
3) Widely scattered.		Thesis and Dissertations, Project Reports
4) Unassimilated into the general body of Knowledge		Diaries, Memos, Correspondence.
Secondary		
Characteristics		Examples
1) Information derived from primary sources.		Bibliographic, current Awareness Bulletins.
2) Organised and arranged according to a Definite plan.		Indexing Journals, Abstracting Journals, Reviews, state-of- art.
3) Scattered information collected.		Reports, Progress, Advances, etc.
4) Repositories of assimilated and digested Knowledge.		Reference Books, Dictionaries, Encyclopedias.
5) Bibliographical key to primary literature.		Directories, etc.

Tertiary

Characteristics	Examples
1) Compilations of primary and secondary Sources.	Bibliographies of Bibliographies, year Books.
2) Organized and arranged according to a Definite plan.	Directories, Lists or Research in Progress, Guides to Literature.
3) Aids to Researching Primary and Secondary Sources.	Information Sources, Organisations, Human Resources.

Information Institutions: Libraries, Documentation and Information Centers, Information Analysis Centers, and such others. These institutions collect, process, analyse, disseminate and distribute all the three types of literature mentioned above.

Distribution Agencies: Booksellers, Subscription Agents, Clearing Houses, Information Brokers and such others. While information institutions are essentially agencies involved in the provision of information Science with reference to specific clientele, distinctions are getting blurred with the advent of information Technology.

3) By Media

Using physical Media as a characteristic for grouping information, we have the following:

- Oral - person to person, one to one, one to many
- Recorded - Paper- print
Microforms
Audio- Visuals
Electronic

In the above two categories, we distinguish audio from other types of textual matter, irrespective of the physical media. Oral information refers to voice information with or without any corresponding textual information.

4) By Recipient

Using recipients as a characteristic for grouping information, we have the following who receive and use information and knowledge for various requirements:

- Individual,
- Groups,
- Organisations, and
- Institutions.

5) By Information Needs

Using Information needs as a characteristics for grouping, we have the following information Needs:

By Standard

Popular
Scientific
Technical

By Type

Know –why
Know-how
Show-how

- Know-why Information: more scientifically oriented information, readily accessible in the numerous secondary tools, available in the libraries and information centers and also easily transferable.
- Know-how Information: more technically oriented, not noticed in the tools and more difficult to locate and obtain, less easy to transfer.
- Show-how Information: operational skills, maintenance and control capabilities, seldom recorded in communicable form and, therefore, never gets recorded in any primary or secondary tools. Transferable only through personal contacts and interaction, depending very much upon the willingness of the person who has the skills to share them and the person who wants to learn the skills.

Recipients and information needs, as characteristics for grouping while producing different sets or classes of information, or in fact closely intertwined. As B.C. Vickery puts it, the social positions of recipients, their activities, knowledge generation and information input, knowledge structure, ability to assimilate, communication behavior, etc. may all be series of influences that will determine the information needs of individual or groups. Information systems and services must respond to these kinds of requirements.

2.3. Properties of Information:

Information can be examined from the point of view of its inherent properties. We are studying them here with reference to those that apply to:

- I) Information in General,
- II) Scientific and Technical Information, and
- III) Information Pertaining to Technology and Economics

1) General:

- Information is not consumed in its use.
- It can be shared by many and can be used simultaneously without any loss to anyone.
- It is the most democratic resource in that it can be consumed by poor and rich alike depending upon the intake capability.
- Knowledge is dynamic, ever growing and continuing and now final word is said or will ever be said on any aspect of it.

2) Scientific and Technical Information:

- Universal, particularly in the Physical, Chemical, and Biological Sciences.
- Open and available to all who seek them, through a well organized operating communication system.
- A system of peer review and mode of communication operates in its dissemination.
- Becomes obsolete in fast developing disciplines and obsolescence factor is quite in some of them.
- Exponential growth in scientific publications has been causing concern in accessibility and availability.

3) Technological and Economic Information:

- Restricted because of time and Geographical space bound.
- Competitive because of business interests, sometimes for reasons of security of nations.
- Secretive because of competition and reasons of security.

Over the years knowledge and information have become powerful weapons for political and economic superiority among nations. The generation of knowledge and its application for various purposes have been given the highest priority in the recent decades, particularly among the western industrialized societies. The developing countries naturally suffer from a number of constraints in the acquisition, storage processing, disseminating and making them available for use.

2.4. Summary

Every tourist decides about going to a destination on the basis of information and this information the tourist collects from a variety of sources which include word of mouth or oral communication, brochures, travel write-ups in magazines, newspapers, journals, etc

We have so far been discussing the nature, concept and definition of information in general. But these discussions also have to seen a long with the different types of information to get a view of all its dimensions. We shall examine, in this section, the fuller dimensions of information with reference to its different manifestations

Over the years knowledge and information have become powerful weapons for political and economic superiority among nations.

2.5. Technical Terms

SOURCE is the mode of communicating messages through signs, symbols, text or graphics.

CHANNEL refers to the established carriers that disseminate information or knowledge or any type of their surrogates.

MEDIA is physical media that carry messages or contents of information.

RECIPIENT is the ultimate receiver of information who may also generate or create information

2.6. Model Questions

1. Write short notes on tourism and information?
2. Explain types of Information?
3. What are the different properties of information?

2.7. References

1. World Tourism Organization 1988, Guide lines for the transfer of new technologies in the field of Tourism.
2. The Management of Tourism by Lesley Pender, Richard Sharpley - Business & Economics - 2004

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Lesson 3: Conceptual Foundations of Information Systems

Objectives:

The objective of this lesson is

- Appreciate the significance of information systems in an organization,
- Understand the information subsystems which could be defined within a typical organization, and
- Differentiate between various types and levels of information systems.

Structure of the Lesson:

- 3.1. Introduction
- 3.2. Organization as an Information Processing Unit
- 3.3. MIS and Data Processing
- 3.4. Information needs for Decision Making
 - 3.4.1. Information for the intelligence phase
 - 3.4.2. Information for the design phase
 - 3.4.3. Information for the choice phase
 - 3.4.4. Information for the implementation phase
- 3.5. Summary
- 3.6. Technical Terms
- 3.7. Model Questions
- 3.8. References

3.1. Introduction :

Information has been recognized as one of the crucial corporate resources, which facilitates. Better utilization of other important resources such as men, machines, materials, money and methods. Managers have come to realize that without proper information-at the right time and at the right place-even other resources may not be fully utilized. A manager needs to have proper information at all the stages of decision making process. And a fully informed manager is in position to take better and faster decisions as compared to uninformed one.

3.2 Organizations as an Information Processing Unit:

The information gets processed within an organization as it travels from clerical to the top levels of management. Figure 3.1 shows how the information gets processed within an organization. It could be seen from the figure that the data is collected from units like customers, internal operations, competition and external data on economy and market, etc. The collected data is processed so as to generate the outputs usually in the form of information reports. This output is information and leads to managerial action. The processed information is also disseminated to the members of the organization, public at large, stockholders as well as government and regulatory agencies. It could be seen from the figures that information is the only linking thread between the external environment and the internal members of the organization.

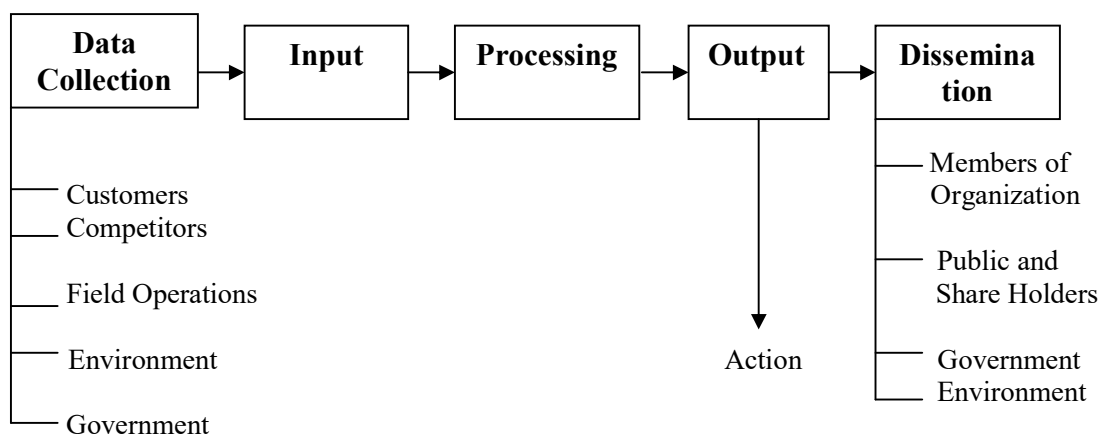


Figure 3.1: Information Processing in an Organization

The various subsystems of any information system could be better understood by looking at it from the organizations point of view. The two approaches used to define the subsystems of a MIS-(1) Organizational functional subsystems and (2) Activity subsystems.

3.3. MIS and Data Processing

MIS can be differentiated from data processing from the user's point of view. Historically, the data processing was the first subsystems to be used in business organizations. It is recently that the data processing is being treated as a lower level activity as compare to MIS. Data processing is basically aimed at processing of transactions generated from day to day operations within an organization; whereas MIS aims at supplying information from the processed data to various cadres of management to support their decision making process. The use of computers for processing of data actually started with data processing and MIS has evolved only recently within the organization. Data processing could be further divided into four different streams as given below:

a) Office Automation Systems (OAS):

The office automation systems are those activities and process which are undertaken on the computer to perform the office routines such as routine correspondence, scheduling, appointments, calendar functions, bulk mail, word processing, etc. However, it may be noted, that OAS does not lead to generation of data directly. These systems are designed following basic principles of office management.

b) Transaction Processing Systems (TPS):

The transaction which get generated on a day to day basis in an organization are collected, stored and used for updating master data files so as to change the current status of organizational entities within an organization. The transaction processing systems are primarily aimed at updating the files relating to finance such as, generation of detailed transaction reports, preparing summarized processed transaction data and so on. Examples of TPS are sales accounting systems, financial accounting systems, personnel accounting systems etc. All these systems are designed following the basic principles of accounting.

c) Management Information Systems (MIS):

These systems are designed for providing information to the key functionaries in an organization. These systems make use of the already processed transaction data which is outputted from TPS and generate information reports after processing data. The examples of this kind of systems could be personnel information systems, marketing information systems, sales information systems, production and operations systems etc. These systems are designed following the principles of organizational theory. The major group users for this kind of systems are the middle levels of management.

d) Decision Support Systems (DSS):

DSS are the highest order of systems among the computer based information systems. These systems make use of the summarized organizational data as well as external data collected from the environment of the organization. The internal data is mostly used for studying the trends whereas external data is mostly used for understanding the business environment. These systems also make use of analytical and planning models such as management science and operations research models. These systems are mostly used for assisting the top management in taking unstructured and semi-structured decisions having long term impact on the organizational performance.

3.4. Information Needs for Decision-Making:

To take any decision proper information is needed. For example, a tour company planning to start inbound tours from Europe first must have all the data and information regarding the market there to design the package and then choose an area/region /country to start the operation. Herbert A. Simon has proposed conceptual framework that divides the decision making process into the following stages:

a) Intelligence Activities:

At this stage, a search of the environment takes place to identify events and conditions requiring decisions. Data inputs are obtained, processed and examined for clues that may identify problems or opportunities.

b) Design Facilities:

At this stage, alternative courses of action are developed, analyzed and evaluated. This involves process to understand the problem, to generate solutions, and to test solutions for feasibility.

c) Choice and Implementation Activities:

Here one has to select an alternative as course of action from those available. A choice is made, implemented and monitored.

Though intelligence, design, choice and implementation activities are sequential in nature, the decision making process includes the ability to cycle back to previous stage as shown in figure 3.2. Choice and implementation have been shown to be separated for better understanding.

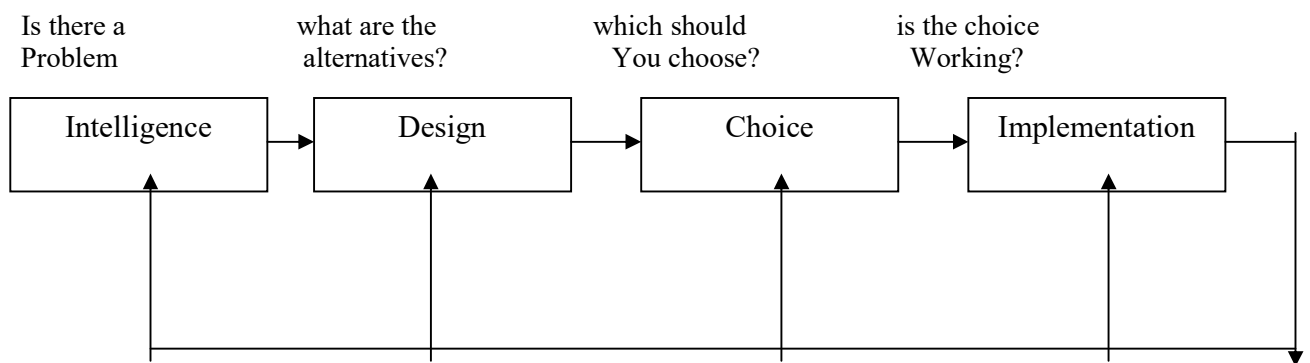


Figure: 3.2. Flow Chart of Decision Process

Let us now look into the information requirements for the various stages described above.

3.4.1. Information for the Intelligence phase:

Information systems can help in the intelligence stage by providing information about external and internal conditions. Intelligence entails scanning the environment, either intermittently or continuously, depending on the situation to identify potential decision situations. For example:

- a) a marketing executive makes periodic visits to key customers to review possible problems and identify new customer needs.
- b) Sales analysis reports can be furnished to managers periodically, when exceptional sales situations occur, or on demand. These help managers to identify the status of sales performance. Also information from market research studies and external databases can help managers identify changes in consumer preferences or competitive activity so as to design product /service.
- c) A tour executive might attend a trade fair to observe possible new ventures that may or could be incorporated in future packaging of tours.

The intelligence phase and its activities result in some type of dissatisfaction with current state or alternatively aid in the identification of potential rewards for a new state. The intelligence phase is the 'tricky' phase and embraces the unstructured non-programmed category of decisions.

A major information system capability is needed at this stage. It should be possible to provide situation-specific information to managers when they make ad-hoc inquiries that could be unique and often unscheduled. All this should be in addition to some of the exception reports that might be changed out on weekly basis.

3.4.2. Information for the Design Phase:

The design phase involves designing of several possible solutions to the problems and evolution of the alternate courses of action. Here more carefully specified and directed information activities and capabilities, focused on specific designs, are required. This stage calls for quite a deal of creativity and innovation. Idea generation and idea engineering could play a useful role in this stage of decision-making.

Models of business operations can be developed with decision support software, including advanced statistical, management science, and modeling packages, or less complex spreadsheet programmes. These packages and models can then be used to manipulate information collected in the intelligence stage to develop and evaluate a variety of alternatives.

Thus, the information system should contain decision models to process data and generate alternative solutions. It should assist with checklist, templates of decision processes, scenarios, etc. The models should assist in analyzing the alternatives.

3.4.3. Information for the Choice Phase:

In this stage a final selection of a particular course of action has to be made out of the various alternatives generated in the preceding design stage. Here a manager can use information tools that can calculate and keep track of the consequences, costs and opportunities provided by each alternative designed in the previous stage. Information systems should help managers select a proper course of action. An information system is most effective if the results of design are presented in a decision-impelling format. The final choice would depend whether there is a single criteria or objective on which it is to be decided or whether the decision situation is one which involves multiple criteria and objectives. An 'expert choice' software is available for the purpose of prioritization of alternatives.

The quality of the choice stage depends very much on the quality of inputs made from the previous two stages-intelligence and design phases. It is possible that the manager, even though at the choice stage, might like to refer and return to the previous stages and reopen the issues for more data or alternatives, etc.

Information systems can help managers in the choice stage in various ways. Managers can be provided with summarized and organized information emphasizing major points such as major assumptions, resources requirements and expected results of each decision alternative.

3.4.4. Information for the Implementation Phase:

This is the final stage of the decision-making process. It is concerned with implementing and monitoring. When the choice is made in the previous stage, the role of the system changes to the collection of data for further feedback and assessment. The information systems must help managers monitor the successful implementation of the decision. Here managers can use a reporting system that delivers routine reports on the progress of a specific solution. Some of the difficulties that arise are resource constraints and possible ameliorating actions. Support systems can range from full-blown Management Information Systems to much smaller system and project planning(PERT/CPM based) software operating on micro-computer. Feedback about business operations effected by a decision helps a manager assess the decision's success or failure, and whether follow-up decisions are needed.

3.5. Summary

Managers have come to realize that without proper information-at the right time and at the right place-even other resources may not be fully utilized. A manager needs to have proper information at all the stages of decision making process. And a fully informed manager is in position to take better and faster decisions as compared to uninformed one.

To take any decision proper information is needed. For example, a tour company planning to start inbound tours from Europe first must have all the data and information regarding the market there to design the package and then choose an area/region /country to start the operation.

Information systems can help managers in the choice stage in various ways. Managers can be provided with summarized and organized information emphasizing major points such as major assumptions, resources requirements and expected results of each decision alternative.

3.6. Technical Terms

OAS : Office Automation Systems are those activities and process which are undertaken on the computer to perform the office routines such as routine correspondence, scheduling, appointments, calendar functions, bulk mail, word processing, etc.

TPS : Transaction Processing Systems are primarily aimed at updating the files relating to finance such as, generation of detailed transaction reports, preparing summarized processed transaction data and so on. Examples of TPS are sales accounting systems, financial accounting systems, personnel accounting systems.

MIS : These systems are designed for providing information to the key functionaries in an organization.

DSS : These are the highest order of systems among the computer based information systems.

3.7. Model Questions

1. Explain Organization as an Information Processing Unit with one example?
2. Discuss about MIS and Data Processing?
3. Write about information needs for decision making?

3.8. References

1. O'Brien – Management Information System
2. Murdick – Management Information System
3. Quality Information and Knowledge Management by Kuan-Tsae Huang, Yang W. Lee, Richard Y. Wang.

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Lesson 4: Role of Computers in Management and Computer Aided Decision Making

Objective :

The objective of this Lesson is:

- Appreciate the significance of computerization for efficient management decision-making at the corporate level, and
- Understand the role of computer-aided decision-making in management of an organization along with the advantages and limitations.
- Monitoring of outside conditions affecting the organizational plans.
- Organization of the MIS function.

Structure of the Lesson:

- 4.1. Introduction
- 4.2. Need and Levels of Information Handling
- 4.3. Advantages of Computerization
- 4.4. Approach to Computerizations
- 4.5. Communication Gap
- 4.6. Reliance on service bureaus or computer vendors
- 4.7. Lack of Master Plan
- 4.8. Organization of the MIS Function
- 4.9. Lack of good Management systems
- 4.10. Managerial Participation
- 4.11. Failure to Identify Information Needs
- 4.12. Poor Systems Prior to Computerization
- 4.13. Overlooking Human Acceptance
- 4.14. Summary
- 4.15. Technical Terms
- 4.16. Model Questions
- 4.17. References

4.1. Introduction :

Prof.H.Simon views the computer as the fourth great breakthrough in history to aid man in his thinking process and decision-making ability. The first was the invention of writing which gave human beings a memory in performing mental tasks. The remaining two events prior to the computer were the devising of the Arabic number system with its zero and positional notation, and the invention of analytic geometry and calculus, which permitted the solution of complex problems in scientific theory. Now the electronic digital computers combine the advantages and attributes of these entire breakthroughs and make them available for decision-making and management of organizations.

This unit takes into account the various aspects of information handling through computerization. It goes on to discuss the role of computers in decision-making processes.

Transaction processing systems using computers have played a relatively limited role as a management tool. This has been so because decision-making has not been their central theme. Instead, they have been specialty-oriented for ongoing clerical needs in personal (Payroll) book-keeping (accounting), technical data (capital projects) or specific functional areas (materials). Alternatively, they have been project-oriented, used to manage a specific programme of limited time and scope, such as, examination result processing, or, they have been problem-oriented for emergency and random retrieval of information to meet a crisis situation of limited duration and scope.

According to Robert Anderson, the corporate **MIS** should assist such material function as:

- Manufacturing, marketing and other real-time operations,
- Futuristic improvement and problem-solving, instead of historical reports of the Past actions,
- Necessary corrective action rather than book-keeping, and
- Monitoring of outside conditions affecting the organizational plans.

Joel E. Ross identifies the reasons for corporate **MIS** as the same for planning in general. It should offset uncertainty, improve economy of operations, focus on the objective and provide a device for control operations. Such an approach is radically different from the patch-work approach of the transaction processing system.(what follows is identification of some of the strategic issues identified by Ross and others, and their suggested solutions in the Indian context).

4.2. Need and Levels of Information Handling:

Management Information System (MIS) can be defined, according to Joel E.Ross, as a communication process where in information (input) is recorded, stored, processed and retrieved for decisions (output) regarding the managerial process of planning, organizing and controlling shown in figure 4.1. **If we now define decision-making as the process of selecting from among alternatives a course of action to achieve an objective, the link between information and decision becomes clear.** Indeed, decision-making and information processing are so inter-dependent that they become inseparable, if not identical, in practice.

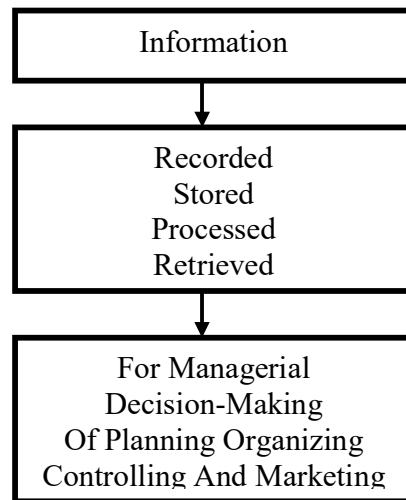


Figure 4.1 Definition of MIS

Computerized MIS cannot technically make a decision but it can yield processed data and follow instructions to the extent of its capacity. For example, the computer can be properly instructed to compare inventory levels with programmed decision-rules on re-order level and re-order quantity, and generate purchase requisition, purchase enquiry and purchase order, etc. This can resemble an automatic control of purchase documents.

The modern role of MIS for managerial decision-making in a complex organization has been compared to that of a military commander. Commanders often adopt a strategy built by direct observation of partial situations. This is the style used by the managers who track operations by periodic communications with remote sales depots, plants divisions and other offices. For instance, the central marketing organization of travel agency has to keep track of all booking offices spread all over India for marketing related decision-making.

Levels of Information Handling

There are four levels of computerized information handling, they are:

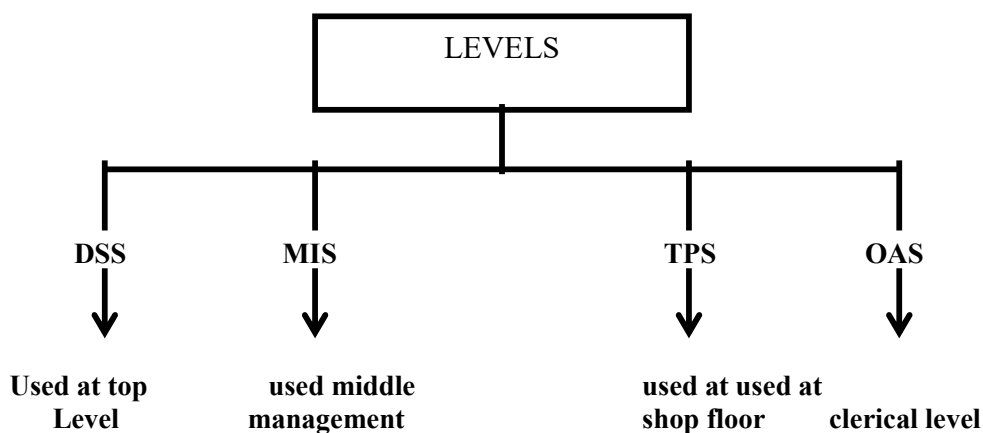


Figure 4.2 Levels of Information Handling

In a modern complex organization, the levels of information handling can be divided as decision support system, management information system, transaction processing system, and office (and other) automation system as in figure 4.2.

At the apex, the **top level managers** may need decision support system (DSS). This would be an interactive system that provides the user-manager with easy access to decision models and data in order to support semi-structured and non-structured decision-making tasks. Inputs for DSS can be some processed data, and mostly management-originated data along with some unique models. The DSS would involve queries and responses, operations research models, and simulation. The output from DSS would be special reports to resolve difficult questions and replies to management queries.

At the **middle management level** (if there exists one), MIS would deal an organized set of procedures to provide information for middle managers to support their operations and decision-making within the organization. At this level, inputs for MIS would be both processed and raw data and some management-originated data, along with pre-programmed models. The MIS process would involve report generation, data management, simple models, and statistical methods. The outputs from MIS would be filtered and screened for semi-routine decisions and replies to simple management queries.

At the **shop floor management level, transaction processing system (TPS)** is a computer-based system that would capture, classify, store, maintain, update and retrieve simple transaction data for record keeping and for feeding MIS and DSS. The TPS would have transaction data as inputs. The processing for TPS would involve classification, codification, sorting, merging, adding, deleting and updating. Outputs for TPS would be detailed reports relating to routine decision and processed data.

At the **clerical level, office and other automation control system can be in operation. Office automation system (OAS)** is simple in an automated office having multiple functions, where the integrated and computer-aided system allows many activities to perform with electronic equipment. The OAS would have inputs such as appointments, documents, addresses, etc. The OAS processing would be scheduling, word-processor, data storage and retrieval's outputs from systems used in hotels and travel agencies are also operated at this level.

4.3. Advantages of Computerization:

The advantages associated with computer-based managerial decision-making can be the following:

1. Response time is greatly reduced.
2. Very large data are stored for information and decision-making.
3. Accuracy of information is considerably improved, thereby improving the quality of the decision.
4. Problems are handled more easily by using various operation research models.
5. The cost involved in the decision-making process is reduced.
6. More secrecy is observed as compared to manual file system.
7. Ability to take quick decision improves considerably as the time for retrieval of information is very fast.
8. Paper work is reduced to the minimum as all the information is stored in the computer itself.
9. Lots of information is stored for future reference.
10. Chances of leakage of classified information are reduced.

11. Accuracy of manipulation is increased very much, and
12. Time spent in various decision-making activities is reduced to minimum.

Emanating from the above, the following benefits for a commercial organization can be attributed to computerization:

1. The availability of accurate forecasts within 1 percent of net income;
2. The preparation of short term profit plans and long-term projections.
3. The provision of pre-plan information budget preparation.
4. The calculation of variances between budgeted and actual results.
5. The triggering of revised forecasts if monitoring activities and the signaling of necessary reactive plans.
6. The early warning system for monitoring activities and the signaling of necessary reactive plans.
7. The indication of income and cash flow by following alternate investment strategies.
8. The assistance to the planning of new facilities and a host of special strides; and
9. The accomplishment of the preceding items at a great speed.

While TPS has been in use over several decades, OAS is coming into practice only now in a number of organizations. The TPS has brought its own benefits for speedy execution, accurate performance and quite often confidential handling. Such benefits will become evident if one considers a couple of very common TPS applications.

The first is examination result processing which the bulk of Indian universities are doing on computer today, either with in house systems or with hired service bureaus. The massive nature of such processing can be visualized by looking at one state alone, namely, U.P. where 13lakh candidates go through high school stream and 6 lakhs through the intermediate stream in any single year. The processing and publication of their results in time would not have been possible without computerization besides, it is possible to maintain some confidentiality on computer processing. Another application is computerized electrically billing adopted by several State Electricity Boards in India. Under the computerized system, every meter for light and fan, or for power is invariably supported by a billing raised by computer and every such bill is again invariably dispatched by computer centre. Both these actions guarantee improvement over the manual system where there is usually little certainty of bills being raised or being actually dispatch due to adoption of foul means.

Now, consider the effect of computerization on airlines. The computerization of the ticketing section has resulted in an easy ticketing procedure and also helps the ticketing agents of the airlines who can get the system on their computers. Moreover, now a day the customer care cargo, marketing departments and others are also computerized. This makes the customer needs easy to handle. Similarly most of the travel agencies have linked themselves to computerized reservation systems of hotels, airlines, car rentals; etc This not only saves time and energy, but also helps them in providing better services and instant bookings to the customers.

Advantages of MIS can be manifold because of the aid to higher level decision making. Once the planning, monitoring, reviewing and control process are facilitated, the benefits can literally multiply several times, over and above the mere shop-floor or clerical TPS applications.

4.4. Approaches to Computerization:

The first important stage of organizing MIS at the corporate level is to build up comprehensive database from TPS for the clerical systems. Valid data should be initially classified and codes attached to each data set. Thereafter database should be constantly updated. The analogy to a reference library system is almost uncanny, where books have to be classified according to the subjects and then codes attached to each book. Their after the books need constant updating through cataloguing and indexing. A library, however, is not as amenable to easy cross-reference among a vast number of books, as a computerized database is. With classification, codification and updating, a computerized database can help the user with almost instant retrieval of any amount cross-classified and cross-revised data, thus helping tremendously the decision-making process.

The second important stage to MIS at corporate level is to decide on the principles of evaluating the raw data for decision-making. For this purpose, the four principles that can be unhesitatingly recommended are : selection, pattern, linkage and overview. The first principle of selection looks at a screened segment of data which can focus attention on variances from standards, deviations from norms, fluctuations from targets and differences from budgets. It is presumed that whatever data are related to the initially fixed standards, norms, targets and budgets they are to that extent, not required to be looked at any further. But whatever is not conforming to the study state or worth looking at for decision-making purposes. The second principle of pattern is to look at the collection of data and to derive insight by virtue of management ratios, trends, correlations and forecasts. Essentially this is a principle of gaining insight into the given mass of data. The third principle of linkage is a way of looking at a number of widely dispersed data-sets and to formulate a coherent picture. The last principle of overview is to derive a total picture which cuts across a number of control parameters and sums up the managerial position.

The third stage of MIS at corporate level is to realise the above four principles in actual practice. The first principle of selection can be implemented by generating exception-based reports. This requires the safe-keeping of classified, codifies and updated data on the computer and retrieving only specially meaningful reports on the basis of exception. The second principle of pattern can be implemented by using mathematical modeling and statistical analysis. Such analytical approach requires the data-sets to be treated with mathematical models and statistical methods in order to derive meaningful indicators for decision-making.

The third principle of linkage can be implemented by inter-relating different data-sets from disparate files or data-bases. The inter-relationships would provide again available insight across the board. The fourth principle of overview can be implemented by aggregating data. Such a process of aggregation can connect together the classified and codified data for purpose of deriving a managerial insight into the total span of operations.

4.5. Communication Gap:

One of the reasons for the over-emphasis on the transaction processing system is the communication gap between the computer professional and the user-manager of the system. In India, far to many organizations have become used to separate EDP departments, now increasingly called computer services departments. Because of the training interest and peer pressure, **Ross** suggests that there is a compulsive tendency for the computer professional to generate massive data-base, to install display devices and glittering data-communications techniques, and to install newer and grander design. This only serves the purpose of empire building and not improved management.

There is a familiar situation where the computer professional is engaged in developing the computer-aided decision-making but is not able to communicate to the user-manager. The information that the user needs is called for, but the user cannot adequately express them as he or she has not been accustomed to a rigorous self-analysis. There after, the computer professional works out a plan based on his or her own understanding of the user-needs, to convert them into flow-charts and programming. In the process, the information needs themselves get altered. When the programmer codifies and implements the system, his or her own interpretation gets incorporated, thus further changing the user-needs. All these end up by frustrating the user-manager. This can be called “**ten-minute syndrome**” where sufficient time has not been spent between the user-manager and the computer professional to get all the needs clearly conveyed and understood.

A situation arose where during examination processing grace marks had to be allocated by way of moderation. Computer professionals allocated grace marks to all students which results in glaring anomalies where some top ranking students secured more than 100 percent marks by virtue of additional grace marks. Obviously, the controller of examinations had not explained properly the mystique of grace marks to the computer professionals!

4.6. Reliance on Service Bureaus or Computer Vendors:

Quite often, Indian user-manager is approached by computer vendors who brain washes the management into buying a system, indicating that the system has all the solutions to the managerial problems. The end-results is that either the user gets a system which is too large for him or her with a lot of computer “fat” or gets inadequate computing power for his or her needs.

Ross suggests that there should not be any technical romance with the computer vendor but a return on investment (RIO) approach to expenditure. Further, the user-manager should operate with a master plan, rather than react to the vendor’s suggestions. There have been cases where an organization had appointed a service bureau for a large sum of money to develop a corporate **MIS**. After spending a year as a couple of lakhs of rupees, the user-organization was thoroughly dissatisfied with the recommendations of the service bureau and did not implement it.

4.7. Lack of Master Plan:

The bulk of computer failures are due to the lack of master plans which hardware acquisition, software development and individual **MIS** design can be related. Without such a plan, “island of mechanization” results with little integration between separate systems. We can cite two successful cases in this regard. The TISCO studied the interface of various systems like production planning and control system, financial control system, and sales invoking and order processing system. It was observed that if individual systems were developed with out regard to their mutual interfaces, the result would be an absence of communication between the systems and the incompatibility of the systems would prevail throughout the company. This was prevented by building up sufficient linkages among these systems and developing an integrated approach was also adopted by TELCO with encouraging results.

4.8. Organization of the MIS Function:

Since clerical systems came first involving accounting, pay roll, inventory returns and similar financial jobs, the transaction processing system developed around all of them. Following the normal principle of assigning a service activity by “familiarity”, the historical trend in India has been to assign the computer to the Controller of Finance or Chief Accountant. This has been the case in many sectors. Only now the situation is being reversed, MIS function has been placed under the user-manager.

With more distributed processing becoming possible, the trend has been to place computer-aided decision-making where it belongs, mainly under the user-manager with his or her own computing power. Already, the personal computers (PCs) have made this trend possible in practice, with individual databases available to the users. Similarly terminals are available to most important users to share central computing power. In both cases, all PCs as well as terminals, the control of the computer-aided activity has to remain with the user-manager.

4.9. Lack of Good Management System:

It is imperative for successful corporate MIS on computer that there is good planning and control within the framework of an efficient organizational structure. No degree of sophistication with computer can cure the basic ill of chaotic data management.

There have been many organizations where computerization has not brought any tangible improvements because there has been no systematic handling of data or attention paid to the data management. In such cases, there would have been considerable gain by first conducting a good Organization and Method (O&M) study. MIS has to be built on top by a management system which should include the organizational arrangements, the structure and procedures for adequate planning and control, the clear establishment of objective, and all other manifestations of good organization in management.

It is interesting to note that good computer professionals know their craft but are simply not oriented towards managerial jobs. In other words, the road-based skills, which are necessary to function both in the computer room and in meeting with user-manager for the MIS, are conspicuous by their absence. This phenomenon has been known globally and that is why computer professionals are often called “machine-mesmerized”, where they are more loyal to their profession than to their organization.

4.10. Managerial Participation:

The single most critical problem in effective computer utilization is the need for understanding and support from top management. Even after top management support is ensured, it is necessary that there is user participation in the design phase on corporate MIS so as to avoid subsequent extensive and time-consuming re-work. This can be called overnight syndrome where users spell out their needs and expect the computer professionals to deliver the outputs immediately thereafter. Converting jobs eventually for computerization needs a stabilization period, which is all too easily forgotten.

It makes good sense, when the user-manager picks up minimum familiarity with the MIS at the beginning. From the point of view of the Organization, corporate MIS is as much a vital part of the operation as marketing operations and finance are today. Indian Airlines, too, discovered that manager

had to be involved in order to get better and more effective information systems by virtue of their participation. A similar approach is being followed in many other organizations.

4.11. Failure Of Identify Information Needs:

A clear identification of information needs is fundamental and necessary to go for design of a corporate MIS. Recently, a Central Government department spent lavish sums on hardware and software to perpetuate the existing 53 MIS reports and to build a sophisticated data-bank without first determining the real information needs of management. It is often forgotten that only that information should go into the corporate MIS which can increase the perfection of managers in critical areas such as problems, alternatives, opportunities and plans.

It is the user-manager who is to provide the specification for what he or she wants out of his or her corporate MIS. If the manger fails to do so, the computer professional by default would provide his or her own objectives and own information needs. These would seldom meet the needs of the user-manager.

4.12. Poor System Prior to Computerization:

It has been observed that computerization of a poor system will merely increase inefficiency at an accelerating rate. The user-manager gets irreverent or bad information faster and the bad decisions are made sooner!

Hindustan Zinc Ltd., for instance, planned to upgrade and improve their transaction-processing system in a methodical manner. Such clerical systems as ledger accounting were to be upgrade to financial planning. Invoking to sales analysis; inventory accounting to inventory management; and production reports to production planning and control. Well established helped them to make a smooth transaction.

4.13. Overlooking Human Acceptance:

A new MIS quite often meets resistance from the user-organization because people do not accept what they do not understand. Such reasons for resistance have to be analyzed and a new attitude brought in to overcome it. **Ross** identified the reasons as threat to the status of the salesmen; threat to the ego of the manager; economic threat to the critical person (fear of job loss), insecurity for the manager having personal power and political base; loss of autonomy and control for the production manager and engineers; and frayed and inter-personal relations for all others.

A number of public and private sector organization such as BHEL, Indian Airlines, ITDC, NTPC, etc. have started a process of systematic programme of training and user-education. It is imperative that such education begins at the top level for computer appreciation, at the middle management for specific computer applications in their own domains, and at the working level for direct involvement in input and output quality control. It is good to see the bulk of Indian organization going through such an elaborate process of computer initiation as there is no shortcut to it.

4.14. Summary

This unit takes into account the various aspects of information handling through computerization. It goes on to discuss the role of computers in decision-making processes.

Computerized MIS cannot technically make a decision but it can yield processed data and follow instructions to the extent of its capacity.

The important stage of organizing MIS at the corporate level is to build up comprehensive database from TPS for the clerical systems.

It is imperative for successful corporate MIS on computer that there is good planning and control within the framework of an efficient organizational structure. No degree of sophistication with computer can cure the basic ill of chaotic data management.

It is the user-manager who is to provide the specification for what he or she wants out of his or her corporate **MIS**. If the manager fails to do so, the computer professional by default would provide his or her own objectives and own information needs. These would seldom meet the needs of the user-manager.

4.15. Technical Terms

MIS : Management Information System.

EDP : Electronic Data Processing

O&M : Organization and Method

ROI : Return on Investment

4.16. Model Questions

1. Explain some advantages of Computer Basic Managerial Decision Making.
2. Explain principles used for evaluating raw data for decision making
3. Explain the points consider before changing to computer aided decision making.
4. Explain advantages of computerization with one example.

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Lesson 5: Introduction to Computers and Evolution of Computers

Objectives

The objectives of this lesson are:

- Initially what actually a computer and its evolution.
- The evolution of computer through five generations.

Structure of the Lesson:

- 5.1. Introduction
- 5.2. Characteristics of computers
- 5.3. Limitations of computers
- 5.4. Components of computer system
- 5.5. Advantages of computers
- 5.6. Evolution of computers
- 5.7. Summary
- 5.8. Technical Terms
- 5.9. Model Questions
- 5.10. References

5.1. Introduction

The history of computers is very old. It starts from the day man learns counting on the fingers. Many discoveries and inventions have contributed to the development of the machine known today as computer.

The hardware of a modern digital computer is largely a collection of electronic switches. An electronic switch which may be defined as has only two positions, close position and open position these electronic switches are used to represent as well as control the routing of data elements called binary digits (bit).

5.2. Characteristics of Computers

Computers are becoming popular day by day because of their continuously increasing power and its usefulness. The following are some of its characteristics.

Accuracy: Computers always produce correct calculations. If mistake occurs in any calculation, they are due to human errors like entering wrong data or incorrect instruction.

Speed: Computers can carry out instructions in less than one millionth of a second.

Versatility: Computer can perform any type of work.

Storage Capacity: Computers have the capability to store large amounts of instructions and data. When we ask for data it supplies the stored information to us.

Repetitiveness: Computers are capable of performing any task given to them repeatedly.

5.3. Limitations of Computers

Lack of commonsense: Computer is only a tool. It cannot think. It does not have commonsense or intelligence of its own. Computer acts like a human up to some extent.

Inability to correct: A computer cannot correct wrong instructions by itself.

Dependence on human instructions: A computer cannot generate any information on its own. We must give the correct instructions

5.4. Components of Computer System:

Basically a computer system has three main components. These three components are constituted by various components and to make them functional, many components and system devices are necessary.

The three basic components and how are they linked in a computer system shown in figure 5.1. These components are as follows.

Central Processing Unit (CPU) : This is responsible to control overall operation of a computer system. This consists of one or more high speed registers, the Arithmetic Logic Unit (ALU) and the circuitry necessary to perform bus control. The CPU decides the speed of a system and kind of software it can do. It determines how much memory the system can address, and its data width. Some of the CPU used in the present systems are 8088, 8086,80286,80386,80486 and Pentium, etc.

Control Unit (CU) : The control unit is the circuitry that controls the flow of information through the processor and coordinates the activities of the other units within it. It also controls transfer of data between CPU and Memory and CPU and I/Devices.

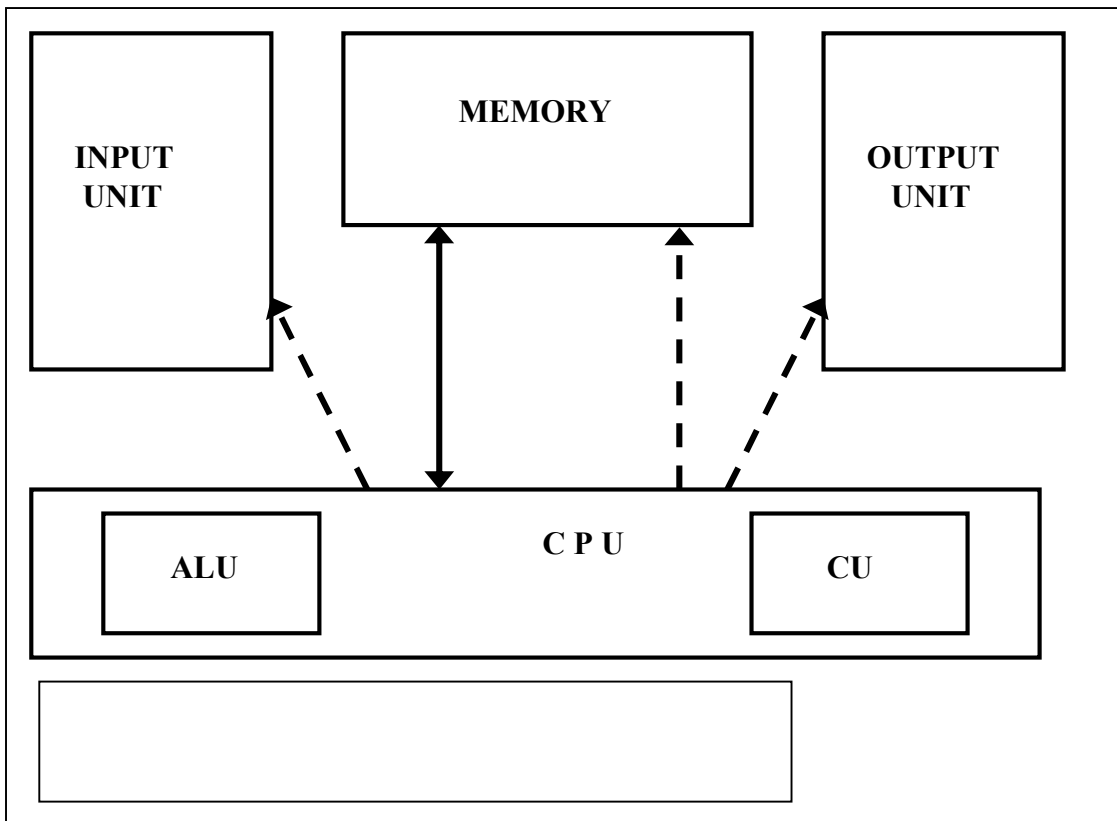


Figure 5.1 Block Diagram Of a Computer

DATA FLOW _____

CONTROL LINES - - - - -

Memory Unit (MU) : It is used to store the data and programs. Intermediate results are also stored in the memory. A computer system uses various types of memory as semiconductor memories, floppy disk, hard Disk and CD-ROM, etc. Different address schemes and memory controllers are in use.

Input/Output Unit : This unit communicate with the out side world, the input unit allows the instructions and Data to be fed into the machine. Keyboard is the input unit and without which system has no utilities. The output unit communicates to users in the results of processing and allows orderly exchange of information to take place. The most common output devices are monitors and printers.

5.5. Advantages of Computers

- High rate of processing speed with reliability.
- Huge volumes of data item can be stored in the memory and any particular data item can be retrieved at random in a fraction of a second.
- Solution of a much-complicated problem is feasible at a greater speed.
- Processing of voluminous data saves a good lot of clerical labor, which in turn reduces the processing cost.
- Performs operations efficiently even in environments inaccessible to humans, such as furnace, poisonous atmosphere, vacuum, unmanned satellite etc.

5.6. Evolution of Computers:

A generation refers to the state of improvement in the development of a product. This term is also used in the different advancements of computer technology. With each new generation, the circuitry has gotten smaller and more advanced than the previous generation before it. As a result of the **miniaturization**, **speed**, **power**, and **memory** of computers have proportionally increased. New discoveries are constantly being developed that affect the way we live, work and play.

They are five Generations

First Generation - 1946-1958: Vacuum Tubes

Second Generation - 1959-1964: Transistors

Third Generation - 1965-1970: Integrated Circuits

Fourth Generation - 1970-Present: Microprocessors

Fifth Generation - Present and Beyond: Artificial Intelligence

The First Generation: 1946-1958 (The Vacuum Tube Years)



Figure 5.2 Vacuum Tube

The first generation computers were huge, slow, expensive, and often undependable. In 1946 two Americans, Presper Eckert, and John Mauchly built the ENIAC electronic computer which used vacuum tubes instead of the mechanical switches of the Mark I as shown in figure 5.2. The ENIAC used thousands of vacuum tubes, which took up a lot of space and gave off a great deal of heat just like light bulbs do. The ENIAC led to other vacuum tube type computers like the EDVAC (Electronic Discrete Variable Automatic Computer) and the UNIVAC I (Universal Automatic Computer).

The vacuum tube was an extremely important step in the advancement of computers. Vacuum tubes were invented the same time the **light bulb** was invented by Thomas Edison and worked very similar to light bulbs. Its purpose was to act like an **amplifier** and a **switch**. Without any moving parts, vacuum tubes could take very weak signals and make the signal stronger (**amplify it**). Vacuum tubes could also stop and start the flow of electricity instantly (**switch**). These two properties made the ENIAC computer possible.

The ENIAC gave off so much **heat** that they had to be cooled by gigantic air conditioners. However even with these huge coolers, vacuum tubes still overheated regularly. It was time for something new.

The Second Generation: 1959-1964 (The Era of the Transistor)

The transistor computer did not last as long as the vacuum tube computer lasted, but it was no less important in the advancement of computer technology. In 1947 three scientists, **John Bardeen**, **William Shockley**, and **Walter Brattain** working at AT&T's **Bell Labs** invented what would replace the vacuum tube forever. This invention was the **transistor** as shown in figure 5.3 which functions like a vacuum tube in that it can be used to relay and switch electronic signals.

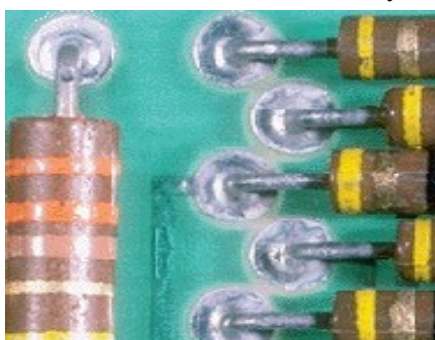


Figure 5.3 Era of the Transistor

There were obvious differences between the transistor and the vacuum tube. The transistor was faster, more reliable, smaller, and much cheaper to build than a vacuum tube. One transistor replaced the equivalent of 40 vacuum tubes. These transistors were made of solid material, some of which is **silicon**, an abundant element (second only to oxygen) found in beach sand and glass. Therefore they were very cheap to produce. Transistors were found to **conduct electricity faster and better** than vacuum tubes. They were also much **smaller** and gave off virtually **no heat** compared to vacuum tubes. Their use marked a new beginning for the computer. Without this invention, space travel in the 1960's would not have been possible. However, a new invention would even further advance our ability to use computers.

The Third Generation: 1965-1970 (Integrated Circuits - Miniaturizing the Computer)

Transistors were a tremendous breakthrough in advancing the computer. However no one could predict that thousands even now millions of transistors (circuits) could be compacted in such a small space. The integrated circuit, or as it is sometimes referred to as semiconductor chip, packs a huge number of transistors onto a single wafer of silicon as shown in Figure 5.4. Robert Noyce of Fairchild Corporation and Jack Kilby of Texas Instruments independently discovered the amazing attributes of integrated circuits. Placing such large numbers of transistors on a single chip vastly increased the power of a single computer and lowered its cost considerably.



Figure 5.4 Integrated Circuits

Since the invention of integrated circuits, the number of transistors that can be placed on a single chip has doubled every two years, shrinking both the size and cost of computers even further and further enhancing its power. Most electronic devices today use some form of integrated circuits placed on printed circuit boards-- thin pieces of bakelite or fiberglass that have electrical connections etched onto them -- sometimes called a mother board.

These third generation computers could carry out instructions in billionths of a second. The size of these machines dropped to the size of small file cabinets. Yet, the single biggest advancement in the computer era was yet to be discovered.

The Fourth Generation: 1971-Today (The Microprocessor)

This generation can be characterized by both the jump to **monolithic integrated circuits** (**millions of transistors** put onto one integrated circuit chip) and the invention of the **microprocessor** (*a single chip that could do all the processing of a full-scale computer*). By putting millions of transistors onto one single chip more calculation and faster speeds could be reached by computers which is shown in Figure 5.5. Because electricity travels about a foot in a billionth of a second, the smaller the distance the greater the speed of computers.

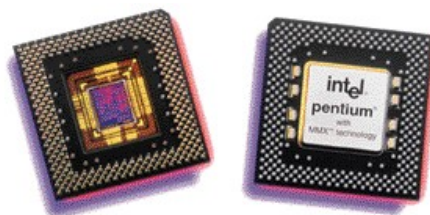


Figure 5.5 Microprocessor

However what really triggered the tremendous growth of computers and its significant impact on our lives is the invention of the **microprocessor**. **Ted Hoff**, employed by **Intel (Robert Noyce's new company)** invented a chip the size of a pencil eraser that could do all the computing and logic work of a computer. The microprocessor was made to be used in calculators, not computers. It led, however, to the invention of personal computers, or microcomputers

Fifth Generation - Present and Beyond: Artificial Intelligence

Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.

Computer storage, or **computer memory**, refers to the computer components, devices and recording media that retain binary information for some interval of time. In casual language, *memory* usually refers to forms of storage which are fast, but lose their contents in a case of power loss, and *storage* refers to forms of storage which are slower, but suitable for long-term retention.

In a home computer, storage will usually take the form of random access memory to store the computer programs that are currently running and the documents that are being worked on, a hard disk to store the programs that are not running and the documents that are not worked on at the moment, and a removable media to store purchased programs and archived documents.

5.7. Summary

Computer is a fast electronic data processing machine which accepts data processes it and returns processed information as output.

Some basic operations that a computer perform.

- Input devices allow data and instructions or commands to be entered into the system.
- A means of storing instructions and data.
- A central processing unit (CPU) which controls the processing.
- A means of returning the processed information in the form of output.

The Generations of Computers:

First Generation - 1946-1958: Vacuum Tubes

Second Generation - 1959-1964: Transistors

Third Generation - 1965-1970: Integrated Circuits

Fourth Generation - 1970-Present: Microprocessors

Fifth Generation - Present and Beyond: Artificial Intelligence

5.8. Technical Terms

Bit : Stands for binary digit. The smallest piece of computer information, either the digit 0 or 1.

Binary code: The most basic language a computer understands, it is composed of a series of 0s and 1s.

Program : A series of instructions written in a computer language that tells the computer what to do and how to do it.

I/O : Transfer of data into a computer, and from the computer to the outside world.

Integrated Circuit : Electric circuits that can store million of bits of information.

Microprocessor: A complete central processing unit (CPU) contained on a single silicon chip.

5.9. Model Questions

1. What is a computer? Explain the characteristics of a computer ?
2. What are the major limitations of a computer?
3. Explain Generations of computers?
4. Explain the function of various units in the block diagram?

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Lesson 6: Computer Hardware and Software

Objectives

- To know about input and output devices.
- To know the function of memory and different kinds of memory.
- To understand different types of software.
- To know about different types of translators.

Structure of the Lesson:

6.1. Purposes of storage

6.1.1. Primary storage

6.1.2. Secondary, tertiary and off-line storage

6.1.3. Network storage

6.2. Characteristics of storage

6.2.1 Volatility of information

6.2.2 Ability to access non-contiguous information

6.2.3 Ability to change information

6.2.4 Addressability of information

6.2.5 Capacity and performance

6.3. Technologies, devices and media

6.3.1 Magnetic storage

6.3.2 Semiconductor storage

6.3.3 Optical disc storage

6.3.4 Magneto-optical disc storage

6.4. Computer Software

6.4.1. Language Translators

6.4.2. Operating Systems

6.4.3. Utilities

6.4.4. Special Purpose Software

6.5. Summary

6.6. Technical Terms

6.7. Model Questions

6.8. References

6.1. Purposes of Storage:

The fundamental components of a general-purpose computer are arithmetic and logic unit, control circuitry, storage space, and input/output devices. If storage was removed, the device we had would be a simple calculator instead of a computer. The ability to store instructions that form a computer program, and the information that the instructions manipulate is what makes stored program architecture computers versatile.

Digital computer represents all information using the binary numeral system. Text, numbers, pictures, audio, and nearly any other form of information can be converted into a string of bits, or binary digits, each of which has a value of 1 or 0. A piece of information can be manipulated by any computer whose storage space is large enough to accommodate the corresponding **data**, or *the binary representation of the piece of information*. For example, a computer with a storage space of eight million bits, or one megabyte, could be used to edit a small novel.

Various forms of storage, based on various natural phenomena, have been invented. So far, no practical universal storage medium exists, and all forms of storage have some drawbacks. Therefore a computer system usually contains several kinds of storage, each with an individual purpose.

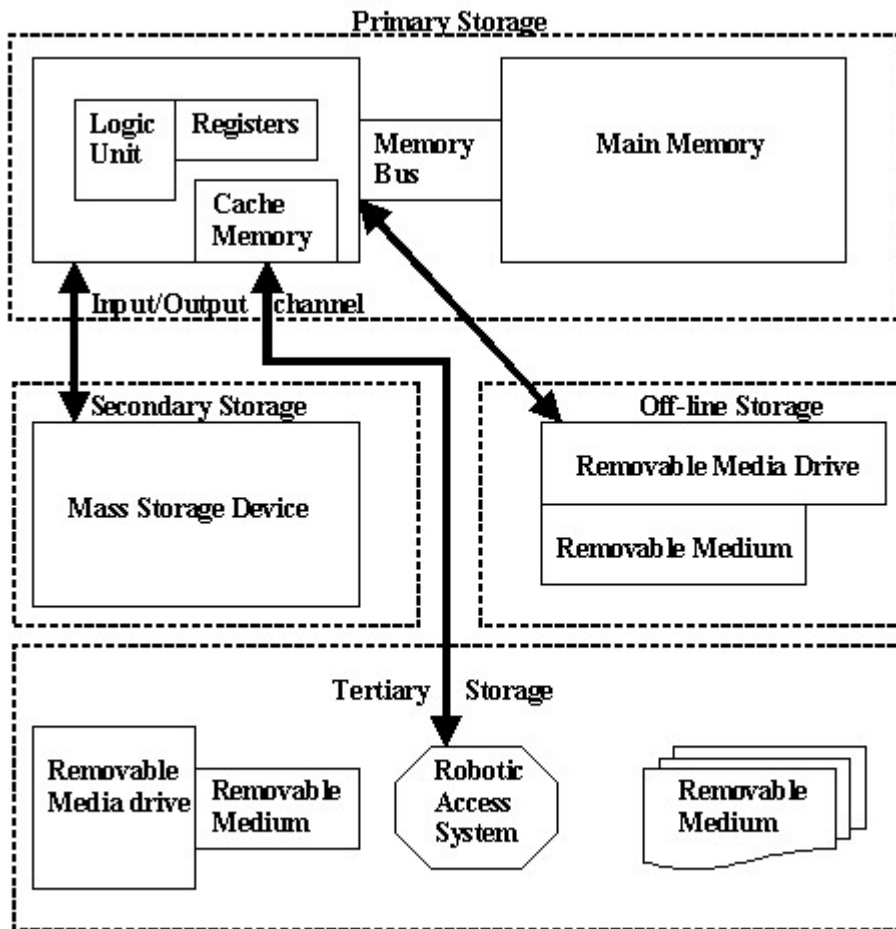


Figure 6.1 Primary Storage

6.1.1. Primary Storage:

Primary storage can be directly accessed by the central processing unit of the computer. Primary storage typically consists of three kinds of storage as shown in figure 6.1.

Processor registers are internal to the central processing unit. Registers contain information that the arithmetic and logic unit needs to carry out current instruction. Main storage contains the programs that are currently being run and the data the programs are operating on. The arithmetic and logic unit can quickly transfer information between a processor register and a location in main storage. In modern computers, random access memory is used for main storage. When people refer to computer memory, they usually mean main storage. Processor cache is a special class of storage used by some central processing units. Some of the information in the main storage is duplicated in the processor cache, which is slightly slower but of much higher capacity than processor registers, and significantly faster than main storage.

6.1.2. Secondary, Tertiary and Off-line storage:

Secondary Storage requires the computer to use its input/output channels to access the information, and is used for long-term storage of persistent information. Secondary storage is typically of higher capacity than primary storage, but it is usually also much slower. In modern computers, hard disks are usually used for this purpose.

Tertiary Storage is a system where a robotic arm will handle off-line storage media (see next item) according to computer's commands. Tertiary storage is used in the realms of enterprise storage and scientific computing, and is something a typical computer user never sees firsthand.

Off-line Storage is a system where the storage medium can be easily removed from the storage device. Off-line storage is used for data transfer and archival purposes. In modern computers, and optical discs are often used for off-line storage.

6.1.3. Network Storage:

Network Storage is any type of computer storage that involves accessing information over a computer network. Network storage arguably allows to centralize the information management in an organization, and to reduce the duplication of information. Network storage includes:

- **Network-attached Storage** is secondary or tertiary storage attached to a computer which another computer can access over a local-area network, a private wide-area network, or in the case of online file storage, over the Internet.
- **Network Computers** are computers that do not contain internal secondary storage devices. Instead, documents and other data are stored on a network-attached storage.

Confusingly, these terms are sometimes used differently. **Primary Storage** can be used to refer to local random-access disk storage, which should properly be called secondary storage. If this type of storage is called primary storage, then the term **secondary storage** would refer to offline, sequential-access storage like tape media.

6.2. Characteristics of Storage:

The division to primary, secondary, tertiary and off-line storage is based on memory hierarchy, or distance from the central processing unit. There are also other ways to characterize various types of storage.

6.2.1 Volatility of Information:

- **Volatile Memory** requires constant power to maintain the stored information. Volatile memory is typically used only for primary storage.
- **Non-volatile memory** will retain the stored information even if it is not constantly supplied with electric power. It is suitable for long-term storage of information, and therefore used for secondary, tertiary, and off-line storage.
- **Dynamic memory** is volatile memory which also requires that stored information is periodically *refreshed*, or read and rewritten without modifications.

6.2.2 Ability to access non-contiguous information:

- **Random access** means that any location in storage can be accessed at any moment in the same, usually small, amount of time. This makes random access memory well suited for primary storage.
- **Sequential access** means that the accessing a piece of information will take a varying amount of time, depending on which piece of information was accessed last. The device may need to *seek* (e.g. to position the read/write head correctly), or *cycle* (e.g. to wait for the correct location in a constantly revolving medium to appear below the read/write head).

6.2.3 Ability to change information:

- **Read/write storage**, or **mutable storage**, allows information to be overwritten at any time. A computer without some amount of read/write storage for primary storage purposes would be useless for many tasks. Modern computers typically use read/write storage also for secondary storage.
- **Read only storage** retains the information stored at the time of manufacture, and **write once storage** (WORM) allows the information to be written only once at some point after manufacture. These are called **immutable storage**. Immutable storage is used for tertiary and off-line storage. Examples include CD-R.
- **Slow write, fast read storage** is read/write storage which allows information to be overwritten multiple times, but with the write operation being much slower than the read operation. Examples include CD-RW.

6.2.4 Addressability of information:

- Provides the file system abstraction to make the operation more understandable. In modern computers, secondary, tertiary and off-line storage use file systems. In **location-addressable storage**, each individually accessible unit of information in storage is selected with its numerical memory address. In modern computers, location-addressable storage usually limits to primary storage, accessed internally by computer programs, since location-addressability is very efficient, but burdensome for humans.
- In **file system storage**, information is divided into *files* of variable length, and a particular file is selected with human-readable directory and file names. The underlying device is still location-addressable, but the operating system of a computer
- is In **content-addressable storage**, each individually accessible unit of information selected with a hash value, or a short identifier with no pertaining to the memory address the information is stored on. Content-addressable storage can be implemented using software (computer program) or hardware (computer device), with hardware being faster but more expensive option.

6.2.5 Capacity and performance:

- **Storage capacity** is the total amount of stored information that a storage device or medium can hold. It is expressed as a quantity of bits or bytes (e.g. 10.4 megabytes).
- **Storage density** refers to the compactness of stored information. It is the storage capacity of a medium divided with a unit of length, area or volume (e.g. 1.2 megabytes per square centimeter).
- **Latency** is the time it takes to access a particular location in storage. The relevant unit of measurement is typically nanosecond for primary storage, millisecond for secondary storage, and second for tertiary storage. It may make sense to separate *read latency* and *write latency*, and in case of sequential access storage, *minimum*, *maximum* and *average latency*.
- **Throughput** is the rate at which information can read from or written to the storage. In computer storage, throughput is usually expressed in terms of *megabytes per second* or *MB/s*, though bit rate may also be used. As with latency, *read rate* and *write rate* may need to be differentiated.

6.3. Technologies, Devices and Media:

6.3.1 Magnetic Storage:

Magnetic storage uses different patterns of magnetization on a magnetically coated surface to store information. Magnetic storage is *non-volatile*. The information is accessed using one or more read/write heads. Since the read/write head only covers a part of the surface, magnetic storage is *sequential access* and must seek, cycle or both. In modern computers, the magnetic surface will take these forms:

- Magnetic disk
- Floppy disk, used for off-line storage
- Hard disk, used for secondary storage
- Magnetic tape, used for tertiary and off-line storage

In early computers, magnetic storage was also used for primary storage in a form of magnetic drum, or core memory, core rope memory, thin film memory, twister memory or bubble memory. Also unlike today, magnetic tape was often used for secondary storage.

6.3.2 Semiconductor storage:

Semiconductor memory uses semiconductor-based integrated circuits to store information. A semiconductor memory chip may contain millions of tiny transistors or capacitors. Both *volatile* and *non-volatile* forms of semiconductor memory exist. In modern computers, primary storage almost exclusively consists of dynamic volatile semiconductor memory or dynamic random access memory. Since the turn of the century, a type of non-volatile semiconductor memory known as flash memory has steadily gained share as off-line storage for home computers. Non-volatile semiconductor memory is also used for secondary storage in various advanced electronic devices and specialized computers.

6.3.3 Optical disc storage:

Optical disc storage uses tiny pits etched on the surface of a circular disc to store information, and reads this information by illuminating the surface with a laser diode and observing the reflection. Optical disc storage is *non-volatile* and *sequential access*. The following forms are currently in common use:

- CD, CD-ROM, DVD: Read only storage, used for mass distribution of digital information (music, video, computer programs)
- CD-R, DVD-R, DVD+R: Write once storage, used for tertiary and off-line storage
- CD-RW, DVD-RW, DVD+RW, DVD-RAM: Slow write, fast read storage, used for tertiary and off-line storage

6.3.4 Magneto-optical disc storage:

Magneto-optical disc storage is optical disc storage where the magnetic state on a ferromagnetic surface stored information. The information is read optically and written by combining magnetic and optical methods. Magneto-optical disc storage is *non-volatile*, *sequential access*, slow write, fast read storage used for tertiary and off-line storage.

6.4. Computer Software:

Computer software consists of sets of programmed instructions which enable the hardware events to perform .Programming a computer to perform has always been a very difficult task. The first electronic computer was programmed using wired panels. Today computers are programmed using software.

Computer software can be broadly classified into two categories –System software and Application software .System software is a set of instructions to the machine hardware to interpret and execute application software. An application software is a set of programming instructions for specific applications like payroll accounting, inventory control ,etc .A system software consists of language translators (called compilers, interpreters) and assemblers, operating systems, utilities and special purpose software.

6.4.1. Language Translators:

A language Translator is system software which will translate a computer programme written by humans into a machine understandable form.

The most essential form of programming uses only the binary digits 0,1 which is directly understood by the electronic circuits. A programme written using only binary digits is called a machine language programme.

Assembly language provided a significant improvement over machine language. Assembly language programmes are written using mnemonic codes like ADD, STORE, etc rather than their machine language representations in binary digits. Therefore, Programming in assembly language is easier. However, it needs to be translated into machine language codes. This translation is done by an assembler. Both machine language and assembly language programmes are machine dependent. This means that a programme written for one machine cannot be used in another machine.

High level languages, which are closer to English, overcame the drawback of machine dependence. A few high level languages are FORTRAN, BASIC, PASCAL, COBOL, etc.

These languages relieve the programmers from being machine specific. However, a programme written in a high level language needs to be translated into machine language codes before execution. This translation is done either through compilers or through interpreters. A compiler is a translator which reads an entire programme written in a high level language and converts it into machine language code. An interpreter on the other hand, is a translator which interprets statement by statement, any programme written in a high level language. An interpreter is very effective tool for programme development as it checks for errors statement by statement in an interactive mode. This allows the programmer to correct errors statement by statement as he or she enters them. A compiler on the other hand, will request user to enter the entire programming statement and then it will check for errors. Basic Language provides a compiler and an interpreter other languages such as FORTRAN, COBOL and PASCAL had only compiler initially.

6.4.2. Operating Systems:

An operating system is the most important system software and is required to operate a computer system. An operating system manages a computers resources very efficiently, takes care of scheduling multiple jobs for execution and manages the flow of data and instructions between the input/output units and the main memory.

Operating systems became a part of computer software with the second generation computers. Since then operating systems have undergone several revisions and modification in order to achieve a better utilization of computer resources. Advances in the field of computer hardware have also helped the development of more efficient operating systems.

The first operating system called batch processing system was developed for the second generation computer. This operating system executes jobs serially one after another from a batch of jobs submitted for execution. The central processing unit is kept busy only during the processing cycle of a job and it idles during the input & output operations.

The above drawback of idling the CPU was overcome with the introduction of overlapped processing. For example; why not take up input operations of job 2 and the output operation of job 1 simultaneously? This and similar considerations gave rise to the concept of multi-programming .A multi-programming operating system handles multiple jobs simultaneously by overlapping the input, output and processing cycles of various jobs.

The operating system was introduced along with third generation computer and is still very popular. It has replaced the earlier batch processing operating system, with multiprogramming a CPU utilization is increased and hence jobs get executed faster on an average. However, a multiprogramming operating system is more complex than a batch processing operating system and hence it requires more powerful hardware to support it.

Other types of operating systems which are popular today are multiprocessing operating systems and real-time operating systems. A multiprocessing operating system uses multiple CPU's to process multiple jobs. A real time operating system is a very different type of operating system, because it is used for different type of applications, i.e., real time applications such as airlines reservations, process control, etc. A very commonly used and popular operating system is MS-DOS.

6.4.3. Utilities:

Utility programmes are those which are very often requested by many application programmes. A few examples are:

1. SORT/MERGE for sorting large volumes of data and merging them into a single sorted list.
2. Transfer programmes for transforming contents from one medium to another e.g., disk to tape, tape to disk, etc.

6.4.4. Special Purpose Software:

Special purpose programmers are those intended to extend the capability of operating systems to provide specialized services to application programmers.

A few examples are:

1. Spread sheet, software like LOTUS, etc.
2. Data management software likes dBase III, DBMS, etc.

6.5. Summary

Primary storage can be directly accessed by the central processing unit of the computer. Primary storage typically consists of three kinds of storage:

Secondary Storage requires the computer to use its input/output channels to access the information, and is used for long-term storage of persistent information. Secondary storage is typically of higher capacity than primary storage.

Magnetic storage uses different patterns of magnetization on a magnetically coated surface to store information.

Computer software consists of sets of programmed instructions which enable the hardware events to perform .Programming a computer to perform has always been a very difficult task.

Operating System : It is the most important system software and is required to operate a computer system. An operating system manages a computers resources very efficiently, takes care of scheduling

multiple jobs for execution and manages the flow of data and instructions between the input/output units and the main memory.

6.6. Technical Terms

Hardware : It is a physical component

Computer Software : It consists of sets of programmed instructions which enable the hardware events to perform .

Operating System : It is the most important system software and is required to operate a computer system. An operating system manages a computers resources very efficiently, takes care of scheduling multiple jobs for execution and manages the flow of data and instructions between the input/output units and the main memory.

Translator : It is system software which will translate a computer programme written by humans into a machine understandable form.

Assembly language : These programmes are written using mnemonic codes like ADD, STORE, etc rather than their machine language representations in binary digits. Therefore, Programming in assembly language

6.7. Model Questions

- 1.What is the purpose of Storage?
- 2.Explain the characteristics of Storage?
- 3.What is memory? Explain different types of memories?
- 4.Explain different computer software with one examples?
- 5.What do you understand by computer hardware and computer software?

6.8. References

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Lesson 7: Classification of Computers & Application Software

Objectives

The objective of this lesson:

- Classification of computers
 - Know the most common types of software used for management applications on personal computers.
 -
-

Structure of the Lesson:

- 7.1. Classification of Computers
 - 7.2. Application Software
 - 7.2.1. Database Management
 - 7.2.2. Word Processing
 - 7.2.3. Electronic spread sheets
 - 7.2.4. Business graphics software
 - 7.2.5. Data communications software
 - 7.2.6. Statistical packages
 - 7.2.7. Integrated software
 - 7.3. Summary
 - 7.4. Technical Terms
 - 7.5. Model Questions
 - 7.6. References
-

7.1. Classification of Computers:

Computers can be classified in to two categories: Analog and Digital computer

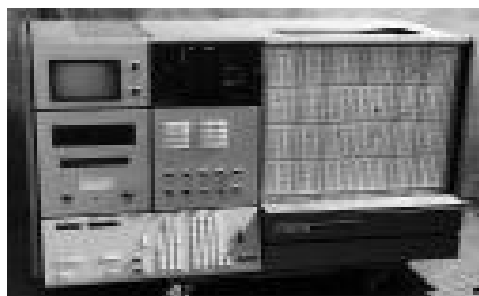


Figure 7.1 Analog Computer

Analog Computers operate by measuring rather than counting. These computers use signals as input, which can come from devices like speedometers, thermometers etc..... as shown in figure 7.1. These signals are continuous flow of physical quantities like speed, temperature, pressure etc.. Analog computers have only limited memory facility and are restricted in the type of calculations it can perform.

A digital computer represents data in the form of digits and all operations are done on these digits at extremely fast rates. Digital computers basically know how to count the digits. These computers are mostly used in engineering and scientific calculations as shown in figure 7.2. Digital watches are good example of a digital computer



Figure 7.2 Digital Computer

Digital computers are divided into the following categories.

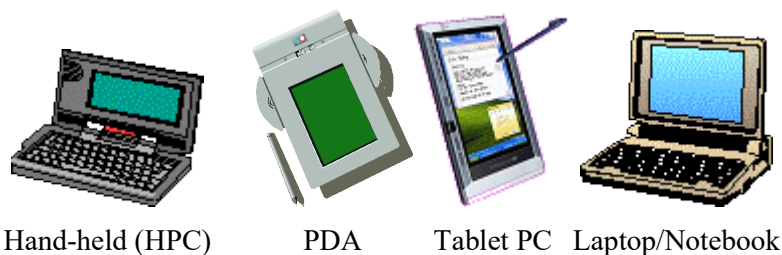
- Personal or Micro
- Mainframe
- Supercomputers
- Mini computers

Personal or Micro Computers

Computers for personal use come in all shapes and sizes, from tiny **PDA** (**p**ersonal **d**igital **a**ssistant) to hefty **PC** (**p**ersonal **c**omputer) towers. More specialized models are announced each week - trip planners, expense account pads, language translators...

Descriptions of Personal Computers

When talking about PC computers, most people probably think of the **desktop** type, which are designed to sit on your desk. (Bet you figured that one out!) The **tower** and the smaller mini-tower style cases have become popular as people started needing more room for extra drives inside as shown in figure 7.3. Repairmen certainly appreciate the roominess inside for all the cables and circuit boards ... and their knuckles.



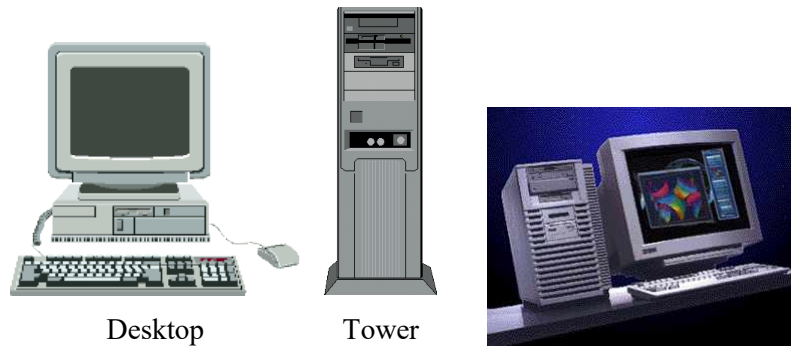


Figure 7.3 Personal Computers

A **workstation** is part of a computer network and generally would be expected to have more than a regular desktop PC of most everything, like memory, storage space, and speed.

The market for the smallest PCs is expanding rapidly. Software is becoming available for the small types of PC like the **palmtop (PPC)** and **handheld (HPC)**. This new software is based on new operating systems like Windows CE (for Consumer Electronics). You may find simplified versions of the major applications you use. One big advantage for the newer programs is the ability to link the small computers to your home or work computer and coordinate the data. So you can carry a tiny computer like a Palm Pilot around to enter new phone numbers and appointments and those great ideas you just had. Then later you can move this information to your main computer.

With a **Tablet PC** you use an electronic stylus to write on the screen, just like with a pen and paper, only your words are in **digital ink**. The Tablet PC saves your work just like you wrote it (as a picture), or you can let the Hand Recognition (HR) software turn your chicken-scratches into regular text.

Main Frame

The **main frame** is the workhorse of the business world as shown in figure 7.4. A main frame is the heart of a network of computers or terminals which allows hundreds of people to work at the same time on the same data. It requires a special environment - cold and dry.

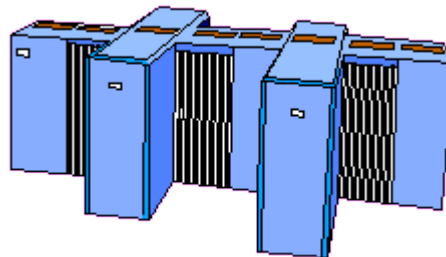


Figure 7.4 Main Frame

Supercomputers

The **supercomputer** is the top of the heap in power and expense as shown in figure 7.5. These are used for jobs that take massive amounts of calculating, like weather forecasting, engineering design and testing, serious decryption, economic forecasting, etc.

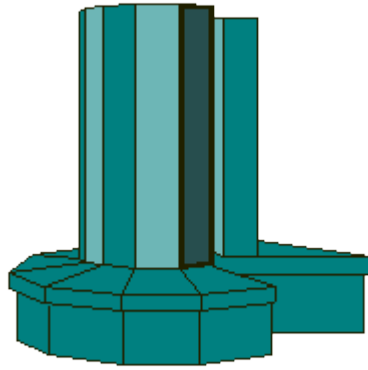


Figure 7.5 The first Cray supercomputer was introduced in 1976

Minicomputer

The **minicomputer** has become less important since the PC has gotten so powerful on its own. In fact, the ordinary new PC is much more powerful than minicomputers used to be. Originally this size was developed to handle specific tasks, like engineering and CAD calculations that tended to tie up the main frame.



Figure 7.6 Minicomputer

7.2. Application Software

Systems software available on micro-computers includes compilers and interpreters for popular programming languages like BASIC, COBOL and FORTRAN. However, because of their large numbers for personal use, powerful applications software which does not require significant programming knowledge has been developed to run on personal computers. These windows is very much preferred to other applications as it combines the uses of many applications together such as Spreadsheets, Word-processing and so on. Other than windows, the other most important categories of software, which enables a user to autonomously utilize a personal computer, are:

- Database Management Software
- Word Processing Software
- Electronic Spreadsheet
- Graphics Software
- Data Communication Software
- Statistical Packages
- Operations Research Packages
- Integrated Software

7.2.1 Database Management Software:

Software packages called database management systems (DBMS) had been developed long before micro-computers to handle the problems of maintaining and integrating large volumes of data on large machines. The most important distinguishing feature of a DBMS package on personal computers is that it provides a very high level language interface which can be learned by a user which is not a computer programmer. In a few hours it is possible to acquire enough skill to use the basic features of DBMS packages like dBASE III which is the best selling software currently in this class.

The dBASE III package has attained its current popularity mainly for the following reasons:

- It is easy to use and is simple. Its basic features can be learned in a couple of hours.
- It provides a very high level language interface which is command oriented. Some people consider it a fourth generation language. In lay man's terms, fourth generation language means it is superior to standard programming languages like BASIC, COBOL, FORTRAN and PASCAL; and it simplifies and sometimes even avoids programming in a conventional sense.
- Small business information systems can be easily implemented in a few days using this package.
- This package can be used as a tool to prototype large applications. Prototyping is useful for saving costs in implementing large applications. Parts of a large system may be implemented through dBASE III package to finalize specifications on what users want through the envisaged application and how these parts could possibly be implemented in their final form.

Like other DBMS packages, dBASE III provides features for:

- i) Creating data files on a computer.
- ii) Maintaining these data files by way of providing functions for adding, deleting, editing and updating a given set of data items.
- iii) Generating reports based on the data files created through dBASE III.
- iv) Querying on those data files.

To develop an understanding of the features provided by dBASE III package, let us take a specific application and see how it could be implemented in dBASE III. Suppose we are operating a small business house which has 1000 customers.

We are interested in maintaining a list of these customers and using this list for our day-to-day business operations. Obviously we will have to create a file which contains Data about these 1000 customers as shown in figure 7.7. In this file there will be one record for each customer. Thus, we will have a file containing 1000 records

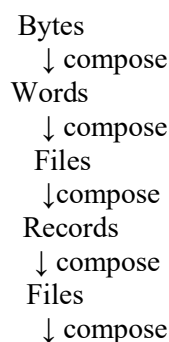


Figure 7.7: Describes the hardware of a typical personal computer system

Each record will have to contain details about a customer. What constitutes the necessary details will depend mostly on what use we want to make of this data-base. For the sake of simplicity, let us say we will have the following information for each customer.

1) Customer Identification code	CUSTID	(G 1029)
2) Customer Name	CUSTNAME	(V.K.GANDHI)
3) Address	ADDRESS	(NARAYANAN CHAMBERS, ASHRAM ROAD)
4) City	CITY	(AHMEDBAD)
5) State	STATE	(GUJARAT)
6) Pincode	PINCODE	(380009)
7) Phone Number	PHONE	(77334)
8) Amount Due	AMOUNTDUE	(5249.25)
9) Credit Limit	CRDLMT	(10000.00)

Each data item above will form a field in the record structure for the customer. When we create a customer file through dBASE III package, it will first want us to specify the record structure for the file.

For a customer file we want each record to have nine fields. One each for the items listed above. In dBASE III, it is necessary to give names to each of these nine fields so that they can be later referred to using these names. The field's names which have chosen are shown in the third column above. Apart from the name we have to also indicate what type of data will be stored in the field and in certain cases number of characters to be reserves to hold the data for that field. We will want AMOUNTDUE and CRDLMT to hold numeric and all other fields to hold text or character data.

Now let us have a quick look at a dialogue in dBASE III for creating and using such a file.

When we start the dBASE III programmatic prompts by dot (.).Also when it finishes executing a given command, it writes dot in the first column of next line on the screen.

Interaction with dBASE III package consists mainly of issuing appropriate commands against this dot prompt.

Each dBASE III command starts with key word followed by certain parameters. The command for creating a file for customer data would be

```
..... REATE CUSTLIST
```

Note the keyword CREATE which is typed by the user against the dot prompt produced by dBASE III.CREATE command wants a parameter which will be used as a name for the file so created. The user can choose any name that he or she desires within the syntactic rules specified by the package. We shall hence forth omit such minor syntactic details of the package. We shall use the symbol `<code>` to indicate enter or return key of the keyboard.

In response to CREATE command,dBASE III will provide a screen where we can enter the above nine field names along with their type characteristics.

Note that this command will have only specified the structure of the record for a file which is to contain customer data.Therefore; we should have some way of loading the customer records in the CUSTLIST file. For this purpose we will have to type the following command:

Append

With this command we get a screen which provides a blank customer record. As the name implies, this command will append a record to our CUSTLIST file. Thus, it can be used whenever we want to add one more customer list.

In the screen provided with above command, we now type the necessary details of a customer. The names of the fields are displayed on the screen to facilitate entry of data for a customer for whom we wish to create in CUSTLIST file. After we type in all the required details about the customer and type we get another blank record in which we can enter data about next customer and so on. When we type right at the beginning of a blank record we get back to dot prompt where we can issue a new dBASE III command.

Now suppose we want to close our dBASE III session and come next day to query this customer file. We must first exit from dBASE III. The command for this is

QUIT

Next let us say we want to query on the customer data for extracting different types of information. Here is a sample list to illustrate how easy it is.

TYPE	TO GET
• LIST FOR AMOUNT DUE > 5000	Details of all customers for whom amount due Greater than 5000
• LIST PHONE FOR CUSID='G1029'	Phone number of a customer whose Identification number is 'G1029'
• LIST CUSTNAME, ADDRESS FOR CITY='MUMBAI'	Name and address of all customers from Mumbai
• LIST FOR AMOUNT DUE > CRDLMT	Details of all customers who have crossed Their Credit limit
• LIST FOR 'SHAH'\$CUSTNAME	Customers who have a character string in Their names. Note that this will list not only SHAH but also customers like SHAHNAZ

We have seen that just with five commands we can do a lot with dBase III package. Below are a few commands which further illustrate the simplicity of dBase III package.

TYPE	TO GET
• AVERAGE AMOUNT DUE	Will provide on the screen average Amount that is due from the customers.
• COUNT FOR AMOUNT DUE > CRDLMT	Will show on screen a number Indicating how many customers have crossed the credit limit.
• SUM AMOUNT DUE FOR CITY = 'MUMBAI'	Will give how much amount is due From customers from Mumbai

One has learn only few additional features to see how sales and receipt transactions can be used. To update amount due for each customer. The dBASE III package also has REPORT command for producing user specified reports.

With the command verbs, dBASE III also provides conventional programming features like IF-THEN-ELSE,WHILE –DO.A complete set of dBASE III programs can be designed to implement a medium sized application in a couple of weeks.

7.2.2 Word Processing:

Word processing software is designed to enable the user to prepare typed documents. Thus, in contrast to data processing where the focus is generally on numerical data, in word processing the main concern is with text. In early days of computing a disparaging remark that computer professionals employed to refer to an application system which did very little computing was to say that the system used the computer as an ‘expensive type writer’. With dropping costs and the increased productivity due to word-processing, today the micro-computer can be used as a ‘cheap type writer’!

In order to prepare a document using word processing package, it has initially to be typed into the computer’s memory from the keyboard. The main productivity improvement comes from the ease and rapidity with which the document can be modified. Only when the finished version is ready it is necessary to put it on paper. Where there are several drafts of a letter or report, or where extensive text from past reports is to be used the productivity gains can be very large. Typical situations where high gains can be very large. Typical situations where high gains are possible are: law firms, contractors, newspaper offices, banks and government offices. Studies in the U.S have shown that the man power required to prepare a document can be reduced from 40 to 80 percent over using an ordinary type writer. In addition, the easily because it is in computer – readable form. Thus, word –processing provides a ready interface to electronic mail.

A typical Word processing package (WPP) has the features:

- **Automatic wrap – around**
With a type writer, the typist has to watch for the end of line and press the carriage return key to start a new line. With a WPP typist simply continuous typing, the computer automatically starts a fresh line when a line is filled up. Only at the end of Paragraph, it is necessary to perform a carriage return.
- **Cursor Control**
All WPP display a bright movable area, the size of one character on the screen. This is called the cursor. It can be moved around the screen by pressing keys. The cursor enables the WPP user to identify an area of text where he or she wants to make changes.
- **Deletion**
Characters, words, sentences, paragraphs and entire pages can be deleted by using the cursor with just one key stroke. The text following a deletion will automatically get re –adjusted to fill the gap created by deletion.
- **Insertion**
Just like deletion except that characters, words, sentences, etc. can be inserted anywhere in the text.
- **Replacement**
Typed characters can over-write characters in document (this is like a combined deletion and insertion)
- **Movements of blocks**
A block of continuous text can be moved from any point to any other point in the Document.

- **Copying of blocks**
A block of continuous text can be copied from one document to another or from one part of a document to another.
- **Formatting**
Spacing, margins, right and left justification, page numbering can be set and changed at any time.
- **Mail Merge**
Common need in many offices is to send the same letter with changes for name and address to a number of parties. This feature enables the computer to process a file of names and addresses and merge it with a standard letter creating letters for each party.
- **Search and Replace**
A string of characters can be replaced any where in the document by another string of letters. This is useful, for example, when the spelling of a persons name has to be corrected in several places.
- **Spelling Checker**
The WPP can be instructed to check spellings and point out where errors may have been made. It would also suggest what the correct spelling might be. Some WPP's also enable the user to add words to its dictionary that the user commonly uses but which are not in its dictionary. Specialised technical terms are examples of this situation.
- **Thesaurus**
The WPP's can be requested to supply words that are similar in meaning to particular word in a document.
- **Multiple fonts**
Different styles such as italics and bold as well as different sizes and shapes of characters can be typed. Mathematical symbols, Greek letters are also available.

7.2.3. Electronic Spreadsheet:

Electronic spreadsheet software hailed as the single most important reason for management use of micro-computers. It is doubtful if the business world would be buying micro-computers in the volume that it does if there were no electronic spreadsheet packages. The fundamental idea of value in such packages is the concept of an 'electronic' spreadsheet. A spreadsheet is simply a sheet of paper with rows and columns in which one can enter data in the form of numbers and text. A balance sheet is a spreadsheet, a price list is a spreadsheet, and in fact most managerial report is spreadsheets. An electronic spreadsheet is like a paper spreadsheet except that:

- It is much faster and easier to make modifications to it and to make both electronic and paper copies of it.
- At a given time one can only see a part of the whole sheet. To see parts which are not visible, we need to 'scroll in' those parts. It is like seeing the spread sheet through a window.
- In addition to allowing numbers and text it allows formula (such as contribution = revenue – variable cost) to be entered into the worksheet. This enables very rapid recalculation to be done under changed assumptions.

The most important capability that a spread sheet offers is that of a straight-forward, rapid and unobtrusive sensitivity analysis. Once a spread sheet has been set up, it is very easy to answer 'what-if' questions. For example, if one has a spread sheet reflecting all the cash-flows and other aspects of an investment, we can readily re-compute the impact of errors in our sales prediction on the return on investment.

Louts 1-2-3 is the most popular spread sheet software package today. The **louts 1-2-3** spread sheet (called a worksheet) has rows entered numbered 1, 2, and 3 up to 2048. It has 256 columns – from A, B, C... Z through AA, AB, etc. up to IV. Newer versions can handle more rows and columns. The width of the columns can be different and can be adjusted to suit the application. At any time 20 rows and (typically) 8 columns are visible on the computer-screen. To view other parts of the work sheet, the 'cursor' key as to

be manipulated. The cursor is a bright rectangle of light which is one row by one column in size. By using up, down, left and right arrow keys the cursor can be moved around on the screen. When the cursor is at the right extreme, pressing the right arrow key will 'scroll' the work sheet one column to the right, i.e., the left column(s) will disappear and a new column (the column to the immediate right of the previous right-most visible column) will appear. By repeating this action as often as required, we can move the window to the right. Similarly, by using the other arrow keys, we can move the window left, up and down as well.

To enter a number of texts, we need to move the cursor to the desired row-column position (called a 'cell'). Next, the data is entered by pressing the appropriate keys. Finally, when the 'return' key is pressed, the data will get entered in the cell and be displayed on the screen. To enter formulas a similar procedure is followed. The only difference is that instead of data, a formula is entered. A formula indicates how the value of the chosen cell depends on other cells of the worksheet. For example, if cell A5 contains the revenue figure and cell B8 contains the variable cost, and the cursor is at cell E15, entering '+A5-B8' will ensure that cell E15 will always show the contribution value. A lot 1-2-3 has many more advanced features. These will be covered in greater detail in a subsequent unit. Spread sheet models have a simplicity which makes them natural for users. They also find use in a surprising variety of applications. Although, undoubtedly, their largest use is in financial modeling, they find frequent use in areas like marketing, production, logistics and human resources.

7.2.4. Business Graphics Software:

While spread sheet and data base packages are very useful in doing analysis, the output of such analysis is generally tables of numbers. The human brain is much more adept at picking up patterns from pictorial representations. If it is true, as the old adage says, that a picture is worth a thousand words, it is equally true that it is worth a thousand numbers. Computer accessible data can readily be converted to graphic form on the screen as well as paper using printers or plotters. With plotters it is possible to have different colours (four colours is very common).

Typical business graphics software enables data to be plotted as:

- Line Charts
- Bar Charts
- Pie Charts.

Sophisticated business graphics software provides for three dimensional display and maps.

7.2.5. Data Communications Software:

In large organization there is often a central computer for data processing which does routine data processing. Sometimes a manager would like to get some of this data for processing on his or her personal computer. To facilitate this, data-communications software has been developed which runs on the computers to make it look like a terminal to another computer. Using this 'terminal emulation' facility the manager can access data from his or her computer. Selected data can be 'downloading' into the personal computer's memory and stored in files on disks. Subsequently, he or she can analyze these files using DBMS or spreadsheet software. An example of this kind of use would be a situation where a main-frame data processing computer has files on sales of products broken down by month and by region. Downloading on a personal computer would enable the manager to analyze up-to-date data on product movement in different markets.

7.2.6 Statistical Packages:

A number of easy-to-use packages which run on micro-computers to perform standard statistical analysis are available. Typical capabilities are frequency distributions, cross-tabulations, tests for population means and proportions, analysis of variance, contingency table tests, regression and correlation analysis.

More advanced packages would include forecasting modules, time-series analysis and non-parametric analysis.

7.2.7 Operations Research Packages:

Inexpensive packages are available for standard operations research models such as linear Programming, critical path analysis, resource scheduling, simulation, decision free analysis and network flow .While these packages are not as powerful ad software on large machines, they ate far more user-friendly and cost one-tenth to one-hundredth as much. They are powerful enough to solve problems of moderate size. For example, practical linear programming models with less than 100 variables and around 50 constraints can be readily solved.

7.2.8 Integrated Software:

Software that combines several of the capabilities of packages listed above is now available. For example, LOTUS 1-2-3 version 2 combines spreadsheet, database, graphics and statistical capabilities. Another example is FRAMEWORK which combines word-processing, spreadsheet, database and graphics functions. The advantages of integrated software are that the user does not have to learn to handle a variety of disparate packages so that his learning time and effort is reduced. Anther advantage is that the same data can readily be passed from one function to another. One such integrated software is the WINDOWS of Micro soft. Latest version is the WINDOWS 98 and is extremely popular. The WINDOWS 95 is also very popular. The Micro soft company keeps on introducing newer version of WINDOWS to make it more user friendly by introducing more graphic oriented commands for easy application of programmes. This allows software is expensive and makes greater demands on the computer resources. But more and more easy availability software has resulted in better and a bit cheaper software than say a decade earlier. The pioneer in integrated software nowadays is Microsoft with their WINDOWS software application

7.3. Summary

Analog Computers operate by measuring rather than counting. These computers use signals as input, which can come from devices like speedometers, thermometers etc. A digital computer represents data in the form of digits and all operations are done on these digits at extremely fast rates.

Systems software available on micro-computers includes compilers and interpreters for popular programming languages like BASIC, COBOL and FORTRAN. However, because of their large numbers for personal use, powerful applications software which does not require significant programming knowledge has been developed to run on personal computers. These windows is very much preferred to other applications as it combines the uses of many applications together such as Spreadsheets, Word-processing and so on. Other than windows, the other most important categories of software..

7.4. Technical Terms

Personal Computer: Computers for personal use come in all shapes and sizes, from tiny **PDA**s (personal digital assistant) to hefty **PC** (personal computer) towers.

Workstation : It is part of a computer network and generally would be expected to have more than a regular desktop PC of most everything, like memory, storage space, and speed.

PPC and HPC : The market for the smallest PCs is expanding rapidly. Software is becoming available for the small types of PC like the **palmtop (PPC)** and **handheld (HPC)**.

Tablet :PC you use an electronic stylus to write on the screen, just like with a pen and paper, only your words are in **digital ink**..

Model Questions

1. Explain different types of computers
2. Explain different types of digital computers
3. What are reasons for popularity of micro computers?
4. Describe the functions of word processing software that would increase the productivity of Typist.

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Lesson 8: Networks, Types of Networks & Topologies, LAN & Wan Network Management

Objectives

The objective of this lesson:

- Various kinds of network topologies.
- The hardware and software components of network and the manner in which they function.
- To know about LAN Management
- To know about NETWORK Management
- To know about WAN Management

Structure of the Lesson :

- 8.1 Networks
- 8.2 Types of Networks
- 8.3 Network Topologies
- 8.4. Network Management
- 8.5. LAN Management
- 8.6. WAN Management
- 8.7. Summary
- 8.8. Technical Terms
- 8.9. Model Questions
- 8.10. References

8.1. Networks

The term Computer networks to mean interconnection of autonomous computers for information exchange. The connecting media could be a copper wire, optical fibre, micro wave or satellite.

8.2. Types of Networks

Introduction

By definition a network is simply two or more computers communicating with each other. By understanding the different kinds of networks and how they work you will be able to determine which network will suit your organizations needs best. Some networks are rather simple and easy to set up while others are much more complex and will require the help of a trained professional.

LAN

LAN stands for Local Area Network. These networks can consist of anywhere from two to thousands of computers. Even a simple network of one computer connected to one printer can be considered a LAN. **Peer-to-Peer** - Sometimes called P2P, these networks are the simplest and least expensive networks to set up. P2P networks are simple in the sense that the computers are connected directly to each other and share the same level of access on the network, hence the name. Computer 1 will connect directly to Computer 2 and will share all files with the appropriate security or sharing rights. If many computers are connected a hub may be used to connect all these computers and/or devices.

- **Client/Server** - Probably the most common LAN types used by companies today, they are called "client/server" because they consist of the server (which stores the files or runs applications) and the client machines, which are the computers used by workers. Using a client/server setup can be helpful in many ways. It can free up disk space by providing a central location for all the files to be stored. It also ensures the most recent copy of that file is available to all. A server can also act as a mail server (which collects and sends all the e-mail) or a print server (which takes all the print jobs and sends them to the printer, thus freeing computing power on the client machine to continue working).

WAN

Wide Area Networks or WANs are very large networks of computers. These networks span large geographical areas, generally covering a couple miles, sometimes connecting computers thousands of miles apart. A WAN can also be a collection of LANs, bringing together many smaller networks into one large network. A WAN can constitute a very large corporate or government network, spanning the country or even the world. In fact, the Internet is the largest and most common WAN in existence today.

8.3. Network Topologies

What is a Topology?

The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations. Logical topology was discussed in the Protocol chapter.

Main Types of Physical Topologies

The following sections discuss the physical topologies used in networks and other related topics.

- Point to Point
- Multipoint or Multi drop
- Mesh
- Linear Bus
- Star
- Star-Wired Ring
- Tree

Point to Point

In point to point topology nodes can communicate only with an adjacent node-one that is “next” to the system as shown in figure 8.1. It should be observed that just because two systems are not in the same room that doesn’t mean that they cannot be adjacent. In its basic form, a point to point network is two nodes directly connected. In its advanced forms, it could be 200 nodes connected to adjacent nodes and those nodes connected to other adjacent nodes, and infinitum.



Figure 8.1 Point to point

Multipoint or Multi-drop

A multipoint or multi drop network is one where nodes shared one line by sharing time on the line as shown in figure 8.2. Multipoint networks are very useful where high speed data transmission capabilities are not necessary and where cost of implementation is an important factor. Many manufacturing companies that use systems to automate their production run their own wires through out the production area. If the company had to run a separate set of wires to every machine, the cost could be prohibitively high. By using multipoint communications, however, the company can implement functional network of production systems quickly and without major cost consideration.

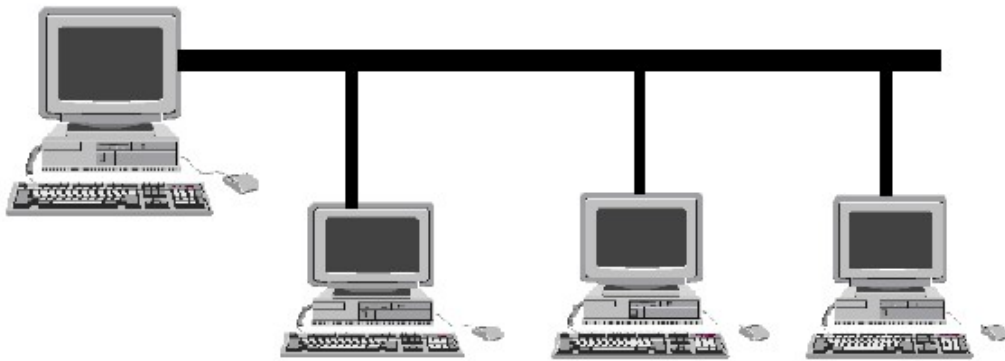


Figure 8.2 Multipoint or Multi drop

Mesh:

Mesh networks are most commonly employed for long distance transmission of data between nodes which act as message switches, circuit switches or packet switches as shown in figure 8.3. A fully connected mesh linking n –nodes requires $n(n-1)$ links but it is unusual for all possible connections to be provided. Throughput depends upon the media and the capacity of the switching nodes. Throughput is the amount of work performed by computer, or the amount of data passed to the network, per unit time or has percentage of the time available. Distance may be extended indefinitely and the number of stations may increase up to the limits imposed by the maximum throughput and the size of the address speed in the message header. Message delay may be high because long distance transmission media have relatively low data rates and the throughput limitations of the nodes may result in queuing for retransmission in store-and-forward nodes. The cost of a mesh network may be optimized by eliminating redundant link capacity.

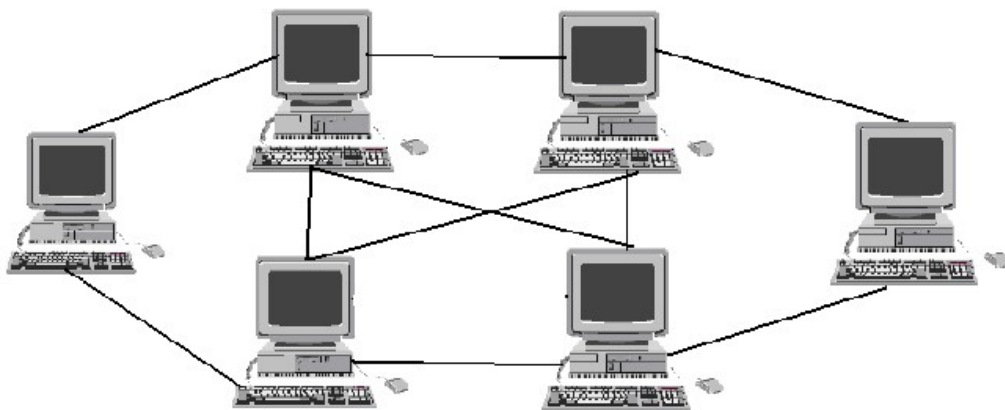


Figure 8.3 Mesh

Linear Bus

A linear bus topology consists of a main run of cable with a terminator at each end as shown in figure 8.4. All nodes (file server, workstations, and peripherals) are connected to the linear cable. Ethernet and Local Talk networks use a linear bus topology.

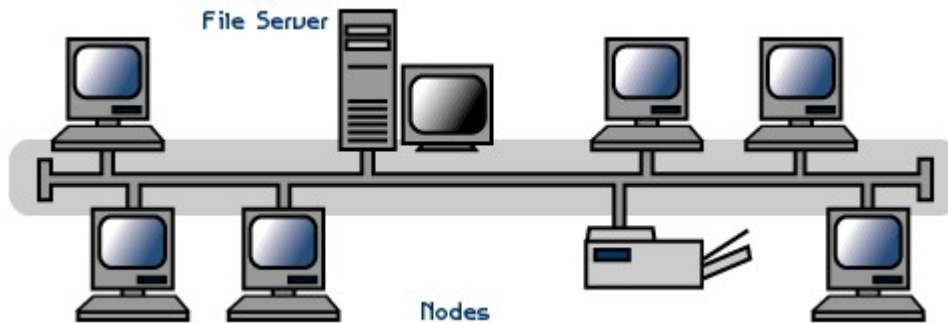


Fig. 8.4. Linear Bus topology

Advantages of a Linear Bus Topology

- Easy to connect a computer or peripheral to a linear bus.
- Requires less cable length than a star topology.

Disadvantages of a Linear Bus Topology

- Entire network shuts down if there is a break in the main cable.
- Terminators are required at both ends of the backbone cable.
- Difficult to identify the problem if the entire network shuts down.
- Not meant to be used as a stand-alone solution in a large building.

Star

A star topology is designed with each node (file server, workstations, and peripherals) connected directly to a central network hub or concentrator as shown in figure 8.5.

Data on a star network passes through the hub or concentrator before continuing to its destination. The hub or concentrator manages and controls all functions of the network. It also acts as a repeater for the data flow. This configuration is common with twisted pair cable; however, it can also be used with coaxial cable or fiber optic cable

Advantages of a Star Topology

- Easy to install and wire.
- No disruptions to the network then connecting or removing devices.
- Easy to detect faults and to remove parts.

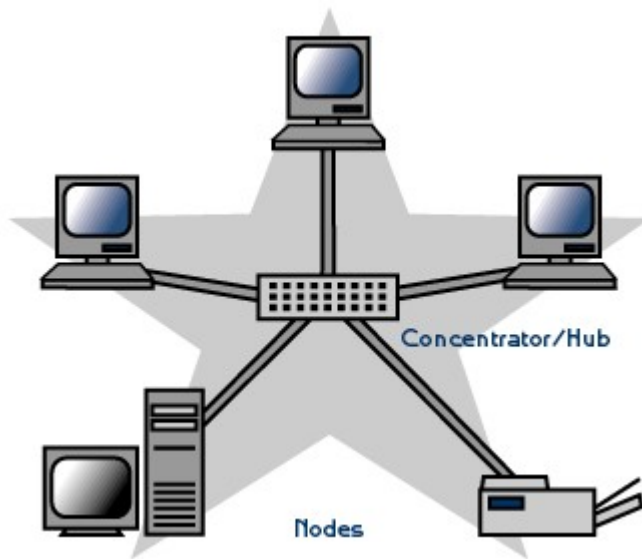


Figure.8.5 Star topology

Disadvantages of a Star Topology

- Requires more cable length than a linear topology.
- If the hub or concentrator fails, nodes attached are disabled.
- More expensive than linear bus topologies because of the cost of the concentrators.

The protocols used with star configurations are usually Ethernet or Local Talk. Token Ring uses a similar topology, called the star-wired ring.

Star-Wired Ring

A star-wired ring topology may appear (externally) to be the same as a star topology. Internally, the MAU (outstation access unit) of a star-wired ring contains wiring that allows information to pass from one device to another in a circle or ring as shown in figure 8.6. The Token Ring protocol uses a star-wired ring topology.

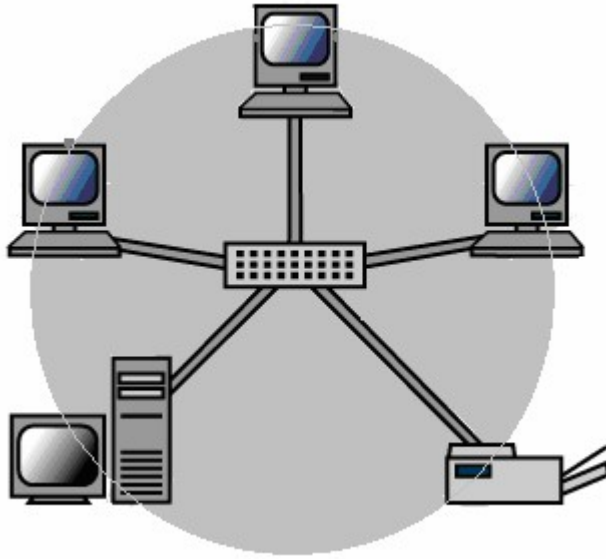


Figure 8.6 Star wired Ring

Tree

A tree topology combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable as shown in figure 8.7. Tree topologies allow for the expansion of an existing network, and enable schools to configure a network to meet their needs.

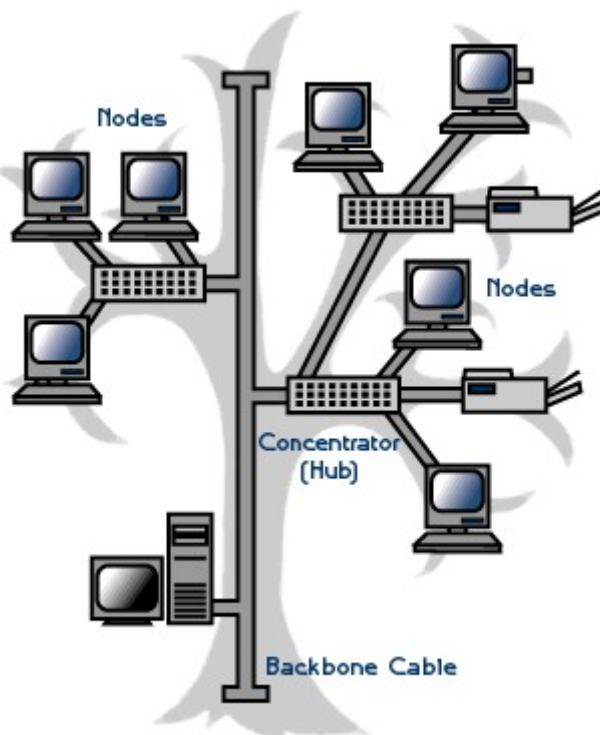


Figure 8.7 Tree Topology

Advantages of a Tree Topology

- Point-to-point wiring for individual segments.
- Supported by several hardware and software vendors.

Disadvantages of a Tree Topology

- Overall length of each segment is limited by the type of cabling used.
- If the backbone line breaks, the entire segment goes down.
- More difficult to configure and wire than other topologies.

5-4-3 Rule

A consideration in setting up a tree topology using Ethernet protocol is the 5-4-3 rule. One aspect of the Ethernet protocol requires that a signal sent out on the network cable reach every part of the network within a specified length of time. Each concentrator or repeater that a signal goes through adds a small amount of time. This leads to the rule that between any two nodes on the network there can only be a maximum of 5 segments, connected through 4 repeaters/concentrators. In addition, only 3 of the segments may be populated (trunk) segments if they are made of coaxial cable. A populated segment is one which has one or more nodes attached to it. In Figure 4, the 5-4-3 rule is adhered to. The furthest two nodes on the network have 4 segments and 3 repeaters/concentrators between them.

This rule does not apply to other network protocols or Ethernet networks where all fiber optic cabling or a combination of a fiber backbone with UTP cabling is used. If there is a combination of fiber optic backbone and UTP cabling, the rule is simply translated to 7-6-5 rule.

Considerations When Choosing a Topology:

- **Money.** A linear bus network may be the least expensive way to install a network; you do not have to purchase concentrators.
- **Length of cable needed.** The linear bus network uses shorter lengths of cable.
- **Future growth.** With a star topology, expanding a network is easily done by adding another concentrator.
- **Cable type.** The most common cable in schools is unshielded twisted pair, which is most often used with star topologies.

Summary Chart:

Physical Topology	Common Cable	Common Protocol
Point-to-point	Twisted Pair	Ethernet
Multipoint or Multi drop	Coaxial cable Twisted Pair	Ethernet
Mesh	Coaxial cables	Ethernet
Linear Bus	Coaxial cables Twisted Pair	Ethernet Local Talk
Star	Twisted Pair Fiber	Ethernet Local Talk
Star-Wired Ring	Twisted Pair	Token Ring
Tree	Twisted Pair Coaxial Fiber	Ethernet

8.4. Network Management

Network management can be defined as OAM&P (operations, administration, maintenance & and provisioning) of network and services. The operations group is concerned with daily operations in providing network services. Network administration is concerned with establishing and administering the over all goals, policies and procedures of network management .The installation and maintenance group handles functions that include both installation and repairs of facilities and equipment. Provisioning involves network planning and circuit provisioning, traditionally handled by the engineering or provisioning department.

8.5. LAN Management

Example of a Simple Local Area Network:

As a start of the course, we will look at an example of how we can build a simple, small Network, either for personal use (many homes install networks nowadays), for the use of a Training in this course or for a small company network.

According to the definition of a LAN, the network must be “a set of physically interconnected computers and computer equipment within a limited area.” If we have at least two computers And perhaps a printer, we could easily start building a network.

Network Interface Card (NIC) :

If two computers are going to communicate effectively, they should have a network interface Card (NIC), often just called a network card.4 Network cards are quite cheap. It is possible to Buy good cards for about €15. Network cards are installed in the computer and you also Install software drivers for the cards in each computer. By installing cards and driver, the Computers are physically ready for the network. In addition, each computer must have an operating system that deals with network. Today, most computers come with a version of Windows. All these different Windows versions have network incorporated in the operating System.

Cabling and Connection:

It is not sufficient that computers have network card installed in order to function properly in a network. A computer will not be a network no matter which software that is installed onto it. Two (or more) computers must also be interconnected by cabling. We will deal with this matter rather thoroughly in the next lesson. Temporarily, we will only state that the kinds of cables that are used in modern networks are twisted pair cables (TP). The “problem” with TP cables is that they can only interconnect two units. It is not possible to have more than these two outlets (and not the way it is on figure 1 with many outlets to different computers). If more than two outlets are requested (which it often is), you need some kind of interconnection components (for example a hub). A hub is simple and easy to set up – there is no kind of configuration at all. When you interconnect different components by a regular twisted pair cable, all signals are sent to all interconnected computers (which only could be two). This connection requires that you have network cards in the computers which have an outlet for twisted pair (RJ45 plug). A cheap and simple hub costs about € 50.

Inter connection of computers functions with a hub. You interconnect a twisted pair cable (they are often called patch cables in sales brochures/stores) between the computer and the hub. (Lately, switches (which are both more effective and secure than hubs) have dropped drastically in price, and have emerged to be cheaper than hubs. Hubs will therefore be faded ut in the future as an old fashioned component.

Hub

A simple network interconnected with a hub if you want to make the network smaller and even simpler, you can use a crossover cable, for example if you only have two computers to be interconnected. This cable works as a null modem cable.. While a null modem cable use the serial port, does a crossover cable use the network outlets in the network card (as any other network connection). With such a crossover cable, one can interconnect two computers directly, without any interconnection components between them.

When we come to the last component in this lesson, the network operating system, we have the following choices:

You can choose to organize the network as a *peer to peer network*. Windows 95/98/NT/ME/2000/XP is alternatives to this. Then there will be no particular Computer that functions as the server, but it is possible to share resources, both Files and services (for example printers). This is a cheap alternative, since most Computers now have one of these operating systems pre-installed. Then there is no Extra license costs connected to this alternative, and you don't have to set aside One computer as server.

Introduction to LAN Management:

You can choose to use one of the computers as *server*. In this case, you have to install a server NOS on this computer. In this course, we look especially at Windows 2000/2003 and Novell Netware. In respect to this, you can therefore install either Windows 2000/2003 server or Novell NetWare server on this computer. The third alternative often referred to is Linux (which words both as a server and workstation operating system).

Calculation of costs for a small network:

We will examine web shops to get a realistic calculation of costs of a small network. We will give all prices in Euros (€) and all prices are approximate. We suppose that you have two computers available (we do not set up any price on these, since price on computers differ much, dependant on which requirements you have). Used PC's (fairly usable quality) are sold for about € 100-150, while new PCs are sold from € 500 and (far) up (including monitor). Let me say that it is possible to buy far cheaper components than Indicted here...

8.6. WAN Management

A wide area Network, or WAN, spans a large geographical area, often a country or continent. It contains a collection machines intended for running user programs. The host is connected by a communication subnet, or just subnet for short.

In most wide area networks the subnet consists of two distinct components: Transmission lines and switching elements. Transmission lines move bits between machines they can be made of copper wire, optical fiber, or even radio links. Switching elements are specialized computers that connect three or more transmission lines. When data arrive on an incoming line, the switching element must choose an outgoing line on which to forward them. These switching computers have been called by various names in the past; the name router is now most commonly used. The collection of Communication lines and routers form the subnets.

8.7. Summary

The term Computer networks to mean interconnection of autonomous computers for information exchange.

LANs and WANs in general are similar in the sense that they are collections of computers. However, there are huge differences between the simplest P2P LAN and a WAN. Whereas it is fairly easy to connect two computers to each other and to a shared printer to for a simple P2P LAN, trying to build a safe and secure LAN takes considerable time and resources. Understanding your organization's needs, the

size of the network to be built, the complexity, and the fundamental differences between the different types of LANs and WANs will help you to build the most effective network for your organization.

The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations. Logical topology was discussed in the Protocol chapter.

8.8. Technical Terms

LAN : Local Area Network

WAN : Wide Area Network

NIC : Network Interface Card

Hub : Inter connection of Cables

8.9. Model Questions

1. Explain various topologies?
2. What do you understand by LAN and WAN?
3. Explain about LAN Management?
4. Explain about WAS Management?

8.10. References

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Lesson 9: Management Information System

Objectives

- Understand one interpretation of what a Management Information System (MIS) is, as well as the basic features of such a system
- Appreciate how the MIS can be subdivided into subsystems that recognize the specific information needs of groups of managers
- Know how to improve the information content of reports
- Understand the role of the MIS in problem solving

Structure of the Lesson

- 9.1. Introduction
- 9.2. Definitions of MIS
- 9.3. Need for Information System
- 9.4. Levels of MIS
- 9.5. MIS Model
- 9.6. Summary
- 9.7. Technical Terms
- 9.8. Model Questions
- 9.9. References

9.1. Introduction

The Management Information System (MIS) is one of the five major CBIS subsystems. Its purpose is to meet the general information needs of all the managers in the firm or in some organization subunit of the firm. Subunits can be based on functional areas or management levels.

MIS provides information to the users in the form of reports and outputs from simulations by mathematical models. The report and model output can be provided in a tabular or graphic form.

Behavioral influences are always important to performance of information systems, but they are especially crucial to such organizational information systems as the MIS. Managers and information specialists can establish programs designed to transform the negative effects of the behavioral into positive results.

MIS reflects an attitude by the executive that they want to make the computer available to all of the firm's problem solvers. When the MIS is in place and functioning as intended, it can help managers and other users both inside and outside the firm identifies and understand problems.

9.2. Definitions of MIS:

We define a Management Information System (MIS) as a computer-based system that makes information available to users with similar needs. The users usually compose a formal organizational entity-the firm or a subsidiary submits. The information describes the firm or one of its major systems in terms of what has happened in the past, what is happening now, and what is likely to happen in the future. The information is made available in the form of periodic reports, special reports, and outputs of mathematical simulations. The information output is used by both managers and non-managers as they make decisions to solve the firm's problems.

Management Information System can be defined as “ a system of obtaining, abstracting storing, retrieving and analyzing data(new facts) to produce information for use in planning, controlling and decision making by yielding information for managers, at the time they can most effectively use it” as shown in figure 9.1.1.

On one side, science and technology are advancing at an accelerating pace, and society is becoming more and more complex, on the other side break-through in management have been provided due to revolution in the field of management information system. This has helped to overcome the problems of planning and control due to huge size, complexity and number of personnel. The success of management lies in its ability to identify its critical problems and then to solve them by using proper decision making process with the help of collection of proper information's related to these problems.

An effective management information system is necessary for providing rational approach towards decision making for critical problems.

As we know that Management consists of two major interrelated phase, viz. planning and control.

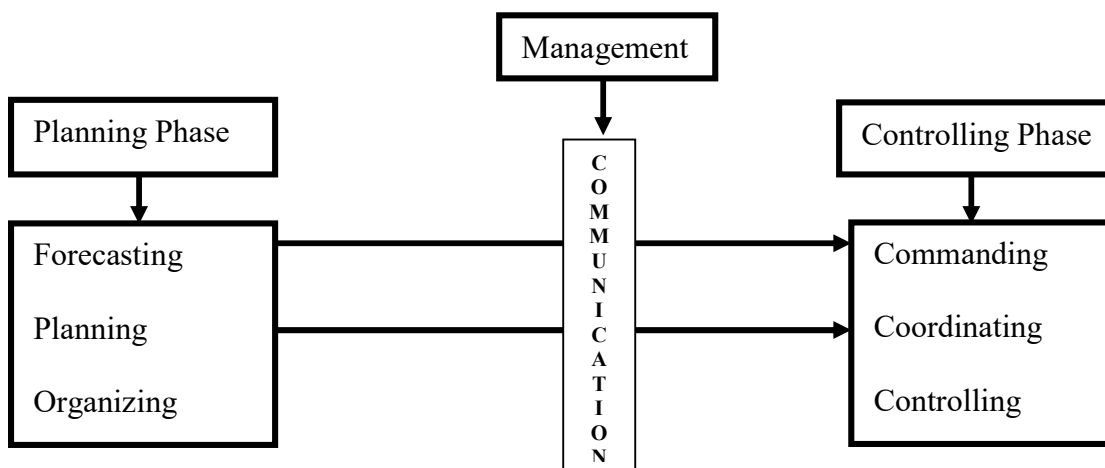


Figure 9.1.1 MIS

Generally new enterprises starts with forecast which leads to planning and than in order to implement the plan, organization is done. These tasks of forecasting, Planning and organizing are taken in planning phase. Control phase starts after planning phase is over. Once the work of organizing is completed, the functional and action

process are required to done in which men and machines are put into action and the management is required to perform the work of directing, coordinating and controlling as shown in the above sketch.

Management needs information so that it can plan intelligently for future; take right and proper time and control various activities as shown in figure 9.1.2.

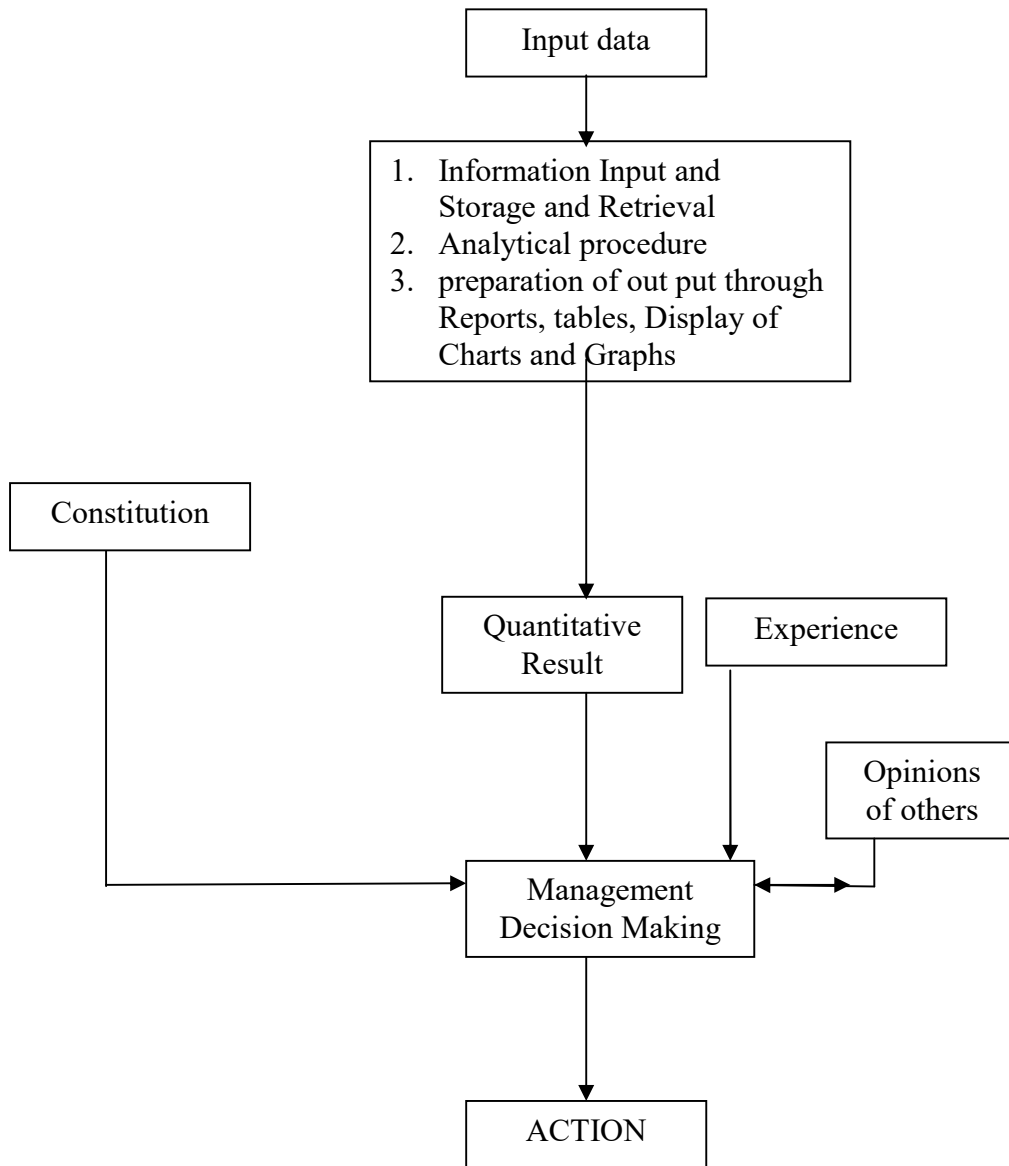


Figure 9.1.2 Management Information System

The Management Information System reduces uncertainty in decision making. An ideal Management Information System would be one which optimizes the value of information and intelligence within the organization itself. The system provides facts upon which most decision making depends. Therefore, it is necessary that information should be properly engineered and maintained current and up-to-date. The following charts illustrates as to how information (or data) are used in the process of decision making in the management Information System.

9.3. Need for Information System

Information system incorporates (i) policy flow from management and (ii) Information flow to management. An information flow is a must for economic and effective control of inventory production cost, management decision, scheduling etc. in the present's day situation quick and correct information flow essential for survival of an organization to proceed from a state of uncertainty, to a state of certainty. The managers need information to manage and carry out his major functions of planning, organizing, directing, staffing and controlling etc.

It is necessary that only relevant information is supplied to management, because unrelated or even undigested information tends to confuse the management. When too much information are collected but not used will lead to a costly waste. As stated earlier that manage takes the decision in the decision maker is dependent upon the completeness, quality, accuracy and timeliness of the information.

Information needs of management with reference of overall function of an enterprise may fall under the following categories:

- (a) Environment information this information includes the information related to political, social and economical climate, in which the enterprise is expected to operate in future. These data may be for unemployment, foreign trade, population average income, price level, availability of labor and political atmosphere etc.
- (b) Competitive information about past performance and current activities pertaining to all competitors to particular files would provide the ingredients for effective external competition.
- (c) Internal Information. It represents the data is to identify the strengths and weakness of the enterprise so that future plans for the organization may be mapped out efficiently and effectively.

Category (a) and (b) are also known as external Information.

Aims of Information System: Following are the main aims of an Information System

1. Effective communication with the user.
2. Reliable and logical data supply.
3. Essential Information and feedback.
4. Clear interpretation of past experience.
5. Rational analysis of information.
6. It should be treated as continuously developing in nature.
7. To bring the new facts to the knowledge.

Characteristics of Good Management Information System: Management Information System should possess the following main characteristics;

Completeness: Information must pass all the elements needed for making a Decision and also it must offer alternatives to assist the decision-making.

Clarity and Conciseness: Information presented be clear and concise

Accuracy and Reliability: Information must be accurate and should be presented in such a manner so as avoid misunderstanding and misinterpretation.

Timeliness: Most current information with latest data must be made available to management.

Relevancy: Information must be relevant, and unnecessary information are not supplied.

Simplicity: Management Information System must be simple and easy to understanding and handle.

Consistency: Information must be identical if it is gathered by different persons and some answers of results are obtained if two groups perform the same work of data collection.

Good structure: Organizational Structure of the system should be such that the responsibility is felt by all.

Predictive Ability: System must be capable to predict or high- light the problem areas before their actual occurrence.

Summarization and Condensation: Information or data collected at the lowest levels must be summarized successively for high levels of management.

Effectiveness: Information system must assists in the process of decision making and taking corrective action effectively and timely. The system must suit the needs of the concern.

Source of Information: Principal sources for obtaining information for the development of Management Information system are:

1. Task force meetings.
2. Personal interviews.
3. Internal and External source of Documents.
External source of documents provides economic, marketing, industry and financial information related to the firm.
4. Personal observation of preparation and communications when feasible.

Application of Management Information System: This information and other data are collected from various sources in order to provide help in taking decisions by the management in the following fields:

1. To know market potential.
2. To provide information about competitor for taking decision about the product for quality, quantity to be produced and sales price.
3. to know the likings of the customer
4. To know about supplies of raw material for future availability, price, quality etc.
5. To know about new process and technology available.
6. To have knowledge as regards to product problems, costs, for processing operations.
7. To know about government politics related with the concern.
8. To prepare long range plans.
9. To be warned for major troubles that are likely to come.
10. To assess new opportunities.
11. To allocate capital resources.
12. To exercise the necessary control over day to day operations.
13. to permit management by exception
14. To provide aid for coaching and education the subordinates.

9.4. Levels of MIS:

Design of Management Information System: Following are the steps to be followed while designing an information system:

1. Determine management needs to monitor the enterprise as a whole and outside fragmentary data relevant to the enterprise.
2. Design fundamental information flow with reference to need for information.
3. Develop the information system in detail.
4. Determine data for the required function and action requirement.

The Management Information System is required to be designed and assigned for assisting the management mainly in the field of planning and control, production and operations, marketing, personal information's.

- (i) Planning and control planning is based on the results obtained by (i) analysis of environment , i.e. economic, technological competitive, market, government and social fields, (ii) identification of strength and weakness related to the product, markets, process, management , financial, research and design, and production.

To exercise control, management approves financial budget and sets standard from time to time. Financial system is the most important single management information system which provides significant effects on their systems. Feedback is provided to exercise full control and to see its results.

- (ii) Production and operation this is connected with the physical flow of goods and the services. It covers various activities like—production, planning and control, transportations and man-machine system.
- (iii) Marketing In this field, information are required help in marking decisions about precision advertising policy, product policy, sales force efforts etc. marketing information system should be useful for making planning market research and making costs, sales performance, sales and distribution. These information systems should essentially have feed back form the market.
- (iv) Personal information the personal information system is mainly concerned with the recruitment placement, training, compensation, labor grievances, relation with labor etc. and feedback.

Development of Management Information System: It has been stated earlier that management information system is system for selecting, storing, retrieving and processing the data to reduce uncertainty in decision making by yielding the information for the managers at proper time.

In order to achieve these objects information system should be developed in the Following stages:

1. **First Stage:** In this stage, main function of the Information System is to acquaint and train people in the design and use of the system and limitations of the system.
2. **Second Stage:** In this stage, collected basic data are utilized for data processing, i.e., analysis trend etc., (for the purposes of sales analysis and sales forecasts, production scheduling, cost control, cash flow, profitability etc.) giving compiled reports and interferences.

3. **Final Stage:** This stage is also known as advanced stage. In this stage, full scale operation research studies and other modern techniques include linear programming, multiple correlation and techniques managers can overcome modern business complexities.

Implementation of Management Information System: Management Information System is implemented in the following steps:

1. Input data.
2. Information Stores and retrieval.
3. Analysis.
4. Out-put.
5. Decision-Making.
6. Action.

These steps are explained here under:

1. **Input Data:** Once the goals are known, system designer determines that what input data are required and how such data can be obtained. After these data are collected they are abstracted and compiled and unwanted data are deleted.
2. **Information stores and retrieval :** The data so obtained (as explained above) and then stored so as to have easy accessibility, so that they can be readily examined, modified and utilized as and when required .these can be stored in a harden file or a general document file cabinet.

Information retrieval is the manner in which information (either raw of semi-processed or fully processed) is indexed, classified and coded so as enable the management for quick accessibility to this information.

3. **Analysis:** To get use of the data, it is necessary to analyze them in the following procedural steps:
 - (a) Define the problem.
 - (b) Determine objectives of the management
 - (c) Development of possible solution keeping the objectives in view.
 - (d) Select optimum best solution
 - (e) Follow implementation procedure.
4. **Output:** Analysis of the information provides output the form of reports, displays, graphs, chars, tables etc, and this output must possess as much characteristics of good management information system as possible.
5. **Decision making:** Once output of the information system is obtained, it is given a final touch with the help of experience and opinion of others to take a decision.
6. **Action:** The design taken are they put to action as a solution to problem.

9.5. MIS Model:

An MIS Model: Our definition can be illustrated with the MIS model in figure 9.2. The database contains the data provided by the AIS. In addition, both data and information are entered from the environment. The database contents are used by software that produces periodic and special reports, as well as mathematical models that simulate various aspects of the firm's Operations. The software outputs are used by persons who are responsible for solving the firm's problems. Note that some of the problem solvers can exist within the firm's environment becomes involved when the firm bands together with such others organizations as suppliers to form an inter-organizational information system (IOS). In that case the MIS supplies information to the other members of the IOS.

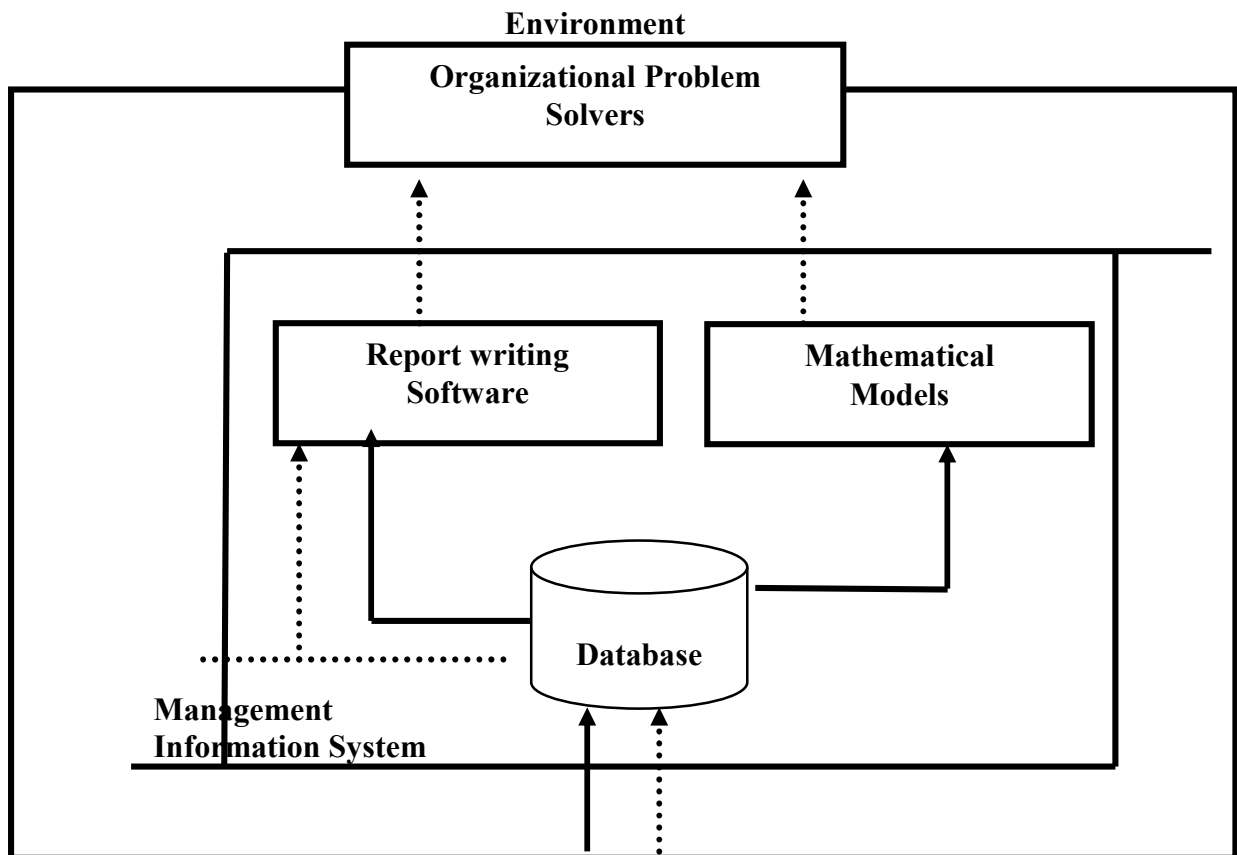


Figure 9.2 MIS Model

9.6. Summary

Management Information System can be defined as “a system of obtaining, abstracting storing, retrieving and analyzing data(new facts) to produce information for use in planning, controlling and decision making by yielding information for managers, at the time they can most effectively use it”.

The Management Information System reduces uncertainty in decision making. An ideal Management Information System would be one which optimizes the value of information and intelligence within the organization itself. The system provides facts upon which most decision making depends. Therefore, it is necessary that information should be properly engineered and maintained current and up-to-date. The following charts illustrates as to how information (or data) are used in the process of decision making in the management Information System.

9.7. Technical Terms

MIS : Management Information System

IOS : Inter-Organizational Information System

9.8. Model Questions

1. Explain about need for information system.
2. Discuss about various levels of MIS.
3. Discuss about MIS model.

9.9. References

1. O'Brien – Management Information System
2. Murdick – Management Information System

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Lesson 10: Anthony Frame work for understanding MIS

Objectives:

Objectives of this lesson are

- To understand about the planning and control of an Organization.
- To understand about the Strategic planning
- To understand about the Management planning
- To understand about the Operational control

Structure of the Lesson:

10.1. Introduction

10.2. Categories of Planning

10.3. Summary

10.4. Technical Terms

10.5. Model Questions

10.6. References

10.1. Introduction

The information processes in an organization are labyrinthine and without some overall map to guide our steps in studying them we should soon be lost in a mass of unstructured detail. Such maps are provided by general frameworks that seek to sharpen important distinctions in the kinds of information that support managerial decisions. A number of such frameworks which, in our opinion, provide the most insight from a pragmatic standpoint are discussed below.

Robert Anthony delineated a framework which distinguishes between the different types of planning and control processes that typically occur in organizations .His basic thesis is that **thinking of planning control as two separate and homogeneous activities in an organization is not only meaningless but positively dysfunctional**. Instated of this segmentation of management planning and control activities into two categories of planning and control, Anthony suggested that the area of management planning and control be segmented into three categories, resisting the “ natural temptation to use as the two main divisions “, i.e.:

- Planning (roughly, deciding what to do, and
- Control (roughly), assuring that desired results are obtained “.

10.2. Categories of Planning

The three categories suggested by Anthony are:

- i) Strategic planning
- ii) Management planning
- iii) Operational control

Anthony describes planning and control activities as so closely inter-linked that to make a separation of these activities is not only undesirable but would make them meaningless. Instead, according to him, it makes much more conceptual and practical sense to link together planning and control activities which are similar and intertwined.

Anthony's definition of these three sub-species of planning and control are:

Strategic planning is the process of deciding on objectives of the organization, on change in these objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition of these resources.

Management Planning is the process by which managers assure that these resources are obtained and used effectively in the accomplishment of the organization's objectives.

Operational control is the process of assuring that specific tasks are carried out effectively and efficiently.

Anthony's departure from the traditional concept of separate planning system and control systems is diagrammed in figures 10.1 and 10.2, respectively.

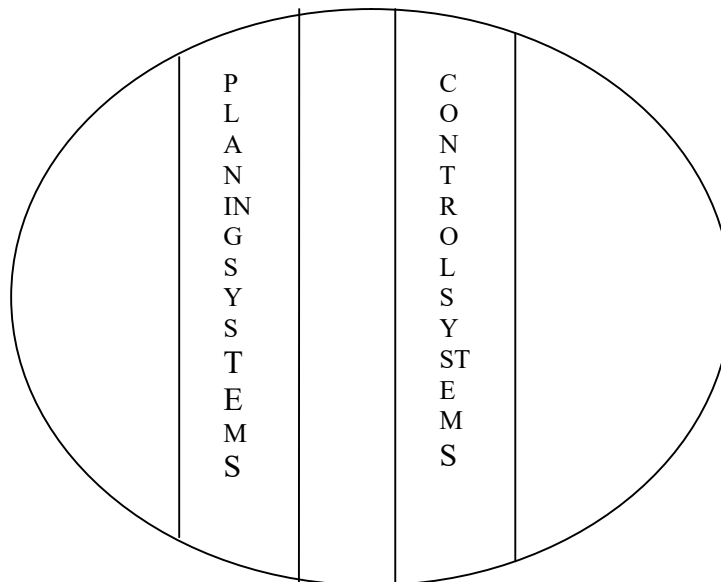


Figure 10.1: traditional segmentation of planning and control systems

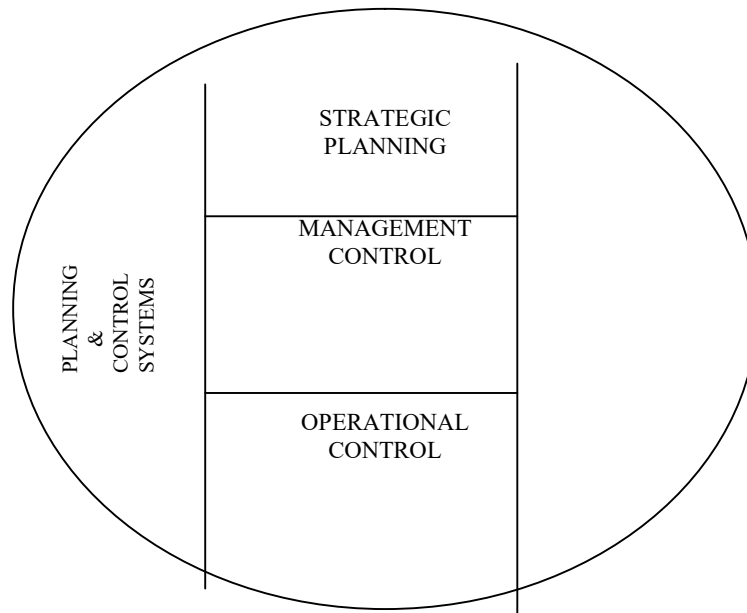


Figure 10.2: Anthony's framework of planning and control

It is useful to clarify the above definitions with some examples. **Table-I** gives instances of planning and control activities in different functional areas classified according to the above definitions.

	Strategic planning	Management control	Operational control
Production	location of a new factory	determining the product mix For a monthly production programme	Scheduling specific jobs on specific machines in shift
Marketing	Entering the export market	Media planning for advertising Expenditure	planning sales contacts to be made by a sales man in the next week
Finance	Raising capital by issuing New shares	determining maximum levels of credit for customers	determining what action to take against non- payment by a specific Customer
Personal	deciding on changes to be Made in the organization Structure	determining who will be promoted to fill a vacated post at middle and lower levels in the organizations	determining which workers will be on each shift

Anthony's framework enables us to understand the characteristics of information needed to support the three types of planning and control processes.

Table -2 depicts these characteristics and highlights the substantial differences in information required for strategic planning, management control and optional control.

Table-2

Information characteristic	strategic planning	management control	operational control
1. Volume	Low	Intermediate	High
2. Level of aggregation	High	Intermediate	Low
3. Frequency of use of a particular	Low	Intermediate	High
4. Currency requirement	Low	Intermediate	High
5. Accuracy	Low	Intermediate	High
6. Scope	Wide	Intermediate	High
7. Source	significant amount From external Sources	Mostly internal	entirely internal
8 Predictability of use*	Low	Fairly high	Very high
9 Variability with user*	High	Intermediate	Low
10 Distance of user (in Organizational Terms) from sources within Organization	Far	Fairly close	close

*how far in advance can the information that will be needed for a decision be stipulated?

** For a given decision, how much of the information considered necessary likely to vary from one individual to another.

Another framework which is useful in structuring our understanding of an MIS is one provided by Simon.

Whereas Anthony's framework is concerned with the objective of the decision-maker, i.e., what the manager is trying to do, Simon's framework examines the process of decision making, i.e., how does the manager makes decisions.

Simon breaks down the process of making a decision into three stages.

Intelligence: This is the stage in which the decision-maker recognizes that there is a problem or opportunity that requires him or her to make a decision.

Design: This stage covers the determination of the alternative actions that he or she could take to resolve the problem or exploit the opportunity.

Choice: This stage is concerned with the process by which one of the alternatives generated in stage-2 is singled out to be pursued.

With this framework we can distinguish between three major classes of decisions.

Programmed decisions are those in which all stages are handled by following a preset well-defined procedure. These decisions are repetitive and routine which arise often and are capable of being modeled mathematically in their entirety. The classic example would be inventory ordering decisions.

Non-programmed decisions are those where none of the stages is amenable to handling by a well-defined, pre-specified procedure. (These decisions are novel and difficult to structure in logical-mathematical terms. They have to be treated de novo whenever they arise.) An example would be the decision to set up a new hotel or launch a new line of products or services.

Semi-programmed decisions are those in which at least one and no more than two of the above stages can be handled by a well-defined preset procedure. An example where the intelligence phase is well-

structured would be the diverse kinds of variance analysis. Here comparison with a budget or standard is undertaken in a well-defined way to signal the need for decision. Subsequent stages of design and choice, however, are not handled by a set procedure.

W.S. Zani's framework (Harvard Business Review) draws upon the earlier two frameworks. He argues that effective MIS can only be designed in a top down fashion, viewing the organization's information needs from the vantage point of managers who will use it rather than in a 'bottom up' manner which automates existing clinical procedures. According to Zani, the important determinants of MIS design are:

- Opportunities and risks
- Company strategy
- Company structure
- Management and decision making processes
- Available technology
- Available information sources

Opportunities, risks, competencies and resources, plus the strategy derived from them, yield the company's organizational structure. This structure sub-divides the essential task to be performed, Assign them to individuals, and spells out the interrelationships of tasks. These tasks, and the organizational structure they compose, determine the various information needs of the company.

Every organization must understand its key success variables which the company must score high for it to succeed. For example, a tour operator company in tourism market must focus on product promotion, understanding customer response to product and monitoring competitive changes. Where as a mill selling grey cloth (unprocessed) must focus on manufacturing and distribution costs.

The key success variables name the key tasks of the company and thus help identify the properties for information system development. The system must provide information that makes the individual managers performance of these tasks easier and better. These tasks could be related to strategic planning, management control or operational control. The content and frequency of reports that will provide the necessary information for key task must be identified through an analysis of the decision-making processes. Here the frameworks proposed by Anthony and Simon prove to be useful.

Zani advocates participative process of MIS design where top management and functional managers help in understanding critical areas of operations, identification of specific information requirements. To fulfill this role properly, managers must be aware of the major sources of information, of alternative methods of supplying data, and of the impact of the major changes of information technology. The major contribution to information systems in these areas, of course, must come from the information and data processing specialists.

Using the framework, then, encourages understanding of the critical areas of operations, identification of specific information requirements, and recognition of the technological, economic and personnel constraints within which an MIS develops. As important as anything else, perhaps, is that systems are of necessity dynamic, changing with the environment and the organization.

In designing an MIS there are two types of situations one may come across:

- 1) If the organization has no experience of computing, application which will create the maximum impact on the identified by using Zani's framework. Key success variables are however seldom obtained through a questionnaire survey of managers, data on environment, past company performance must be analyzed and discussed to identify key success variable. It is sometimes useful to pen down a qualitative measure of such variable. For example the performance of textile

unit can be summed up through two indicators – contribution per loom shift and fixed cost per loom shift. Similarly the performance of a tour operator may be measured as gross operating profit per day per tour. Precise definitions of performance indicators enable the analyst to understand and quantify the likely impact of improvement in different tasks of planning and monitoring.

An analysis of the company's key success variables can be done only after a thorough understanding of the company's operations. Consultants and vendors who do not spend adequate time in understanding the operations are unlikely to throw up application areas which will create the maximum impact. They are likely to suggest 'off-the-shelf' application. For such applications use standard software which is available.

For a company getting into computerization for the first time, a list of applications would have to be generated, keeping in view a 4-5 years perspective on the basis of which a suitable configuration would be decided. However, the development and implementation of the application would have to be done in phased manner. The first few applications must be those, which can an impact on the performance of the organization, are quick to implement with the least amount of changes in the existing procedures systems. Initial success can make the later implementation of complex and more involved systems easier.

2) For organizations which have been into data processing and would like to graduate to MIS, the choices are somewhat limited. Existing computer technology, manpower and past experience with computer applications all such factors will condition the future growth of MIS.

By and large an effort is made to create useful data bases which capture data during the execution of routine data processing systems. Such data are then analyzed to produce periodic planning report for monitoring.

Examples of such systems are the sales analysis based on invoice processing; inventory control based on stock accounting, costing and profitability analysis on the basis of financial accounting systems. Of course marginal additions to data fields, new coding structure, revised procedures are introduced to make the data base and reporting more useful.

A few factors which will increase the chances of a successful implementation of MIS are:

- a) Involvement of top management in the computerization effort in defining the purpose and goals of computers within the organization.
- b) Selection of EDP manager who has the political skills to involve managers in choosing application areas, identifying information needs and designing reports.
- c) A computer staff which has interdisciplinary skills in computers, management and operations research.
- d) A balanced expenditure on hardware and software.

10.3. Summary

Robert Anthony delineated a framework which distinguishes between the different types of planning and control processes that typically occur in organizations .His basic thesis is that **thinking of planning control as two separate and homogeneous activities in an organization is not only meaningless but positively dysfunctional.** Instated of this segmentation of management planning and control activities into two categories of planning and control, Anthony suggested that the area of management planning and control be segmented into three categories, resisting the “ natural temptation to use as the two main divisions “, i.e.:

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10.4. Technical Terms

Programmed decisions are those in which all stages are handled by a preset well-defined procedure.

Non-programmed decisions are those where none of the stages is amenable to handling by a well-defined, pre-specified procedure.

Semi-programmed decisions are those in which at least one and no more than two of the above stages can be handled by a well-defined preset procedure.

10.5. Model Questions

1. Explain about various categories of planning
2. Explain about W.S. Zani's framework
3. Explain about Anthony's frame work of planning and control.

10.6. References

1. O'Brien – Management Information System
2. Murdick – Management Information System

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Lesson 11: Management Functions

Objectives

The objectives of this lesson are:

- Understanding of various managerial functions like planning, organizing, controlling representation, coordination etc.
- Understanding of various levels of Management like Top level, Middle level and Low level.
- Understanding of various principles of management and their importance
- Universality of the principles of Management

Structure of the Lesson

- 11.1. Introduction
- 11.2. Intensity of Management Functions at Various Levels of Management
- 11.3. Principles of Management and their importance
- 11.4. Universality of Principles of Management
- 11.5. Summary
- 11.6. Technical Terms
- 11.7. Model Questions
- 11.8. References

11.1. Introduction:

The study of the functions of management is an important point in the theory of management. Management is the art of getting things done through and with people so the overall job of a manager is to create within the organization an atmosphere which will facilitate the accomplishment of its objectives. For this purpose he has to perform a series of functions. It is a strange thing that each author accepts the pervasiveness of the managerial functions but there is hardly any unanimity of them. Every one has his own list of functions and he tries to define his classification. For example, R.C.Davis enumerates only four functions – planning, organizing, executing and controlling. L. A. Appley too describes three functions – Planning, motivating, co planning, organizing commanding, coordinating and controlling. But this difference of opinion does not come in our way. According to Koontz and O'Donnell – “The most useful method of classifying managerial functions is to group them around the activities of planning, organizing, staffing, directing and controlling”. This classification of managerial functions is a helpful and realistic tool for analysis and understanding. But we shall discuss some other managerial functions too with them.

1. **Planning:** Generally speaking, planning is deciding in advance what is to be done, it is first and foremost function of management. Almost all managers plan whether they are at the top, middle or bottom of organization. In the words of M.E.Hurle – “Planning is deciding in advance what is to be done. It involves the selection of objectives, policies, producers and programmes for attaining enterprise goals.” Similarly, in the words of Terry, “It is the selecting and relating of facts and the making and using of assumptions regarding the future in the visualization and formation of proposed activities believed necessary to achieve desired results.” It involves deciding in advance what to do, when to do, where to do it, how to do it and who is to do it and how the results are to be evaluated. Thus, planning is done with the aim of chalking out future course of action. Its main purpose is to provide a guideline for individuals engaged in the enterprise goals. In its essence, planning is a process of decision-making after a through evaluation of alternatives.
2. **Organizing:** The second function of management is organizing. The process of organizing is very essential for accomplishing the objectives of the enterprises set by administration and planned my management. It involves the establishment of an organization structure through determination and grouping the activities, the assignment of activities to the specific departments and individual, defining role and establishing relationships, the delegation of authority to carry out the responsibility and provision of co-ordination of men and work. The development of sound organization requires certain principles.
3. **Staffing:** Staffing is an executive function which involves the recruitment, selection, training, placement, compensating promotion and demotion and finally the retirement of an employee. Thus staffing is a process of managing the organization and keeping manned. The sole aim of staffing is to take right man for the right job. It needs man power planning, job analysis and such other staff functions. It is the quality of hired personnel which governs the future of the business enterprise.
4. **Directing :** Direction is also an important function of management. As the process of management is concerned with getting work done through and with people, they require continuous encouragement to work effectively. According to Terry, “Directing means moving to action and supplying simulative power to group of persons.” So management guides and leads them continuously. It imparts instructions to them, communicates them orders, rules and decisions, motivates, provides leadership and guidance supervises their work and behavior inspires them towards improved performance. These all functions are in the ambit if direction. Through it is very simple to define direction than to practice it. It requires foresight and experience.
5. **Controlling:** The next function of management is controlling. In the words of Henry Fayol, “In an undertaking control consists in verifying whether everything occurs in conformity with the plan adopted, the instructions issued and principles issued.” Thus the control is a measuring and corrective device. In measures, performance against goals and plans. Whereas planning guides the management in the timely use of resources to accomplish specific goals, the control ensures the effective planning. The process of control involves three things:
 - i. Setting of standards of desired performance;
 - ii. A comparison of actual performance as against standards;
 - iii. Taking corrective actions.
6. **Innovation:** The famous modern thinker on the Science of Management Peter Drucker says that management is a creative rather than an adaptive talk. The management must try to create new product, new practices, new ideas and new structure looking to the needs of the future. Furthermore, the function of innovation involves the preparing people and organization will become state and static.
7. **Representation:** Representation means the representing business concern in outside world. The managers are leaders of their organization as the leader of organizations they have an onerous responsibility of representing the organization before the interested groups – government, trade unions, customers, employees, financers and suppliers and so on. The management has to project its own

image as well as the image of his organization before others. So the management must be well informed, inspired and loyal to the objectives of their organization.

8. **Coordination:** Some authors consider coordination as a separate function of management while many other call it is 'essence of manager ship'. The process of coordination involves synchronizing individual actions with the goals of the enterprise. Today's, organization have grown in size and in character. A large number of people work there in. So coordination has become very necessary. In the words of Koontz and O'donnell – "The best coordination occur when individuals see how their jobs contribute to the dominant goals of the enterprise. This implies knowledge and understanding of enterprise objectives."

The relative Importance of Functions.

The above list of management functions is also not conclusive. The word is very dynamic and changing. It imposes new problem hence the management has to accept these changes. One this more, all of the above discussed functions of management has to accept these changes. One thing more, all of the above discussed functions of management are inter-related. They are not independent and do not attach any more or less importance. No one function can be performed without involving the others. Actually, managing is a composite process. It is a circular in nature. So there is no beginning or end in this process. The only thing is this that the relative emphasis on different functions changes according to situation.

11.2. Intensity of Management Functions at various levels of Management

'Levels of Management' refers to a line of demarcation between various managerial positions in an organization. In most organization, there are generally three levels of management in the organization hierarchy, namely, (i) Top management, (ii) Middle level management, and (iii) first line or supervisory management. The number of levels of management increases when the size of the business and work-force increases. According when the size of the business and work-force increases. According to Dale, "As a company becomes larger and more complex there is a natural tendency for the chain of command to lengthen. Even though the company marks no effort to limit span of control to any given number if there is extensive growth, there comes a time when commands at various levels have to be split up and another layer of supervision inserted." Actually, there is a limit to the number of subordinates a person can supervise. Therefore, in order to make supervision effective, levels of management are increased.

The intensity of various management functions at various levels of management is quite different. Before, reviewing the functions of management at various levels, we should know about the various levels of management in an organization.

The levels of management may broadly be divided into five, namely top level management, upper middle management, middle level management, lower or supervisory level or first line management.

The functions of various levels of management are as follows:

Top Level Management

Top management in a company consists of the Board of Directors and the Chief Executive or the Managing Director as shown in figure 11.1. They are the ultimate source of authority in the company. They set the goals and establish the policies to carry them out. Top management performs all the functions management performs all the functions of management, namely, planning, organizing, directing and controlling. But it spends more time on planning and organizing the middle or lower level management. It is responsible to the shareholders or

owners of the company for its overall management. All the policy decisions are taken by the board of directors and the chief executive and they periodically review the implementation of various decisions.

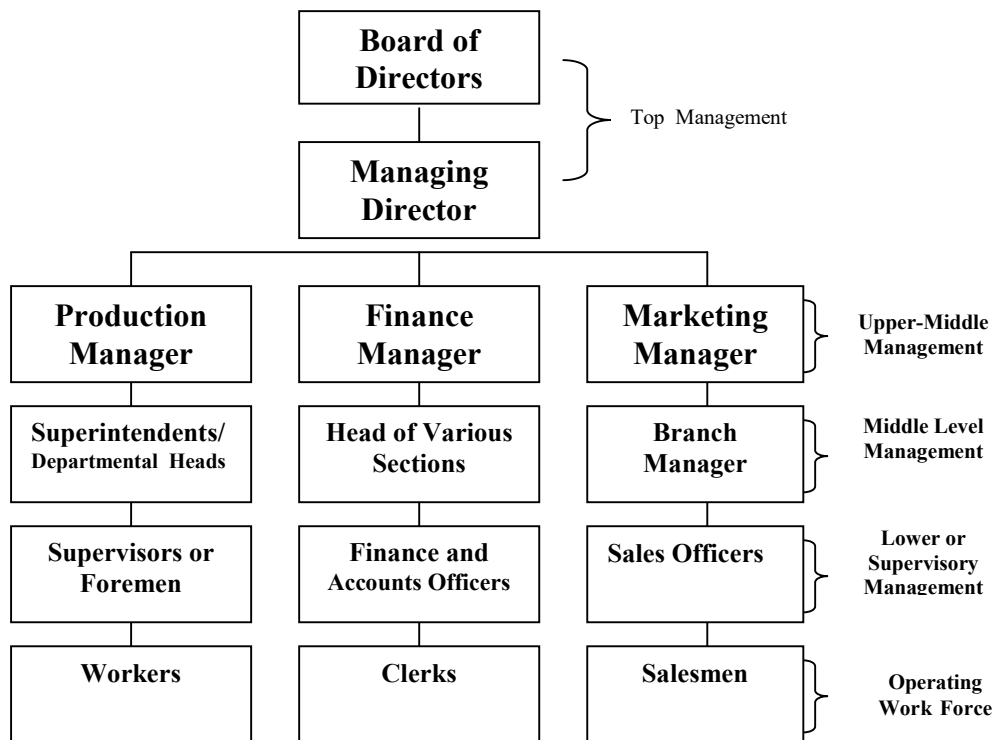


Figure 11.1. Managers of Levels

The Board of Directors concerns itself with review and decision upon matters of major importance to the company's success. The Board reserves authority and responsibility for deciding long term objectives, policies, programmes, and budgets that apply to the company as a whole; it approves the overall company organization and exercise control through review of overall financial and operating result. The Board of Directors reserves authority for commitment of significant amounts of capital funds. It raises and borrows capital and authorizes capital expenditures. The operative work of the Board is relatively limited. It is performed by the chief executive who is appointed by the Board. The Board of Directors provides, "invaluable support to the chief executive as mentors, councilors and critics."

The Chief Executive is the managing director or president of the company. He is a member of the Board and represents a link between the Board and other managerial personnel. Thus he is accountable only to the Board and is organizationally located above all other organizational elements. As a result, only he can handle problem involving two or more subordinate units with perspective and objectivity. Unless special provision is made for coordination at lower levels, all management and operating problems of consequence come to focus in this position.

The responsibilities of chief executive position include the interpreting of organizational policies and communicating the goals of the organization. The chief executive thinks and takes decisions for the long-run welfare of the enterprise. He puts into effect the policy decisions taken by the Board and maintains effective coordination in the organization.

From the nature of functions of top managers, it is quite clear that they are expected to possess and use more conceptual skill than human and technical skills. The members of the top management should have the ability to develop new concepts and to visualize the enterprise as a whole. To quote B. Yuill, "It is the function of top management of watch, interpret, exploit, or where necessary, counter external influences with appropriate adjustments in the functional authority and status structures of the organization. It is top management's duty to protect the integrity of the organization so that it can survive for its own employee's, the shareholder's, the

suppliers, and the customer's interests and for the general good of the social and economic system within which it operates.”

Middle Level Management

Middle management acts with and under top management to accomplish the objectives of the organization. Mary C. Niles in her book 'Middle Management', has laid down the seven functions of middle management, which are as follows:

- i. To run the details of the organization, leaving the top officers as free as possible of their responsibilities.
- ii. To co-operate in making a smoothly functioning organization.
- iii. To understand the interlocking of departments in major policies.
- iv. To achieve the coordination between the different parts of the organization.
- v. To build up a contented and efficient staff where reward is given according to capacity and merit and not according to chance or length of service.
- vi. To develop leaders for the future by broad training and experience.
- vii. To build a company spirit where all are working to provide a product or service wanted by others.

As shown in figure, middle management may be upper middle management and simple middle management. In small organizations, there is only one layer of middle management but where both these exist, the upper middle management gets authority direct from the top management. This level consists of various functional heads such as production manager, finance manager and marketing manager who are responsible their functions. In big companies, these managers are also members of the Board of Directors. In such a case they become a part of the top management. Whatever may be the case they become a part of our functional managers is to organize their departments to implement the top management's policies. They are concerned with the results in their areas. For performing their responsibilities, they should have more conceptual and human skills as compared to technical skills.

In companies where upper middle management exists, simple middle management will include heads of various sections, superintendents and branch managers. They are concerned with the carrying out of tasks assigned to them by the departmental managers. They also perform the managerial functions of planning, organizing, directing and control. The first level manager is concerned with the overall management of a unit created in any functional area.

Supervisory or Low Level Management

Supervisory management refers to grades of executive leadership whose work has to do largely personal oversight and direction of operative employees. This level includes supervisors foremen, finance and accounts officers, sales officers, etc. The essential feature of this level is that managers at this level are in direct contact with the operative employees. They are more concerned with direction and control functions of management as compared to planning and organizing. They implement the policies of top management communicated to them by the middle level managers.

Managers at the low level are also known as first line supervisor. They represent a link between the management and the workers. They plan day to day production schedules within the goals set from above. They assign tasks to the operative employees, guide them and take corrective action on the spot. So they should possess more of technical skill than by the upper levels. They are concerned with planning and organizing at their unit level. They can set the goals only for the short-run. They perform the control function by evaluating the performance of operative force and then communicate the information higher in the organization. They must also possess the requisite human skill as they have to deal with the workers to get things done from them. They are responsible for developing harmonious relations among the workers and help them in solving their work problems. They must represent the company of the workers and the workers to the company.

From the above discussion, it can be concluded that all managers – top, middle and first line – perform the same managerial functions. The main difference between their jobs in terms of management functions is emphasis. The top management spends more time on planning and organizing than does the middle or first line management. The middle management spends more time in directing and controlling than the top management. The first line managers spend a great deal of time in directing the workers. But most managers, at various times, perform all the managerial functions through in varying degrees.

11.3. Principles of Management and their Importance

A management principle is a statement of a general truth about organization or management. In the words of Herbert G. Hicks, 'Principles of management are the guiding rules of laws for managerial action.' They are designed primarily to provide for better understanding of business circumstances and improving the organizational performance.

Principles of Management: A number of principles of management have been developed to assist managers in performing their function well. A large number of principles has been contributed by the management authors belonging to the traditional school of management thought. Henry Fayol a French industrialist, offered fourteen principles of management first time in 1916. During the period 1920-40 in the U.S.A. many authors did hard work in developing and testing various principles of management. Today, there is a very lengthy list of management principles and it is not possible to give an exhaustive list of these principles. Here are some important principles of management;

(a) Fayal's General Principles of Management

1. **Division of Work :** Division of work means specialization, Each job and work should be assigned to the specialist of his job. Division of work promotes, efficiency because it permits an organizational member to work in a limited area reducing the scope of his responsibility. Foyol wanted the division of work not only at factory but at management levels also.
2. **Authority and Responsibility:** Authority and responsibility go together, Fayol stressed upon this that right and power to give orders should be balanced by the responsibility for performing necessary functions.
3. **Discipline:** Fayol saw discipline in terms of 'obedience, application, energy and respect to superior'. According to him penalty for poor performance should coupled with competent and fair supervision.
4. **Unity of Command:** A subordinates should take orders from only one boss. Fayol claimed that if the unit of command is violated. "authority is undermined, discipline in danger, order disturbed and stability threatened."
5. **Unity of Direction:** Each group of activities having the same objective must have one head and one plan. It will create dedication to the purpose and loyalty.
6. **Subordination of Individual Interests to General interests:** The interest of the business enterprise ought to come before the interests of the individual workers.
7. **Remuneration:** Remuneration should be fair and adequate. It should afford the maximum satisfaction to both types of incentives – financial as well as non financial.
8. **Centralization:** There should be one central point in the organization which exercise overall direction control of all the parts. But the degree of centralization of authority should vary according to the needs of the situation.
9. **Scalar Chain:** The scalar chain is chain of supervisors from the highest to the lowest rank. It should be short circuited. An employee should feel free to contact his superior.
10. **Order:** The principle or order applies to both material as well as men. An organization ought to be based on an orderly, rationally thought-out plan. "A plan for everyone and everyone in his place," was his slogan.

11. **Equity:** Kindness as justice should be exercised by management in dealing with their subordinates. This will create loyalty and devotion among the employees.
12. **Stability:** Stability is linked with long tenure of personnel in the organization. Efficiency is promoted by a stable work force.
13. **Initiative:** To ensure success, plans should be well formulated before they are executed.
14. **Esprit de Corps:** Fayol said that in union there is strength. The whole organization should function as a team and every team member should work to best accomplish organizational good. He emphasized the importance of good communication in achieving team work.

Foyol said that even this list of principles of management is not inclusive. They are not rigid, they are flexible and absolute, but must be utilized by the management, in the light of changing and social conditions. Management should develop continuously new ideas and new principles.

(b) Other Principles of Management

1. **Harmony of Objectives:** The effective organizational performance is achieved only when all persons of units of the organization work towards an objectives that is harmonious. Harmony of objectives brings unity and uniformity in efforts.
2. **Principle of Planning:** Planning in the process by which objectives are formulated, concepts are conceived, approaches are selected and decisions for accomplishing these objectives are made. Formulation of objectives is a pre-requisite step if the organization is to accomplish its, goals in an orderly and rational manner.
3. **Principle of Balance:** Stability in the organization requires that authority, power, responsibility and accountability be balanced. If any of these factors is out of balance, the organization will be under pressure to restore the balances. Continued imbalance will cause resentment, hostility, friction and strike. Serious imbalance can threaten the continued existence of the organization too.
4. **Principle of Coordination:** The principle of coordination explains that effective organizational performance is achieved when all persons and resources are coordinated in a balanced manner. Without coordination, non productive random activity will result.
5. **Principles of Exception:** Management must invariably follow the principle of exception in the area of decision making and control. The management must transfer all routine work to subordinates and should concentrate on important matters only.

Importance of the Principles of Management

The above discussed principles of management are very valuable for managers. Proper use of these principles can improve organizational performance. But these principles should be viewed as being valid for most organizations under most circumstances. They are not as exact as the principles of physical sciences. Because management is a social science so the limit of human behavior, his reaction etc., will always be there with these principles. It remains the manager's job to use his judgment in determining when to apply a certain principle. The odds can be in his favor if he includes some important principles of organization also in his managerial tool kit. Even then the importance of these principles can be explained as follows:

1. Their knowledge increases managerial efficiency.
2. These use brings orderliness and clarity in the area of management.
3. Their knowledge facilitates future research in management.
4. The organizational performance is effectively improved if they are applied by the management judiciously.

Principles of Management are Flexible:

The principles of management are not like the principles of physical sciences like physics and chemistry. The principles of management cannot be rigid or absolute as they are not rules or laws. No principle operators automatically, as for instance, Newton's Third Law of Motion which states that "To every action there is always an equal and opposite reaction." The major cause of this is that human factor in management is every

delicate. For instance one may derive a principle of motivation which states that productivity can be increased by increasing the wages. This should not lead to a conclusion that a 25% increase in wages would automatically increase the productivity by the same percentage, Urwick has rightly observed. "The principles, however, convenient as a shorthand method of thinking, are only guides in action. If they become rules-rigid they lose their utility. There must be continuous machinery for working out new principles and applying existing principles to cases."

It is not necessary that the management should follow the set norms and that it should in no circumstance deviate from the treated path. No Social Science worth its name can afford this situation. Certain amount of flexibility is a must to accommodate the new thinking and to adjust according to the needs of the situation. Thus, principles of management can be modified and improved by any manager in any situation. They are neither absolute nor stable for all times to come. They are flexible in the sense that they can undergo a change according to the changed conditions.

However, the flexibility of principles does not mean that they may be overhauled according to the whims and experience of even those who have not matured themselves in managing. If this is allowed, the principles will not withstand the test of time. The principles, if they are to serve as the foundation for efficient management for future managers, must be able to withstand the test of time.

11.4. Universality of the Principles of Management

The principles of management are called to be universal. It means that they are applicable in every type of organization, at every level of organization, in any country of the world and so on. But the concept of universality of the principles of management is not universality acceptable. There are different opinions as regards to it. Many persons hold the view that management theory and practice both have universal application but many others do not agree with this view. We shall examine the arguments for and against of it.

a. Management Concept and Principles have Universal Application

Mr.L.R.Sayles, L.A.Allen, Koontz and O'Donnell, Mc-Farland and many other are of the opinion that management theory, principles and practices are transferable from one country to another, from one firm to another within a country and from one person to another. In other words, they have universal application. In the words of Koontz and O'Donnell, "The management fundamental theory and principles – have universal application in every kind of an enterprise and at every level of enterprise." The following are the arguments forwarded by the supporters of the universality concept:

1. **The Process of Management is Common to all types of Human Activities:** The process of management involves planning, staffing, organizing, directing and controlling functions. Managers or administrators of any organization perform these functions without any difference. They plan, direct, organize and control the activities, of their subordinates. H.H.Albers writes: "The management process is a necessary feature of all organized activity. Although the purpose of organization differ, the management process remains constant. It is present in factories, banks, retail establishments, military organizations, Churches, Universities and Hospitals." The same principle applies to the functional area of specialization, such as production management, marketing management and financial management.
2. **Management Functions and Managerial Techniques :** It is not correct to confuse the management theory and principles with the techniques and approaches of management. While functions are common, the specific technique may vary according to environment and circumstance of the organization. In the words of Mary F. Murnighan, "While practices and applications will vary widely from one situation to another, fundamental concepts and principles of management and of human nature remain much the same even when they take effect in different combinations."

3. Transferability of management: Principles and skills McFarland argues that principles, concepts and skills of management are universal. Managers may shift from one company to another, from one industry to another and from one type of organization to another. He regards that such shift is an indication are at work. In his own words, “The knowledge of management principles and skills in managing enables the executive to learn specific applications and problems as he applies his skills to the new setting.”

b. Arguments against Universality Concept

Peter Drucker, Ernest Dale, Mc Millan, etc., do not support the universality concept of management. They forward the following arguments in their support:

1. Difference in objective of Different Enterprise – Drucker is of the opinion that the skills, the competence and the experiences of management cannot be transferred and applied from one enterpriser to another enterpriser because they differ in their capabilities of the management required. So these all things can not be transferred as such without introducing change. So it is wrong to say that managerial theories have universal applications.
2. Difference in Philosophy: Ernest Dale opines that because of differences in philosophies of different enterprise a manager cannot be a good manager in all type of enterprise. He cannot manage a religious academic, military and business institutions with the same success and capability. The reason for it is very simple. The philosophies that under-lie each type of organization are very much different.
3. Management is Culture-Bound: Some management expert opines that management is culture-bound hence the applicability of management principles may be limited to particular situation of culture. As farmer and Richman say. “If a country has a strong traditional, religious and cultural bias toward non-scientific behavior it will prove difficult to introduce modern managerial methods, which are based on the same type of productive rational view of the world as the more purely technical devices.

11.5. Summary

The study of the functions of management is an important point in the theory of management. Management is the art of getting things done through and with people so the overall job of a manager is to create within the organization an atmosphere which will facilitate the accomplishment of its objectives. For this purpose he has to perform a series of functions.

‘Levels of Management’ refers to a line of demarcation between various managerial positions in an organization. In most organization, there are generally three levels of management in the organization hierarchy, namely, (i) Top management, (ii) Middle level management, and (iii) first line or supervisory management

A number of principles of management have been developed to assist managers in performing their function well. A large number of principles has been contributed by the management authors belonging to the traditional school of management thought. Henry Fayol a French industrialist, offered fourteen principles of management first time in 1916.

11.6. Technical Terms

Planning is deciding in advance what is to be done, it is first and foremost function of management.

Organizing: is very essential for accomplishing the objectives of the enterprises set by administration and planned my management.

Staffing: is an executive function which involves the recruitment, selection, training, placement, compensating promotion and demotion and finally the retirement of an employee.

Directing : means moving to action and supplying simulative power to group of persons.

Controlling: is a measuring and corrective device.

11.7. Model Questions

1. Explain about various managerial functions
2. Write about management functions at various levels of management.
3. Discuss about principles management and their importance.
4. Write about universality of the principles of management.

11.8. References

1. O'Brien – Management Information System
2. Murdick – Management Information System

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Lesson 12: Decision Making

Objectives

The objectives of this lesson are:

- Understand about the Decision Making
- Understand the stages of Decision Making
- Understand the types of Decision Making

Structure of the Lesson:

- 12.1. Introduction
- 12.2. Decision Making Defined
- 12.3. Classification of Decisions
- 12.4. Procedure of Decision Making
- 12.5. Levels of Decision Making
- 12.6. Types of Decision Making
- 12.7. Stages of Decision Making
- 12.8. Summary
- 12.9. Technical Terms
- 12.10. Model Questions
- 12.11. References

12.1. Introduction

It is the most important job of management and we can say that good decision making ability is the key to a successful carrier in management. Management with out decision is like a man with out backbone. As Managers are required to take decisions very frequently, and efficiency of concern, loss or profit, environment is effected by these decisions, great amount of attention is being paid Management are over and have been replaced by new concepts and scientific techniques.

In general, decisions are the output of the following inputs:

1. Knowledge and information
2. Ability and skill: (a) communications (b) Analytical (c) Conceptual.
3. Value system: (a) Opinions (b) attitudes (c) habit (d) Beliefs.

The task of Management involves a large number of decisions. For example, in starting a factory some of the decisions which are to be taken by the Management are:

- (a) What is to be produced?
- (b) How much to produce?
- (c) What must be the organization ser up?
- (d) Where to install this factory?
- (e) How and which type of workers to be employed?

- (f) How the raw materials are to be produced?
- (g) What must be specifications and the quality of the raw materials?
- (h) Form where these raw materials are to be produced?
- (i) Where to sell the final product?
- (j) What should be the selling price of the product?
- (k) What must be the quality, specifications and strength of the product?
- (l) Number to varieties of the products to be produced and so many other decisions are to be taken by the manager. List of these questions itself shows that how much these decisions may affect the whole of the factory.

12.2. Decision Making Defined

Thus we see that main function of the administration and Management is to make decisions and to see that these are being carried out, not only in the starting of a concern but also in the course of running a plant large number of decisions are required to be taken. Such problems may arise due to the change in the situations and due to other unforeseen circumstances during the course of production. These problems can be solved through decision making for proper running of the concern. Such problems may be related to organizational structure procedure, coordination, division of work and responsibility deviation of quality standard, reduction in output etc.

“Decision Making” implies commitment to something -- a point of view a principle and a course of action etc.

In other words, a decision is a course of action or inaction selected to meet the requirement of a solution of problem.

“Decision Making” is an intellectual activity, because it calls for both judgment and imagination to select one from among many alternatives.

A “Decision Making” is something that takes place prior to the actual performance of the action that has been decided upon.

Decision Making and Administration. As explained above it is the proper decision which affects the efficiency; working and profitability of the concern. Thus Management should take correct decisions at correct time. Sometimes this work becomes more complicated when there are more than one alternative solutions of a problem. Manager must be able to select one best alternative.

Some persons are of the opinion that capacity for making decisions is a god gift and training cannot develop it in him, if he is not having this capacity originally. But others are of opinion that of course, good decisions makers must be training he can improve his decision making ability and can become a very good manager.

Figure 12.1 explains the Management System using “Decision Making” as its central focus. The various sub systems are involved in different types of decisions but they do not act independently.

Characteristics of Decision. The main characteristics are:-

- (i) It is the choice of the best course among the alternatives.
- (ii) It is the end process proceeded by deliberation and seasonings.
- (iii) It is the associated with commitment.
- (iv) It is rational.
- (v) These relate the means to the end.
- (vi) Evaluation process exists in every course of decision making.
- (vii) These may be negative and may just be not to decide.

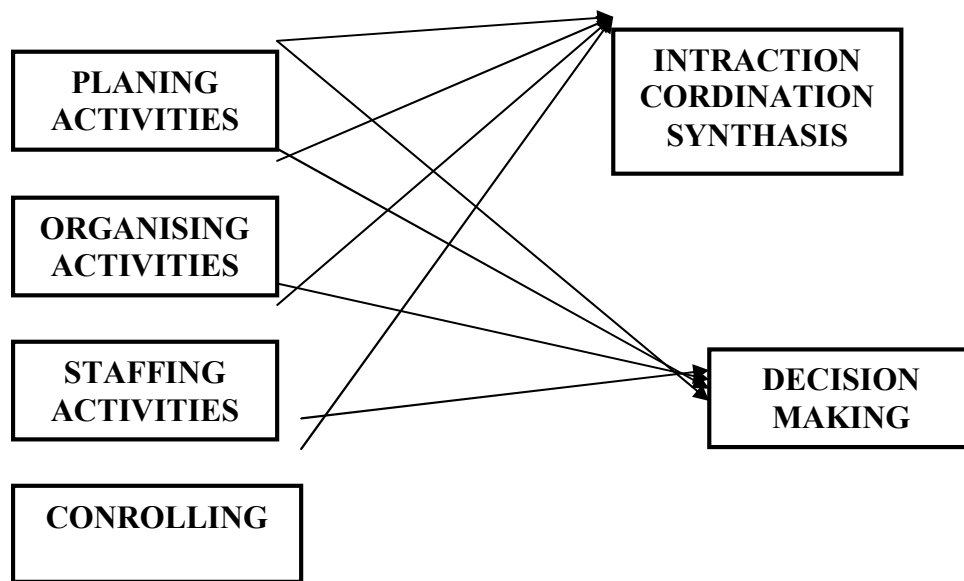


Figure 12.1 Management system using decision making as its central focus.

Current Trends in Decision Making:

They are

1. Increasing use of tools and models in decision making.
2. Increasing use of behavior science to the problem of administration decisions.
3. Greater use of computer applications and advances in Management information systems, which is the backbone of decision making process.
4. Development of theories, analytical concepts, and models based upon research findings.
5. Conceptualization of administration decision as a complex system of process, activities and subsystems under dynamic conditions.

12.3. Classification of Decisions:

Decisions can be classified in the following ways:-

1. Major and minor decisions.
2. Routine and strategic decisions.
3. Policy and operating decisions
4. Programmed and un-programmed decisions
5. Departmental and non-economic decisions
6. Organizational and personal decisions

1. **Major and Minor Decisions:** These can be categorized on the basis of their intensity. For example purchase of a new precision machine of worth Rs.5 lacs is categorized as major decision, while purchase of stationary (pencils, papers, pens etc.) for office use will be the minor decisions.

2. **Routine and strategic decisions:** the decisions which arise during the course of Production and are settled on the basis of past practice termed as “Routine Decisions “. For examples, deputing a worker

in particular shifts is routine decision while “lockout” of the factory or stopping the production of one item in the factory is “strategic decisions”.

3. **Policy and operating decisions:** whether the piece rate system or time rate system is to be followed in the factory for calculating the wages of the workers is the “Policy decision” and is required to be taken at high level. While the calculation of the wages is the example of “operating decision”.
4. **Programmed and Unprogrammed decisions:** these are classified on the basis of procedure adopted. Programmed decisions are those which are repetitive and of routine nature for which definite procedures have to be worked out e.g. granting of earned leave to the workers, allowing annual increment to workers etc. Unprogrammed decisions are those, which are taken at the time when they arise because this or similar problems have not arisen earlier. Example of such decision is whether to stop or to start manufacturing decisions.
5. **Departmental and non-economic decisions:** these are taken by the departmental heads and relate to the individual departments only. Decisions relating to the non-economic factors such as technical values, normal behavior etc. may be known as non-economic decisions.
6. **Organizational and Personal Decision:** when the managers take decisions in their official capacity, it is termed that they have taken an organizational decision. On the other hand, personal decisions relate to the manager as an individual and not as member of the organization.

12.4. Procedure of Decision Making

Good decisions can only be made if following steps are taken before making decisions:

1. Recognizing and analyzing the problem :
 2. Finding relevant facts.
 3. Determining possible alternatives.
 4. Evaluating the impact of alternatives.
 5. selecting the best solutions
 6. Implementation of the decisions
1. **Recognizing and analyzing the problems:** the main job of a manager is to find out the real problem before arriving at a decision. There may be a large number of symptoms that could be the real issue. Hence first step is to recognize and identify the real problem, and not simply the symptoms. It is just like a job of physician analyzing all the symptoms before identifying the cause of illness. For example, a manager notices a symptom of reduction in production. The problem is to find out why production is declining, whether it is due to reduction in the availability of raw material, power, or labor crisis, rising inefficiency in the plant or in employee.

To solve the difficult problems many managers normally break a problem into parts into parts of easier diagnosis and solution. For this generally different varieties responsible for each part are found and seen whether it is controllable and if so then who will control and how it is to be controlled.

2. **Finding relevant facts:** after recognizing and analyzing the problems next step is to collect all the relevant data. A decision must always be based on facts instead of guesses and random thinking. As such, decision taken on the basis of facts, reduces the degree of uncertainty and risk. This also helps the manager to know the probable results of the decision.
3. **Determining possible alternatives:** Generally problems have more than one alternatives and it is very rare that a problem has only one solution. To find out possible solutions manager has to keep an open mind, because we neither must nor consider only one solution which he wants to implement, he must

consider all the possible solutions including a competitor's solution or those used in the past. After developing different alternatives next step in decision-making is to evaluate the consequences of each proposed alternatives.

4. **Evaluating the impact of alternative:** This is very important function of a decision maker, as decision depends very much on the skill and care used in evaluating each alternative. After listing alternative solutions decision maker must mentally put it into effect and visualize the impact of the alternatives and thus he forecasts what will happen if a certain alternative is adopted. While evaluating the impact of alternatives, manager must keep in mind all the limitations of the concern.
5. **Selecting the best solution:** Best solution is then selected by comparing the merits and demerits, gain or losses etc. of each alternative. Decision maker must also consider degree of risk, availability of resources limitations and time required for implementation.
6. **Implementation of decisions** After selecting a best solution, it is required to be converted into effective action. Actually manager makes the decision but he himself does not apply it. Hence the decision must be communicated to the persons applying it in simple, clear and easily understandable languages. For better implementation it is necessary that subordinates must feel sense of participation, for which they may be associated at some stage in decision making process. In the beginning, manager himself must take personal interest in implementing the decision.

Decision under Certainty:

The decisions may be taken as discussed before when the problems are under certainty i.e. where a complete knowledge about the nature of future conditions is known. Let us take a simple example. It is not uncommon for constructing firms to set up service facilities in an area in which they have unusual temporary activities. They are many times come across to find the economy of setting up; such facilities and the economy of various locations within the area.

Thus the decision must be in favor of source A on the basis of economic analysis.

Decision under Uncertainty :

Further as every body knows that now a days a businessman or manager is able to have a complete idea about the future conditions as well as various alternatives which will come across in near future. Such problem when exist then decision taken by manager is known as decision making under uncertainty.

When such condition of uncertainty is there then to make decision, a businessman or manager has two alternatives. First one is to apply some short method such a thumb rules etc. when it is found that the future is so unpredictable that no refined analysis is possible; the other alternative is to deal systematically with the uncertainty itself, with careful use of probabilities in addition to the application of statistics whenever possible. In general, it is always better to have an intermediate position between the above two alternatives, to avoid the minute analysis of every element of uncertainty. Now it is very clear that theory of probability plays an important role while making decision under the condition of uncertainty. The condition of uncertainty can easily be understandable

Everybody makes decisions. It's a natural part of life, and most of the time we don't even think about the process. In an organization, decisions are made at every level. The level at which the decision is made can also determine the complexity of the decision in relation to the input of data and output of information.

12.5. Levels of Decision Making

Previously we discussed the various types of Information Systems and how they relate to the levels of an organization. We can also relate those Information Systems to the types of decisions managers make.

Strategic Decision Making. These decisions are usually concerned with the major objectives of the organization, such as "Do we need to change the core business we are in?" They also concern policies of the organization, such as "Do we want to support affirmative action?"

Management Control. These decisions affect the use of resources, such as "Do we need to find a different supplier of packaging materials?" Management-level decisions also determine the performance of the operational units, such as "How much is the bottleneck in Production affecting the overall profit and loss of the organization, and what can we do about it?"

Knowledge-Level Decision Making. These decisions determine new ideas or improvements to current products or services. A decision made at this level could be "Do we need to find a new chocolate recipe that results in a radically different taste for our candy bar?"

Operational control. These decisions determine specific tasks that support decisions made at the strategic or managerial levels. An example is "How many candy bars do we produce today?"

Types of Decisions: Structured versus Unstructured

Some decisions are very structured while others are very unstructured. You may wake up in the morning and make the structured, routine decision to get out of bed. Then you have to make the unstructured decision of what clothes to wear that day (for some of us this may be a very routine decision!). Structured decisions involve definite procedures and are not necessarily very complex. The more unstructured a decision becomes, the more complex it becomes.

12.6. Types of Decision and Types of Systems

One size does not fit all when it comes to pairing the types of systems to the types of decisions. Every level of the organization makes different types of decisions, so the system used should fit the organizational level, as shown in Figure 12.2.

It's easy to develop an information system to support structured decision making. Do you increase production on the day shift or hold it to the swing shift; do you purchase another piece of equipment or repair the old one? What hasn't been so easy to develop is a system that supports the unstructured decision making that takes place in the upper echelons of a company. Do we expand into foreign markets or stay within the confines of our own country; do we build a new plant in Arizona or Alabama; do we stop production of a long-time product due to falling demand or boost our marketing? The ability to create information systems to support the latter decisions is long overdue.

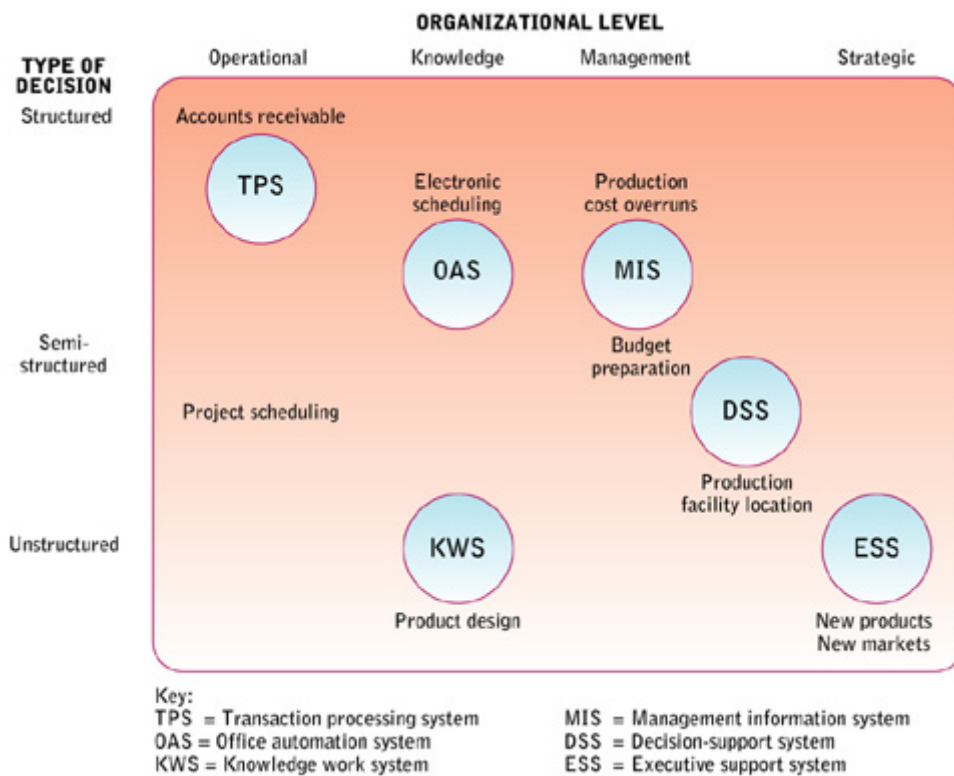


FIGURE 12.2 Information systems support different decisions at different organization levels

12.7. Stages of Decision Making

Some people seem to make sudden or impulsive decisions. Other people seem to make very slow, deliberate decisions. But regardless of appearances, the decision-making process follows the same stages of development and implementation. Let's use the example of purchasing a new television, using Figure 12.3.

Intelligence. You identify the facts: You don't have a television or the one that you do have isn't any good. You intuitively understand what the problem is and the effect it's having on you. You missed your favorite show last night.

Design. You design possible solutions: You could watch the television in your neighbor's apartment or you could purchase a new one for yourself. Your neighbor will get annoyed if you keep coming over. On the other hand, you won't be able to go on vacation if you use your money to buy a new television.

Choice. You gather data that helps you make a better decision: Your neighbor doesn't like the same shows you like or she's getting rather tired of you being there. You also determine that televisions cost a lot of money so you figure out how you can afford one. You choose to purchase a new television instead of watching your neighbor's.

Implementation. You implement the decision: You stop at the appliance store on your way home from work and carry out your decision to purchase a new television.

Feedback. You gather feedback: You're broke but you can watch anything you want!

Of course this is a simplified example of the decision-making process. But the same process is used for almost every decision made by almost every person.

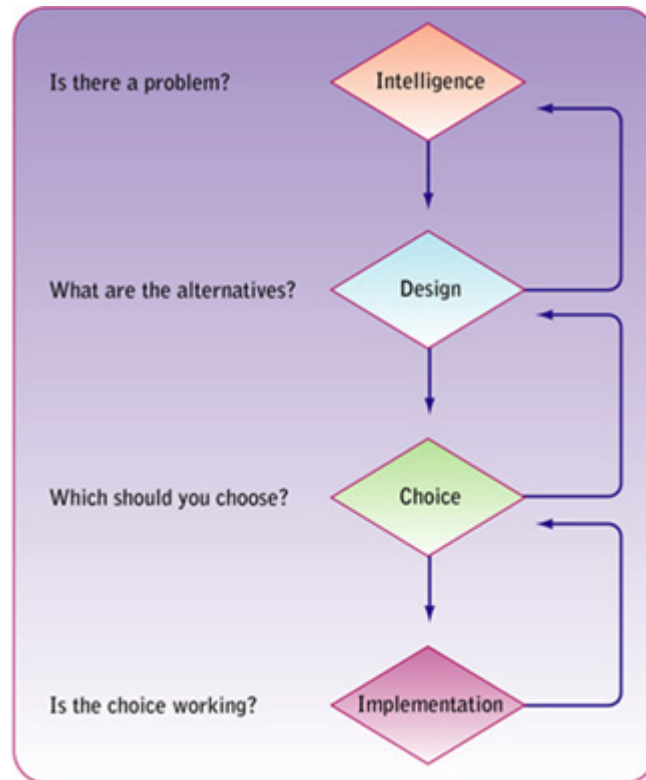


Figure 12.3 The decision-making process

Information Systems help improve the decision-making process by

- providing more information about the problem
- presenting a greater variety of possible alternatives
- showing consequences and effects of choices
- measuring the outcome of different possible solutions
- providing feedback on the decision that is made

12.8. Summary

It is the most important job of management and we can say that good decision making ability is the key to a successful carrier in management. Management with out decision is like a man with out backbone.

Some decisions are very structured while others are very unstructured. You may wake up in the morning and make the structured, routine decision to get out of bed. Then you have to make the unstructured decision of what clothes to wear that day (for some of us this may be a very routine decision!). Structured decisions involve

definite procedures and are not necessarily very complex. The more unstructured a decision becomes, the more complex it becomes.

12.9. Technical Terms

Intelligence. understand what the problem is and the effect it's having on you.

Implementation. You implement the decision

Feedback. gather feedback: You're broke but you can watch anything you want!

12.10. Model Questions

1. Explain various stages of decision making
2. Discuss about various levels of decision making
3. Write about classification of decision making
4. Explain procedure of decision making with one example.

12.11. References

1. O'Brien – Management Information System
2. Murdick – Management Information System

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Lesson 13: Information Technologies and Tourism

Objectives

Objectives of this lesson is

- Understand the Importance of having the latest information technology in the tourism sector
- To establish that improved tourism information systems lead to an improved information quality

Structure of the Lesson

- 13.1. Introduction
- 13.2. Information Technologies and Tourism
- 13.3. Advanced Tourism Community Support
- 13.4. Summary
- 13.5. Technical Terms
- 13.6. Model Questions
- 13.7. References

13.1. Introduction.

.Earlier you have read about the importance of Information in today's world. You read about the use of information in the process of decision – making and also the use of computers and other information technologies in aiding the aforesaid process. In this unit, you will learn about the use of information technologies, like, computers in tourism and also the various sources of information in the context of tourism.

13.2. Information Technologies and Tourism

Today, the consumers have become very informative and also inquisitive. They require every kind of information possibly available regarding the goods that they are purchasing or the services that they are about to avail. The need of information is more important in the service industry such as tourism, where the goods being sold are intangible. In other words, the customers here are unable to see or touch the product that they are about to purchase but, they can only imagine, may be, the comforts of a flight they are about to take or the beauty of their travel destination. And, in such cases it becomes importance to

provide more and more information so that the client can imagine the feeling of the product. Computers are being used in a big way by the tourism sector for handling all types of tourism information needs. The number of tourists is increasing and so is the number of destinations. This has led to a boom in the tourism services, which in turn has led to a great demand of information. The right kind of information at the right time and place is more important now than ever before. Information about destinations and services is available in a variety of forms, i.e. from the traditional brochures to CD-ROMs and through the web-sites at internet. Technological advances have effected the selling of tourism products and services. Today, tourism operators can show the clients the photographs of a remote holiday resort at the press of a few keys and give them a better perspective of the services they are about to buy.

In the earlier Units, you have also read about the computers and the various applications and extensive use in the various areas of management functions, especially in context to information systems. In this unit, you will be reading specifically about the application of computers in the tourism. You will be introduced to the use of information technologies in the different specters of tourism, such as, **Information and Reservation System (IRS)** in travel industry, special software packages used in the tour operations and also in the Hotel Industry. You will also be introduced to media and Internet, both of which can be extensively used for providing and receiving information.

Our main objective is to establish that improved tourism information systems lead to an improved information quality. In the long term we furthermore want to establish, to what extent this improved information quality leads to improved travel quality



Figure13.1: Travel IS influence information quality. Information quality influences travel quality

Travel IS cover both the technology (e.g. a forum) and the induced usage behavior (as observed in the member contributions to the forum). This makes sense, because technology only leads to changes through its use. Figure13.2 introduces an elaborate version of the framework, further defining the constructs.

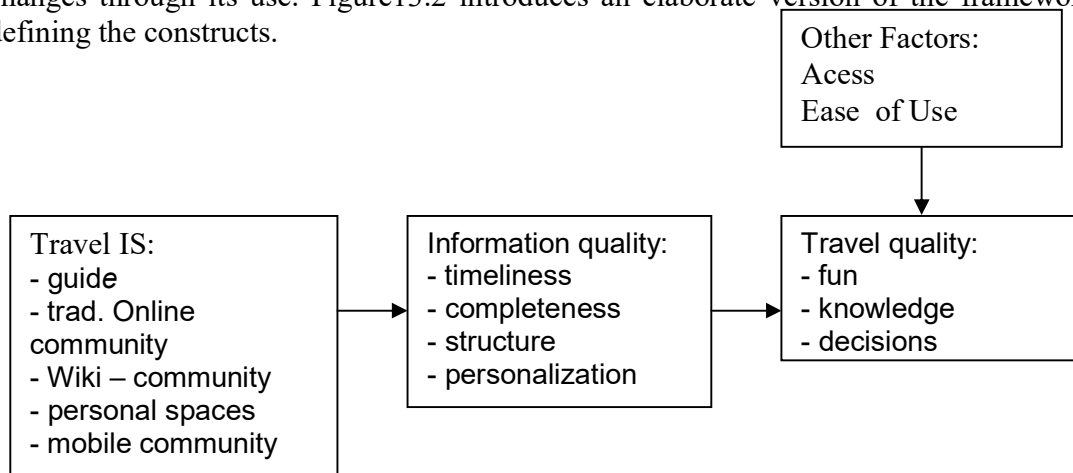


Figure13. 2: Framework for studying the informational value of different forms of tourism information

Travel IS: The framework covers five possible forms of travel information systems: A printed travel guide (e.g. Rough guide), a traditional discussion oriented online community, a Wiki community, a community with personal spaces and a mobile community. The latter three are emerging modern community based information systems.

a) Currently the guide book is still the prominent media for tourists. As an information system it is quite simple as there is a separate group of information producers and information consumers. Interaction between both is possible but typically with a large time lag .

b) Traditional online travel communities have been well-established for years. Typically they create, structure and archive their information in discussion trees. This feature makes it easy to participate in ongoing discussions.

c) The Wiki community allows the community to keep knowledge in a structured form as shared material in a Wiki. A Wiki is a kind of web server that provides a mechanism for creating and editing web pages through a web client, i.e. users may simply click an “edit” button and edit the content of pages. Thus, any visitor to a web page may also become an author. The largest Wiki-based travel community is Wikitravel [<http://www.wikitravel.org>] that strives to establish a world-wide travel guide following the example of the joint development of an encyclopedia in the Wikipedia project [www.wikipedia.org]. The information quality of the Wikipedia has been rated superior to commercial encyclopedias by a professional journal [Kurzydum 04]. Wiki based information spaces can and will be connected to traditional communities in order to allow for efficient transfer of information (fluidity). Transfer occurs both ways: knowledge as outcome of the discussions in the forum goes into structured, coherent texts in the shared space and content in the shared space is still connected to the discussion space to preserve legitimacy and transparency (how and by whom was this knowledge created). This model allows the content to be easily discussed and thus maintained up to date. Finally, discussions containing information that is too specific and individualized to fit into the structured knowledge may still be attached to the shared content and thus still be easily retrievable. Attaching discussions to shared content also gives users a starting point, as they can quickly overview existing discussions they may join in if the structured knowledge base is not sufficient.

d) In an online community with personal spaces, each user can create his or her personal view on the community’s content (e.g. during travel preparation) and augment the community content with his personal content (e.g. to create a travel diary). The personal spaces can be private or publicly accessible. Technically such private spaces merge communities and Blogs (public online diaries). An example is the Virtual Tourist [www.virtualtourist.com]. This community has been online since 1998. It is not a companion product to a guidebook, but is profit-oriented: advertisement banners and product catalogues are prominently placed and based on user behavior. Virtual Tourist offers its members the creation of personal home pages about their travels. These pages differ from traditional Blogs in two ways: content is not presented in chronological order and the content is semi-structured. When entering text, users chose categories to describe the specific information, e.g. they select category hotel and are then presented a form with fields for address, opinion, price category etc. Thus, the content of these Blogs is retrievable by categories. Additionally, users may freely design personal pages about themselves and introductory pages about their trips. User names are the same in forums and the Blogs, so a user’s forum questions and replies and

comments on other's Blogs can be retrieved. Other information available is page views, registration date, rank based on ratings and user-provided data.

e) In a mobile community the members can access and enter information with mobile devices (e.g. a Smartphone). The small size of the device requires the use of different information visualization, interaction and navigation methods. Furthermore, location/position information can be used to index travel related information and therefore provide context-dependent information. We also see new possibilities for travel coordination e.g.: users may meet other travelers or friends in defined locations ("flash traveler mobs"). It allows retrieving community information with a smartphone, to annotate objects with their location and to retrieve location-specific information. The traveler can use all five systems in combination and will likely receive the best benefit by using each information system where its strengths are and avoids usage where they are weak. In order to identify those strengths and weaknesses, this paper will analyze books and online travel communities and then isolate the specific value each modern community support system adds to traditional online communities.

Information quality: Each of the travel IS can improve information quality in a specific way. The framework identifies four quality factors: Timeliness, completeness, structure and personalization. *Timeliness* refers to the fact, whether information is up-to-date. Clearly, timeliness is more an issue with fast-changing information (e.g. about events in a travel destination) than with stable information (e.g. on a country's history). Thus, more timely information offers the opportunity for more participation in the social and cultural life of a travel destination. *Completeness* refers to the ability of a medium to serve information needs. There are two aspects of completeness: How completely does an information system answer the traveler's information request (i.e. does she find an answer for all question) and how complete is the retrieved information. Timeliness and completeness are of particular importance for critical information, e.g. on travel safety. *Structure* refers to presentation and structure of information, which may greatly affect efficiency of information access. Information structure is particularly important for gaining a deeper understanding of the travel destination. *Personalization* refers to the possibility to access information that is specifically relevant for someone's own context. Like timeliness, personalization can greatly enhance the traveler's participation in social and cultural life. Information quality factors will be discussed in more detail in the sections below describing our hypothesis. Whereas information quality of guidebooks is assured by its editors, in virtual communities it is assured through discussions and thus depends on the community's liveliness.

Travel quality: We propose that improved information quality can lead to improved travel quality. Travel quality can be measured as the fun a person has had during the travel and the knowledge (e.g. about a country) a person has gained. Besides information quality other technology related factors contribute to travel quality: *Access* refers to the technical possibility of accessing information. While a guidebook may be carried around, access to electronic data is dependent on a mobile device or access to computer systems. *Ease of use* refers to the efforts a user has to undertake in order to use the information product/service.

13.3. Advanced Tourism community Support :

In the prior section we have proposed that current online communities are superior to guidebooks with regard to information timeliness, information completeness and information personalization. We furthermore proposed that information structure is inferior to guidebooks. The next sections take the current online tourism communities as a reference and propose hypothesis how new forms of online tourism communities can improve their information quality. Those new forms contribute collaborative spaces, personal spaces and support for mobility. As most of those systems have only recently been developed, those hypotheses are more speculative than the hypotheses proposed so far. We will therefore be shorter in arguing for their support. Before moving on to the hypotheses, we will briefly summarize weaknesses of traditional discussion based online tourism communities:

1. Lack of content structure: The discussion based tree structure of information widely disperses information about the same object or similar objects through the system.
2. Insufficient possibility to explicitly build on prior knowledge. This weakness is a direct consequence of the lacking content structure. Members are discouraged to provide unsolicited information leading to sub-optimal information completeness.
3. No possibility to update stored information. Incomplete, incorrect or out-of-date information cannot be directly corrected or updated. As automatic retrieval can pull information out of its discussion context, even corrections in an on-going discussion may be ignored by a searching community member. This leads to a sub-optimal information timeliness.
4. Lack of personal spaces: At the heart of personalization lies a personal space for each community member. Thus, traditional online communities provide suboptimal information personalization.
5. Only stationary information access: Traditional online communities still run mainly on PCs. PC access is well-suited for travel preparation and post-travel sharing of experiences, but ill-suited during travelling. Opportunities for information access and information input during travelling are missed leading to a sub-optimal information timeliness and information completeness.
6. Lack of location specific data. Location based information is particularly important for travelling, but not made explicit in online travel communities. This lack leads to a suboptimal information structure. Location information on the traveler opens the opportunity to provide much better contextualized information. The lack of this location information thus leads to suboptimal information personalization.

13.4 Summary

Computers are being used in a big way by the tourism sector for handling all types of tourism information needs. Travel IS cover both the technology (e.g. a forum) and the induced usage behavior (as observed in the member contributions to the forum). Each of the travel IS can improve information quality in a specific way. The framework identifies four quality factors: Timeliness, completeness, structure and personalization. *Timeliness* refers to the fact, whether information is up-to-date. *Completeness* refers to the ability of a medium to serve information needs. *Structure* refers to presentation and structure of information, which may greatly affect efficiency of information access. Information structure is particularly important for gaining a deeper understanding of the travel destination. *Personalization* refers to the possibility to access information that is specifically relevant for someone's own context.

13.5 Technical Terms

IRS : Information and Reservation System
CD-ROM : Compact Disk-Read Only Memory
IS :Information Systems

13.6 Model Questions

1. What is information?
2. Define IRS?
3. Explain about Information Technology?
4. Difference between Information quality and Travel quality?
5. Limitations of Tourism Community?
6. Explain different framework quality factors?

13.7.References

World Tourism Organization 1998Guide lines for the Transfer of new technologies in the field of tourism

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Lesson 14: Tour and Travel Services and Computers

Objectives

The objectives of this lesson is

- Comprehend the use of the various computer software packages in the travel and tour services.

Structure of the Lesson

14.1. Introduction

14.2. Travel Services and Computers

14.2.1. Car Rental

14.2.2. Railways

14.2.3. Airways

14.3. Tour Services and Computers

14.4. Hotel Services and Computers

14.4.1. Reservation

14.4.2. Food and Beverage Services

14.4.3. Billing

14.5. Summary

14.6. Technical Terms

14.6. Model Questions

14.7. References

14.1. Introduction

The travel services, all over the world and in many parts of India are fully computerized. The travel services, such as, railways, car rental, bus/coach hire or trip and airlines tickets, all are computerized and thus proper information management is possible. Information regarding the tourists or passengers of yesterday, today and tomorrow is now readily available through the data generated by various tourism organizations.

14.2. Travel Services and Computers

The various fields of travel services using computer applications can be summed up as:

14.2.1. Car Rental

Car Rental is a big business world over and in the metropolis and big cities of India. The main clients of car rental are the corporate or business travelers along with the tourists waiting better service and comforts while traveling.

The car rental business is fully computerized abroad, especially in America and Europe, and the Information and Reservation System, such as that of **Amadeus, Sabre**, etc. are being used for car rental and information. In India, a very few companies have computerized their car rental services. Couples of these companies are solely dealing with the rental of vehicles, such as Wheels, etc. and the rest of the companies are the transport divisions of travel and tour operating agencies, such as TCI, Thomas Cook, Graham Tours and Travels, etc.

In the case of computerized car rentals, instant conformation is possible even in case of International booking using the IRS, such as, **Amadeus, Galileo** and so on. Locally, in the same city, computerized systems help in tracing free cars and cabs easily and quickly. And it becomes possible to trace a vehicle in a garage close to the place of booking, and sending it over, as and when required.

14.2.2. Railways

In India, Railways is the most favored form of travel. The computerization of the railway services was introduced a few years back. The software package used in ticketing and other customer Services has been specially designed and developed for the Indian Railways and the railways It provides the training required for operating the package to its employees.

The computerized system broadly centers around the PNR (Passenger Name Report) number provided on each ticket of the customers. Each one of these PNR number is unique and identifies not only the person traveling on the ticket along with the passenger's personal details but also the train and the destination of travel. Now a person can book tickets well in advance of the date of travel and get reservation on the spot. The computerized ticketing system has also shown way to computerized customer service facilities, in most of the cities of India. A dial-in facility for information is also available. In this system, different phone numbers have been provided for different information, such as one phone number for arrival and departure of trains, another number for inquiries and so on. A person can dial the number for the

information required and get the information on following the directions of the computerized system. The computerization of railway services has made traveling in India not only easier, but also stress free in terms of reservations.

14.2.3. Airlines

The airlines have seen the maximum computerization in the travel segment. Computer Reservation system (CRS) is widely used to book tickets in all the airlines. The CRS helps in generating a higher rate of occupancy and also provides a better scope of marketing and distribution to the airlines.

The increasing popularity of air-travel globally, gave rise to the need of a better and efficient distribution mechanism. In the 1970s, the first Information and Reservation System (IRS) was developed in U.S. This system provided both information of tourism industry, including that airline industry and also provided CRS for direct booking on the airline of choice. The IRS initially provided information regarding the flight schedules, flight timings, flight availability and the booking facility on CRS. The IRS are being used by the Airlines so as to market and distribute their products better and, in this process, also improve efficiency and passenger capacity as well as strengthen their position in the market. Travel agents are using this system to gather information about the travel segment, get the details of flight schedules and also for bookings on the Airline. Tourism Offices, Tour Operators and other service providers of tourism are using this system to provide better customer service by being more informative, and also to search for new markets for travel. A few global companies of IRS are AMADEUS, GALILEO and SABRE.

AMADEUS, a popular European IRS, was founded in 1987 in Air France, Iberia, Lufthansa and SAS (NO LONGER A SHAREHOLDER). AMADEUS, now known as AMADEUS Global Distribution System is an electronic information and booking system. It shows flight information of over 700 airlines and provides booking on over 430 airlines. This information system now also provides information and reservation facilities in many hotel properties and car rental companies globally. AMADEUS also provides up to date information about Hotels, Rails, Ferry, Tours, Cruises and many popular destinations. This is the first to have partner in railway networks.

The AMADEUS data is held in Erding, Germany, which is also the centre of AMANET which uses various links to deliver over 26 million bits of information every second. AMADEUS has established more than 50 companies worldwide with the help of local partners. These are the National Marketing Companies (NMC), where AMADEUS is a part or sole shareholder. These NMCs market Amadeus products in their own country and provide training, customer service, and help desk facilities. NMCs work in coordination with the regional offices to provide additional support to the NMCs in all areas.

GALILEO was also developed in 1987 by a group of airlines to provide CRS facilities, now it's a in venture of many Airlines. It was established in Swidon, England. The primary purpose of Galileo was to provide airlines reservation and information and thus, provide CRS facilities to the travel agents. The distribution channel locally are known as National Distribution Companies(NDC) which promote Galileo products in their country and also help in providing non-airlines travel services, such as, hotels, cars, tours and so forth.

SABRE is the largest American IRS. It is marketed in Pacific in a joint venture. This provides CRS facilities primarily in US and is very popular as an IRS. In THE 1990s, it has tried to break into the European Market and it's been very successful. There are also other IRS available in the vastly competitive airlines sector, such as, WORLD SPAN, and others.

Many IRS now provide information regarding all sectors of tourism industries and also provide direct reservation of hotels, tours, cruises, car rentals and so on, but it is still more popular as an Airlines CRS.

All the IRSs are planning to be the largest information providers, globally, in the future. Though they have started facilities of booking various services through their NMCs and NDCs, they are still more popular as CRS and information providers of Airlines.

14.3. Tour Services and Computers

The tour operators are also using computers on a large scale. The preparation of tour proposals, itinerary, costing and pricing, invoice preparation, vouchers preparation all are done on the computers. Software packages made especially for the tourism purposes are readily available in the market. Many big companies like SITA, TCI and others have their own customized software package developed for the purpose of tour operation handling. Were as many companies are installing the readily available software package from the market and in some case customizing the packages to suit their own needs.

The software package used in the computers for tour operations can usually be used for handling both customized packages as well as readymade tour packages. In the case of readymade tour packages the tours, inclusive of price are printed on brochures. These brochures also have the details of services that will be provided. The same is typed in the computer, say, TOUR 1: GOA TRIP -3 days and 2 nights, or TOUR 2: TRIP TO PORT BLAIR- 5 days and 4 nights. The complete proposed itinerary, invoice and vouchers are all connected to each other. The invoice in the bill is given to the client for the service utilized and also a copy of the same is provided to the finance section for processing. The voucher is the coupon provided to the clients, who in turn will give the same to the places where services have been partaken by them. The clients mostly pay for their tour well in advance and the tour operators in turn pays to all the service providers, such as, hotels, guides etc. The client only uses the vouchers and pays to the services providers through these vouchers. The service providers in turn send the vouchers to the tour operators so as to confirm that the client has availed their services and subsequently the tour operators pay the service provider. Sometimes the tour operator has to pay well in advance to book the services, but in this case also, the client will use the vouchers and the service provider will pass the voucher to tour operator. Once the tour booking is done by a client for say TOUR 1, the name of the client is introduced for TOUR 1 and with proper commands the copy of itinerary for the client along with the invoice and the vouchers will be processed on their own. The same will be true for more clients for same or any other tour packages. These auto processes save a lot of monotonous work and time of the tour operating personnel involved.

Usually, in the case of customized packages of itinerary is provided on the software which is connected to costing, which in turn is connected to both invoice and voucher processing. The package usually has access to a file regarding confidential tariff. A confidential tariff is the tariff charged by a tour operator for a particular service. The tariff includes the special hotel rates provided by the various hotels with a lot of concession and commissions. And also the rates of different other services like sight seeing, transfer to and from hotel and so on forth. An executive while making an itinerary in the computer can always follow it up with on computer costing. The costing can be done on the computer by comparing the services and the hotel provided for, as per the clients budget and preferences, from the itinerary and getting the tariff for the same in the corresponding tariff file. The costing completed, the concerned executive can initiate the processing corresponding invoice and voucher by giving proper commands with the pressing of a few computer keys. The computerized processing thus saves a lot of time and also brings down the number of mistakes.

Though a lot many companies have totally computerized their tour section, many smaller agencies have only partially computerized their work pattern. Then use computer to type the itinerary, do the respective

costing, make invoices and vouchers, but a package is not used. And due to this all the aforesaid is done separately. Though a lot of time is spent, but the result is always neatly typed and easily understandable to both the services providers and the clients.

Tour operators also make use of information technology in designing their products. Destination databases provide all information related to accommodation, sight seeing, attractions, etc., which come handy in preparing itineraries and day schedules. Similarly, tourist databases help in targeting market segments to be created to.

14.4. Hotel Services and Computers

The hotel industry is using computers in all departments like front office, house keeping, etc. Computers are used to provide essentially and efficient and better services. They are used for booking bills, taking care of room services and also other food and beverage services.

14.4.1 Reservation

The room reservation system of star hotels has been computerized almost all over India. Reservation system is very important as a proper system takes care of selling of rooms, keeping in view both the daily fluctuations concerning arrivals and departures. In a properly managed property, much depends upon accepting and rejecting of reservation requests. The room reservation requests are considered on the status of guest, i.e., whether the guest is a business traveler or a tourist or say a VIP or a business partner or may be a black-listed guest and so on. The booking of rooms should be done keeping in view the season, i.e., whether it is peak season or a lean season, festival or any special occasion in the city, etc. Usually a hotel with 10 rooms book 110 guests to cover the inconsistency of the guests not turning up. We must remember that in service industry if services are not sold on time, they are lost forever. For example, if a room is not booked for any said day, then the money to be earned for the room, for that day, is permanently lost. An alternative policy has to be decided upon in case all the 110 guests turn up, and for this purpose management has to be properly informed about the business in the said period, business of and with the other hotels of the city, scope of guest adjustments in a near by hotel and also the possibility of having recurring business from any of the guests. A proper and well-informed management can forecast and handle crisis at a fast pace and efficiently. Many hotels maintain guest data on computers for keeping the profile of repeat visitors.

Computerized reservation system takes off from the manual reservation system. The common manual system used is Whitney's system in which reservation is basically maintained on paper mounted metal frames, arranged according to data and also alphabetically. Also, color code is used to identify a guest, i.e., whether an old client, or a VIP, a frequent traveler and so on, and also identify their special needs and requests. The computerized reservation introduced in 1980s follows mainly the Whitney system but it does not produce much paper work and the data are arranged in a much better and efficient manner. For example, after the introduction of a client name, the computer will on its own search the files to find out whether the present guest was previous guest or not and will also provide information on whether a agency asking for booking is on the credit list or not. Many chin hotels are operating their own Centralized Reservation System (CRS). The concept was influenced by the Airline CRS. By providing the services of a CRS, the management can handle booking of large groups efficiently. The CRS also helps to market and manage reservation demand. A guest, by availing a chain hotel CRS say Taj CRS, can make bookings in all the hotels and properties of the chain, in this case Taj. Thus, all the confirmation is available from one place only, reducing the tension and paper work. The advantage of

CRS have led the smaller hotels abroad to consider a CRS of their own as it is not economically viable for a single hotel to have a CRS. The IRS systems are also providing reservation with some of the hotels world over. The main advantage of computerized reservation system is that one is able to keep track of the sold and unsold rooms, i.e., rooms inventory, and as it provides the scope of self check-in and check-out by the guests. Even bills are prepared on the checking out of the guests with a few proper commands.

14.4.2. Food and Beverage Services

Computers are used to keep track of the bills preparation and menu card preparation, among other functions. The use of Election Cash Register (ECR) and Point-of-Sale (POS) technologies is very common.

As in the case of room reservation, computers are also used for reserving tables in a restaurant-even a table in a specific location of a restaurant. The computerized booking checks that no double booking, i.e., overbooking takes place.

The room service use computer for keeping track of the services provided. On receiving an order, instantly is sent over the kitchen, via the LAB, there vote\k station printer or monitor is provided in the kitchen, or through a computerized receipt-one to kitchen.

In a restaurant service ECR/POS plays very important role. ECR/POS system usually works with four files:

- **Menu File**, which lists all the items in the menu, describes them and states their prices, taxes applicable and amount to be reported to the inventory,
- **Guest Receipt/Check**, which is an open data file containing the guest names and the items ordered. Each guest receipt will identify the guest, identify the restaurant, the menu items ordered, individual price of menu item, tax-applicable and total,
- **A Master File** having the detail of each of the employee in the restaurants and the work hours, guests handled and also wages earned are mentioned.
- **Inventory** file is very important so as to keep track of purchase and utilization of products. The goods/ingredients is difficult, so an inventory file is necessary to get a clear picture.

The ECR/POS forms daily report on revenue and sales reports to be used by the management. The data contained in report provides an insight of sales trend, demand of customers and also future employee requirement. The technology used by the restaurant depends upon the need of the management and also on the type of restaurant-Quick service or sit-in and so on. A sales report nevertheless is required by all to gauge the type of the product sold, as from these reports at-a-glance one can say that 50 Russian Salad or Sweet and Sour coup sold. A trend can always be seen and predicted from the ECR/POS systems reports.

Computers are also used for Menu Preparations which includes taking account of the ingredients used, calculate the possible cost of a helping, calculate the applicable taxes and other overhead costs and decide upon a price which will prove profitable to the organization.

In a very few restaurants, menu is displayed on a screen or monitor and patrons can order via the screen. Either the screens/monitors are touch sensitive or they are accompanied by keys. The guests can see the menu items on screen and by using specific commands can read the menu description and use Price Look Up (PLU) keys to check the price. The guest can order to the computer and they will be served by a steward. In this way the guests are not hurried by the presence of a steward and can also easily understand and decide upon the food and price without any embarrassment.

14.4.3. Billing

The billing of the rooms, room services and restaurant services are all done using computerized receipt printing. The rates of the different rooms per day are already there in the computer software packages. While billing a guest, the check-in and check-out data and time is typed and auto processing allows computerized bills to be prepared. And the guest does not have to wait for bill while checking out as his or her bills are ready as soon as he or she signs, for checking out, in the guest register.

The room service and restaurant bills or any other bill, such as laundry, gifts, etc., if not paid earlier by the guest are also attached or added to the bill. Then the room number and guest ID name and number on the bill initiates the computer to add any unpaid bill to the total bill. Usually for room service the guest may or may not pay on the time of availing the service. Same is the case of the restaurant bill. If the guest in the restaurant is a resident guest of the hotel then the guest is identified by Guest Name, Room Number and guest ID number, and the guest can choose to pay or just sign the bill for payment later on. The unpaid bill is automatically added to the guest bill through guest ID and Room number. The guest, whether or not a resident of the hotel, get the bill with each menu item ordered along with its individual price, taxes applicable and total made out. The clean and neat print out makes it easier for guest to understand the bill.

14.5. Summary

Thus, providing efficient and prompt services to customers. In the same country, usually a travel agent has sister concerns all over the country and, when a booking comes by, the same is informed to the sister concern of the city of travel via telephone, fax or e-mail. Internationally IRS (about which you will read in latter sub-section) helps a lot. Whether the booking is made over the IRS directly or with a travel agent, the same is passed on immediately to a travel agency, preferably a concern with whom one has business dealings in the country of travel. For the purpose of international booking e-mail is the most preferred form of making booking and also for making any inquiries. New technologies are always coming up and the old technologies are becoming obsolete, so keep reading, the periodicals and journals to keep track of the changes taking place.

14.6. Technical Terms

PNR : Passenger Name Report
ECR : Election Cash Register
POS : Point-of-Sale
PLU : Price Look Up
CRS : Centralized Reservation System
NRC : National Distribution Companies
NMC : National Marketing Companies

14.7. Model Questions

- 1) Explain about Hotel services and computers?
- 2) Discuss about tour services and computers?
- 3) Discuss about Travel services and computers?

14.8. References

World Tourism Organization 1998 Guide lines for the Transfer of new technologies in the field of tourism

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Lesson 15: Media: An Information Tool of Tourism

Objectives

The objectives of this lesson is

- Learn the importance of proper use of print material and media

Structure of the Lesson

15.1. Introduction

15.2. Media: An Information Tool of Tourism

15.2.1. Television

15.2.2. Print Media

15.2.3. Others

15.3. Summary

15.4. Technical Terms

15.5. Model Questions

15.6. References

15.1. Introduction

Many of the Indian, organizations have also understood the scope of TV as a promotional media and have recently started using advertisements for promoting themselves, e.g., Taj Group of Hotels, Raj Travel and Tours, Thomas Cook and so on. Earlier, only print media was being used but lately very attractive and subtle advertisements of the tourism sector have started on the television channels.

15.2. Media: An Information Tool of Tourism

Media is playing a very important role in providing information. Media can be television or print media which provides the required information.

15.2.1. Television

Television has proved to be great sources of information. There are many travel related programmes on the different channel. Most of the programmes provide information on new areas of travel, how to approach\reach there, where to stay, what to eat and also what are the dos and don'ts. Traveling to exotic and new places has become big business and travelogues are the new "in programmers". Many of these deal with budget travelers, others with luxury travelers whereas some try to blend in both of them.

These travel programmes give information regarding the time of visit and also the travel agents to contact for visiting those places. In a way they are promoting both the place and the service providers by recommending them. Many a programmes, promote only a special type of travel, i.e., adventure trips or trips on nature's trail. It is not possible for one person to visit every place of tourist interest and these travel programmes give an insight of the various destinations. The information can prove to be vital when a prospective client asks you a question about a place they are planning to visit. As a tourism professional, it would be useful for you to watch these programmes to gain information about the present popular destinations and also decipher why they are popular and advertisement.

You should remember that after seeing something on TV it stays longer on the consumers mind than hearing about it. Also it gives you as a professional, a fair idea of what the competition is up to.

15.2.2. Print Media

Travel industry has been using print media for a long time for promoting business. Regular advertisements appear in the newspapers and magazines regarding the different fabulous or once in a lifetime offer regarding a tour package. Also there are advertisements regarding air travel or other modes of travel to a favorite holiday spot. Brochures and pamphlets are just promotion material. While mostly these are printed to promote and publicize the travel service provided by the agency many a times heavy discounts on different tourist resorts and other properties are also advertised. One should always keep track of such information as it gives an idea of what is happening in the travel and tour sector and in the process you might get a bargain for your organization.

Newspapers are the best way to advertise for reaching general public. But trade papers, such as, Travtalk and others are also available for getting the news regarding the tourism sector. You should regularly read the various travel and tourism magazines as government policies, new happenings, new schemes, new destinations, latest development in the industry, all are talked about in the periodicals. One should keep abreast of the new happenings and also know more about colleagues in the trade. They are a useful source of information.

15.2.3. Others

Various conferences, seminars and other meetings of the various organizations, such as, ATA, PATA, etc, are organized to keep the travel and tour industry together. The plans for future and are discussed on these occasions along with business transactions. There are the best time to make business friends or new business partners.

Regular travel marts and trade fares are also the source of latest information besides being events for promoting tourism. It is also possible that new ventures will open out for your organization in these marts.

15.3. Summary

Many a times you might get required information regarding a place of a hotel from travel books or CD ROMs (compact disk- read only memory). Many tourism guide books, such as, Lonely planet , Hotel and Restaurant guidebook of India , etc., are viable. Many new CDs are coming track of these developments related to tourism information and as managers also encourage your employees for the same.

15.4. Technical Terms

CD ROM : Compact Disk- read only memory

15.5. Model Questions

1) Explain various media in information tool of tourism?

15.6. References

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Lesson 16: Internet: Key to Future Tourism

Objectives

The objectives of this lesson is

- Comprehend the way Internet is being used by the tourism organizations to promote their business.

Structure of the Lesson

16.1. Introduction

16.2. Internet: Key to Future Tourism

16.3. E-Tourism

16.4. Summary

16.5. Technical Terms

16.6. Model Questions

16.7. References.

16.1. Introduction

Internet is the latest and fastest way to gain information and also conduct business. The direct booking on the various CRS is possible over the internet. Internet is not only easy to access but it is also very easy to use since it is graphic oriented and uses very few than keyboard command.

The internet has provided a new economic environment in which to conduct business.

E-commerce is a growing sector and many tourism businesses are involved in developing their internet services including traditional travel agents, tour operators, national tourist offices, airlines, hotels and other accommodation providers and car hire firms. This means of doing business is known as 'e-tourism', or 'tourism e-business'. The key differences from traditional markets are the speed at which information can be communicated, global accessibility and the minimal costs of establishing a business online.

16.2. Internet: Key to Future Tourism

While browsing the internet for any information you can take the help of the search engines, such as yahoo.com or 37.com and others, and type in your subject of search. The process of searching will take up a few minutes and various categories, websites and webpage for the topic will be displayed to you.

You can either download the required information on to your computer or get a print out of the same. Downloading, as you know from the earlier units, is the transfer of information from a server to your computer. You can have information regarding a destination or an IRS all through the internet. Many travel related sites of different newspapers, can be read by you on the computer via the net. Internet is a mine of information provided you have the time to search for the information.

There are many information posted on the internet by the various departments of tourism all over the world, many tour operations, airlines and also IRS. Sitting at your office or home you can book yourself a ticket or tour, over the net. The information sites of tourism also provide destination guidance, booking facilities along with the costing and pricing.

The tour operations display their brochures on internet as it gives a wider scope of publicity and for reaching people. A client can check out the trip of choice and make enquiries or booking via e-mail and business is promoted very fast and easily. Every enquiry does not mean a client but it does give an opportunity and hope of making a client.

The travel agents are using IRS and even the IRS are giving access to people for booking reservation on a flight over the internet. All the formalities and time limit is provided via net. Internet is preferred by various organizations to communicate with each other and information, messages and bookings, all are passed within minutes to other countries.

Internet is proving to be fast and easy, due to the graphic interface used. It is also proving to be cost effective as say in the case of faxing a file overseas it will be easy to just e-mail the file as an attachment with an email message. We can say that very soon internet will be the way to conduct travel business, and so keep abreast of the latest happenings on internet. Get to know the internet better as it will help in shaping the tourism future.

In this unit, you have learnt about the use of computer in tourism. We discussed about IRS and CRS used by the travel agents for making reservation on the various airlines. The tour operations are also using various software packages to handle the various aspects of tour operations such as itinerary preparation, costing, invoice and voucher processing. You have been introduced to the use of computers in hotel industry in reservations, restaurants and billing. And finally the use of internet as a mine of Information and a future business procedure has been explored. Internet is proving to be a boon in all business sectors and service industry. In tourism also the use of internet can prove to be cost effective and a better way of business promotion and management.

16.3. E-Tourism

That it is the most cost effective way of communicating with target markets and disseminating information. It is a quick and easy way for the customer to buy travel products. It offers opportunities for improvements in customer service and retention through meeting and promoting individual preferences. It reduces costs through increased efficiency in internal operations and purchasing processes. It encourages greater co-operation amongst traditional competitors through the provision of hypertext links. Links are a

cheap, quick way of raising the profile of a new site and getting round the difficulty of up-dating information in-house. The inclusion of links on tourism websites offers benefits to both the user and the service provider. The service provider can offer a greater range of information on related tourism products without having to enter into contracts with the service providers and the user has access to immediate information and online shopping opportunities.

16.3.1 Development of E-Tourism

E-Tourism has only become possible through the spread of information and communication technologies (ICT) and the Internet, which has changed the distribution of tourism sales and information. An Internet - based tourism services sector is developing based on networks that link producers and users. This has resulted in a shift away from traditional supply chains and communication channels (e.g. high street travel agents). Such technologies have been developing over a number of years. In the 1970s, a travel marketing and distribution system known as Computer Reservation Systems (CRS) was introduced. This was an airline database that managed and distributed reservations electronically to remote sales offices and external partners.

16.4. Summary

This allowed customers (travel agents) to make and confirm reservations and allowed all travel businesses to operate flexibly. It offered travel agents increased productivity and competitive advantage as thereafter they were able to offer the consumer quick access to the most up-to-date information and indeed access to CRS is of continuing importance to online travel agents.

16.5. Technical Terms

ICT : Information and communication technologies
CRS : Computer Reservation Systems

16.6. Model Questions

- 1) Explain why internet will hold the key for future business transactions.
- 2) Discuss about E-Commerce?
- 3) what do you understand by IRS?

16.7. References

World Tourism Organization 1998 Guide lines for the Transfer of new technologies in the field of tourism

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Lesson 17: Social Dimensions of Computerization

Objectives

- The Objective of the lesson is to study of computerization of the tourism sector.
- Study of Impact of computers on living styles and intellectual capabilities of individuals.

Structure of the Lesson

17.1. Introduction

17.2. Individual and the Computer

17.2.1. Impact of Computers on Living Styles

17.2.2. Intellectual Capabilities of Individuals

17.3. Summary

17.4. Model Questions

17.5. References

17.1. Introduction

As you have studied in earlier Units, computerization of the tourism sector is rapidly gaining pace. Computer technology is a reality and is there to stay. While the developed countries have moved to an extent that the computer has become part of every man's life, in the developing countries the impact of the computer technology can be felt only in certain fields. Seeing the place at which the use of this technology is spreading over, it may look rather out of place to raise such questions as whether we should adopt this technology at all, or should adopt this technology at all, or should we adopt it selectively? Etc. It, as in the case of ecological and environmental aspects of fields such as energy, industrial production, urbanization etc., which are hotly debated all over the world, the environmental impact of the computer technology also needs to be looked into. It is in this background that the social, political, organizational and individual impacts of computer technology are discussed in this unit. Both the beneficial and harmful consequences of the computer technology will also be discussed.

This unit not necessarily focuses on the effects of computerization in the tourism sector but on the effects of computerization on our behaviour, lifestyle and society as a whole.

17.2. Individual and the Computer

17.2.1 Impact of Computers on Living Style

An individual, who is a professional say a doctor, engineer, architect, manager, businessman, consultant, etc., undergoes a substantial change in working pattern where he or she takes to a computer. The computer helps to process information more quickly and effectively which in turn upgrades the quality of work and makes one more self-confident. He or she also ventures to examine more alternatives, do more comparisons and applies more of ones thinking and analytical capabilities, as against the preoccupation with data processing. Thus the computer enables the professional to become more competent.

An individual who is a member of an organization also can, when making use of a computer become more competent in his or her field. However, an organization means a lot of people with different needs at different levels, under different circumstances. Therefore, subject to a variety of forces in the organizational context, the actual growth of an individual in an organization using the computer technology will depend on many things other than the opportunity to avail the technology.

The common man in general is also affected by the computer even though he or she himself/herself may not have access to a computer. The common man is the recipient of both the beneficial as well as harmful effects of the computer technology. In many public services like railways, Airports, employment exchanges, Universities, Libraries, Hospitals, Departmental Stores, Banks, Stock Exchanges, etc., one can get quick and effective service in a computerized environment. In developing countries, especially with a public sector bias the common man has been at the receiving end of the bureaucratic manual systems for so long that he or she will definitely enjoy the services that can be provided in a computerized environment.

In all those counties which have adopted computer technology in a big way, the individual citizen is affected in many other ways also. one can have a computerized alarm to wake up, a computerized telephone to help deal with the telephone calls. a computerized oven which will bake bread to a pre-determined temperature, a computerized music and television system which will play as per preferences etc. Also one can sit and ride a computerized car which will take a person to his or her workplace with very little intervention from oneself. Perhaps he or she does a kind of work in the organization for which one need not necessarily go to the workplace, but can sit at home and work on a terminal connected to the office. At the bank, in the shops, no money need be exchanged but only computer printouts after necessary adjustments. Even one need not to go out fro shopping for it is possible to have computerized ordering from home. One could even hold a computer conference with a businessman in another part of the world sitting at home over the internet and avoid a costly and time-consuming travel.

17.2.2 Intellectual Capabilities of the Individual

Another highly debatable question which is to be touched upon is whether the dependence on computers for arithmetical operations will affect children in terms of their numerical abilities and there by their I.Q score. Though no research evidence is available on the subject, it is a fact that many people in the west who work at shop-counters would be completely in difficulty if the computers or cash registers which they are accustomed to fail even for a few minutes.

In India most elderly people have great veneration for the ability to do arithmetic mentally and they look down upon children who cannot do such mental arithmetic.

Beneficial Impacts: Some of the benefits which an individual derives from computerization are as follows:

- At home, in the workplace, the drudgery of repetitive type of operations is avoided.
- Speed of processing helps quicker, more timely decision –making.
- To such professionals as researchers, scientists, engineers, etc., the accuracy in calculation and information provided by the computers is of immense value.
- As a customer one receives quicker service.
- The advances in medical diagnosis etc. can come to the help of every individual.
- The computer combined with electronic communication devices makes life easier for the individual in many fields such as reducing or even eliminating costly travel, shopping from home, getting news from any part of the world instantaneously etc., all of which are very valuable to the businessmen and industrialists.
- With help of computer and electronic communication devices, tourists can choose their holiday destination, plan their travel, and make reservations, etc., on their own.

Harmful Impacts: The harmful impacts are as follows:

- The individual's dependence on computer can cause untold miseries, if for some reason the data fed into the computer were to be lost without a backup.
- One may cease to use brain for commonsense arithmetic and may in the time lose ones numerical ability.
- The individual becomes so transparent to the whole world through the storing of information about every aspect of his or her life in many places there by losing own privacy.
- The individual may suffer from the use of inaccurate information kept by him or her in the computer. There is also likelihood of information being misused to ones disadvantage.
- Every individual who is not inclined to learn about computers may find himself or herself being treated as a second class citizen in certain contexts.
- Every individual who is a wage earner may find his or her services superfluous, with the computer taking over the work and thus making him or her, at least temporarily out of job.
- The effects of radiation, harmful effects from the continuous exposure to the V.D.U. etc., may also affect some individuals.

- In tourism, over dependence on networks data may not provide total information regarding the quality of services; computer failure can lead to breakdown of operations.

17.3. Summary

An individual who is researcher either in physical sciences or social sciences is perhaps more benefited from the use of computers .In processing data, in getting accuracy, in controlling flow of chemicals, in simulation etc., the computer offers enormous potential.

The other side of the picture is that many a person who can do quick mental arithmetic can hardly comprehend any higher form of mathematics .Therefore, it can be argued that children who shy away from lengthy and time consuming calculations may be tempted to take up the challenge of complex problems if they have the support from the computer.

17.4. Model Questions

- 1) Explain the differences between beneficial impacts and harmful impacts?
- 2) Discuss about Impact of Computers on Living Styles?
- 3) Discuss about Intellectual Capabilities of Individuals?

17.5. References

Bhatnagar, S.C. and K.V.Ramani, 1991, Computers and Information Management : A Primer for practicing managers, Second edition, Prentice Hall of India.

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Lesson 18: Computers and Organization

Objectives

- Identify major issues related to the use of the computer.
- Examine the impact of computers in the context of Indian society in a limited way

Structure of the Lesson

18.1. Introduction

18.2. The individual and the computer

18.3. The computer and organisations

18.2. Summary

18.3. Technical Terms

18.4. Model Questions

18.5. References

18.1. Introduction

Computer Technology has come to stay in our country. While the developed countries have moved to an extent that the computer has become part of every man's life, in India the impact of the computer technology can be felt only in certain fields. Seeing the pace at which the technology is spreading in our country, it may look rather out of place to raise such questions as whether we should adopt this technology at all, or should we adopt it selectively etc. yet, as in the case of ecological and environmental aspects of fields such as energy, industrial production, urbanization etc., which are hotly debated all over the world, the environmental impact of the computer technology also needs to be looked into. It is in this background that the social, political, organizational and individual impacts of computer technology are discussed in the following paragraphs. Both the beneficial and harmful consequences of the technology will be discussed.

18.2. The Individual and the Computer

Beneficial Impact

Some of the benefits which an individual derives from computerization are as follows

- At home, in the work place, the drudgery of respective type of operation is avoided
- Speed of processing helps quicker, more timely decision making.
- To such professionals as researchers, scientists, engineers etc.,
- As a customer he receives quicker service.

The advances in medical diagnosis etc., can come to the help of every individual.

Harmful Impact

The individual's dependence on computer can cause untold miseries, if for some reason the data which he had fed into the computer were to be lost without back-up, He may cease to use his brain for commonsense arithmetic so that, he may lose his numerical ability.

The individual becomes so transparent to the whole through the storing of information about every aspect of his life in many places thereby losing his privacy.

The individual may suffer from the use of inaccurate information kept about him in the computer. There is also likelihood of such information being misused to his disadvantage. Every individual becomes the potential victim for the consequences of computer controlled decisions in such strategic areas such as use of atomic and other potentially dangerous weapons and gadgets.

An individual who is not inclined to learn about computers may find himself treated as a second class citizen in certain contexts.

Every individual who is a wage earner may find his services superfluous, with the computer taking over his work and thus making him at least temporarily out of job.

The effects of radiation, harmful effects from the continuous exposure to the V.D.U etc., may also affect some individuals.

18.3. The Computer and Organizations

As you know computerization of organizations is rapidly bringing changes in the work culture. Organizations have availed the speed and accuracy of the computers but in process many beneficial and harmful impacts of computerization have come forth:

Beneficial impacts: Organizations benefit from computerization in the following ways:

- All the benefits which a computer affords to an individual are available to organizations also, perhaps several fold.
- The management process, which tries to substitute rationality in decision making using timely, relevant and accurate information, is greatly facilitated by the computer.
- Tremendous gains in financial control, inventory control, market control etc., are possible using the computer technology. In factory production quality control, production

planning and monitoring etc., are made more effective and easy with the help of the computer.

- Organizations can move into higher levels of forecasting using such techniques as simulation, and also benefit by the use of various O.R techniques with the help of computer.
- The horizons of organizations themselves are widened with the help of computers combined with modern electronic communication facilities.
- Central Reservation Systems, through computer networks, have made transport and hotel reservations much simpler and quicker.
- Destination databases, customer profile data, etc., help tourism organizations in a big way in designing or rejuvenating their products and services.
- Providing computer services in it have become a part of the product line, particularly of those organizations that cater to business travel.

Harmful Impacts:

These can be described as follows:

- Many organizations have and continue to invest in the technology without sufficient systems analysis, and without preparing the ground properly for implementation. This results in various kinds of frustrations in such organizations.
- The mix of skills needed in the organization undergoes major change which may create tensions and may harmfully affect the human resources.
- When computers take over many items of work from human beings the Organization may find itself loaded with unwanted manpower.
- The employees start living in continuous fear of being declared redundant and lose morale and motivation.
- The non-computer skilled people may find themselves treated as second class citizens in the organization.
- New and devious ways of misuse of the computer technology may be found to defraud the organization.
- The organization becomes transparent and may suffer at the hands of competitors.
- The dependence on computers for handling information can lead to several embarrassments and even losses when there is a failure of the system.
- Large investments in hardware and software are required to use the technology which may not yield immediate returns.

18.4. Summary

The computer combined with electronic communication devices makes life easier for the individual in many fields such as reducing or even elimination costly travel, shopping from home, getting news from any part of the world instantaneously etc., all of which are very valuable to the businessman and industrialist.

18.5. Technical Terms

V.D.U : Virtual Display Unit

O.R : Operational research

18.6. Model Questions

- 1) Explain about the harmful and beneficial impacts of individual and the computers?
- 2) Explain about the harmful and beneficial impacts of computer and organizations?

18.7. References

World tourism organization 1998, Guide lines for the transfer of new technologies in the field of tourism.

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Lesson 19: Computers and Society

- The objective of the lesson is to study of employment opportunities and work pattern and computer living styles and politics

Structure of the Lesson

19.1. Introduction

19.1.1. Employment Opportunities and Work Pattern

19.1.2. Computers and Living Styles

19.1.3. Computers and Politics

19.2. Summary

19.3. Technical Terms

19.4. Model Questions

19.5. References

19.1. Introduction

Since the introduction of computers, it was told how computers are going to enhance the quality of our lives. The quicker, efficient working of computers is supposed to change the society and bring better life-style, innovations and changes our way. For example, the information and communication channels have opened up the world, electronic banking system, searching travel information on the internet, etc, have indeed changed many traditional aspects of our life and in all these we have the computer to play a role. Here we study the effects of computerization on three specters – employment opportunities.

19.1.1 Employment Opportunities and Work Pattern

One of the most hotly debated and sensitive issues arising out of computerization is its impact on employment. In developing countries, particularly, there is widespread fear that the computer will drastically reduce the employment potential or result in retrenchment of currently employed people. The trade unions particularly project this aspect of computerization especially in relation to white collars workers such as clerks,

Accountants, etc. it is fact that the computer is a potential threat to ones means of livelihood.

Another aspect is the effect on the work pattern of an employee. Let us assume that an average white – collar worker is rehabilitated in a computerized environment as, let us say, a data entry operator, the basic question will arise whether the employee is really relieved of the monotony of the earlier manual work. is it not only moving form of monotonous work to another? In terms of position and power to influence also, it cannot be said that he or she has gained. In fact in many situations one stands to lose terribly in terms of power. The typical clerk in a manual system has a lot of power in view of his or her opportunity to harness or help the public at will. The employee also has considerable influence over the superiors because of his or her familiarity and knowledge of rules, precedents and procedures, none of which the supervisors are thorough with. If rehabilitated as data entry operator he or she stands to lose terribly in terms of his or her sway over the public and superiors. On the other hand, the supporters of computers argue that the use of computers, in addition to providing employment opportunities in designing manufacturing, marketing and training, will also raise the demand for services in geometric proportions which will compensate for the fall of employment in routine clerical operations. Of course, the access to computers affects the manager’s work pattern in a qualitatively better way. Ones dependence on others reduces and accessibility to information increases tremendously. The drudgery reduces and the power arising from possession of relevant and timely information increases. Another argument brought up in support of computerization is that most of clerical work is a very low level repetitive type of human begins used to do manually efficiently. Therefore there is no merit in contending that the computer will not replace human beings in certain jobs. Jobs do disappears with the advent of technology. Mechanization has eliminated most skilled jobs in handloom industries. Computers linked with photo type setters are replacing linotype machines endangering the continued existence of the entire craft. Similarly, in the tourism industry the introduction of electronic data processing can reduce employment in office. At the same time the demand for workers with computer operating skills will also increase.

The question that follows is, what weight age should be given to job redundancy in making decision about computerization. Should not the added conveniences and better public services be given high weight age? Can some compromises be evolved by involving the trade unions also in the decision-making process? David B.Archer redefines the problem as below:

“Our problem is not that computers, automation or technology will create unemployment. Our problem is that the legislation does not exist to adequately look after short run dislocations, and government economic and manpower policies are inadequate to cope with a constantly increasing labor force.”

No readymade solutions are available in this regard and the solutions would vary society to society.

19.1.2. Computers and Living Styles

One of the major changes that can arise is that people need not spend as much time as they spend now in waiting for information. This will release good number of hours for other purposes. Of course this additional time can be used for production or as leisure time depending on social interventions.

Much better public service at the railway station, airport, banks, hospitals, tourist services, etc., can release a lot of tensions and frustration of the average member of the society in developing countries. People can reduce a lot of their local as well as long distance travel when the potentialities of both computers and modern communication are combined. This adds to convenience as well as saving of time. Again this time can be used for productive purposes or leisure.

As you have studied earlier in the unit, with the help of computers one can work from ones own home or neighborhood at ones own pace and convenience. The employee will be connected to the office computer and work from home or to go to neighborhood work station where employees of many organizations work at one place using computer connection from individual organization.

A stage may come when people can trade without having to use notes and coins. This adds to safety and convenience.

Shopping can be done from home. Tickets for a show can be booked through computers. Sale of shares can be done through computers. Books in libraries can be reserved through computers. For the professional who is hard pressed for time these facilities are extremely valuable.

Computer controlled machine operations, chemical processing, control of excusers to various energy beams, rays, etc., can provide high accuracy. Hence the society is likely to demand much more accuracy for all products.

The programmed computer robot can do many production operations which are hazardous and which are done by human beings today at great risk. In and around furnaces, in toxic environment, in dizzy heights, in strait and narrow interstices, etc., the robot can relieve human beings.

There is perhaps no human activity in much computer cannot have a place, aiding in reducing the drudgery of repetition by giving information in a form suitable for taking decisions. In fact the computer can take over decision-making in various programmed decision situations. It can also support one in non-programmed and unstructured situations by helping one to evaluate the possible consequences of several alternative decision choices. When combined with Operations Research Techniques the computer serves as a real decision support system.

Computerized cars, planes, trains, etc., are becoming realities. Such automation can help society to accomplish more speedy and safe travel.

Computers, together with modern satellite communication technology have made the world and the countries shrink. The N.I.C. computer link now functioning in India has linked all the district headquarters and has made the district and Delhi come very close together for various administrative purposes.

The computers have helped research in a phenomenal way resulting in several benefits to society. The advancements in biomedical area are already to humanity. Computers also help monitoring of health status of patients in critical condition and have saved many a life.

The list of beneficial impact of computers on society is bound to undergo elongation day by day. Imaginative adaptation by the human beings of the computer technology is bound to be moving foreword in leaps and bounds.

As in the case of nuclear technology, the computer technology is also equally susceptible to be misused either deliberately which otherwise is also known as hacking.

As mentioned, one of the major impacts of the adoption of computer technology is that it will display a substantial proportion of employed people, especially those employed in white-collar jobs. This will naturally affect society's equilibrium in socio-economic spheres. Whether Computerization will produce equal or greater employment opportunities in other areas like marketing, manufacturing, servicing, training, etc. , is a moot question as far as the displaced people are concerned. In a developing country with high unemployment, therefore, the extent of resistance from white collar workers is bound to be naturally very high. Further in organizations where the number of supervisory positions is fixed on a ratio basis with reference to the number of employees at lower levels, there is a possibility of loss of promotion schemes etc. are not introduced to protect and safeguard the interest of those who are displaced, the resistance will continue. And this will have a negative bearing on life styles.

It is well recognized that the introduction of computers will reduce or eliminate the drudgery of repetitive and low intellectual type of data processing manually. The speed of processing will increase tremendously and this will help quicker public service. However, as far as the nature of work of rehabilitated. Workers are concerned, say as data entry operators, etc., as explained earlier, they will only move into another form of drudgery.

With the introduction of computers technology the mix of skills required in the society will undergo a substantial change. This will result in the educational and training scenes undergoing major changes. Many new opportunities and innovations in these fields will also arise. However, in the educational and employment fields which are already in a state of unhealthy competition , more competition will be brought in. the consequence of this will be that there will be more stratification of the society in terms of the extent of computer literacy.

Among managerial people a further division will be created in terms of the extent of computer knowledge and skills. The relatively senior people stand to suffer in this situation, unless they can quickly accomplish the necessary learning. Already the strains of this phenomenon on senior managers are visible.

In the initial stages of the adoption of computer technology for handling large volume and complex problems also throws open equally large opportunities to commit frauds. More thinking and innovative safety measures and devices have to be generated. In fact, in India the central bureau of investigation has already started training its investigators in the area of detecting computer and electronic banking related crimes.

When more reliance is placed on computers for decision-making in such strategic areas like defense, operation of weaponry etc. , the magnitude of catastrophes either due to willful human action or through ignorance also increases. The threat to society is therefore enhanced.

The pleasures of shopping and bargaining, etc. are in itself an exercise for many but the possibility of a moneyless society can take away these pleasures.

The time released by the computer may corrupt the society rather than being used for beneficial purposes. This needs careful social interventions. If people can do everything from home more conveniently using the computer, social interventions will undergo tremendous changes. Individuals may become less sociable and more and more self centered. The threat to privacy of the individual due to storage of enormous amount of data about oneself in computers is a real

social problem to which several countries have started reacting. Much legislation has already been enacted. However, it is doubtful whether legislations can really deal with the problem since the size of the inspecting and prosecuting agencies has to be something like a parallel police force.

From the foregoing discussions it becomes clear that the computer technology is endowed with tremendous potential for benefits to society as well as having different types of harmful impacts. The question of adoption of the technology or the extent of adoption, the extent and nature of curbs to be introduced, the monitoring and correction process to contain the harmful effects etc., are all matters of social choice which should not be left to the technologist alone. Multidisciplinary groups through democratic procedures should take decisions. The concern which society has for ecological and environmental issues in respect of energy, industrialization, deforestation, mining, etc., should be extended to computerization also. It may be that in this process the full potential of computer technology as envisaged by the technologists is not harnessed. But then that is also the safeguard against technological Frankensteins.

19.1.3. Computers and Politics

Computer helps in making all sorts of political analysis and gathering other information needed by the politicians and media. We can summarize the effect of computers on the politicians and media. We can summarize the effect of computers on the politics in the following manner:

Beneficial Effects:

- Data processing in census, elections, etc., have helped a great deal in making these operations related to political activities more data-based, quick and efficient
- The computer and communication technology has made election result processing and its communication more effective.
- Even though still under debate the use of computerized voting machines in some constituencies has made the election process less amenable to muscle power interventions.
- The computer has helped many a parliamentarian to use information effectively to support his contentions. The whole parliamentary process can in due course be more data-based dependent.
- Constituency profiles like number of booths, villages, venues of village heads, development work done, etc., are maintained by politicians on computers.

Harmful Effects:

- When the opportunity for processing information through computers is not equally distributed and also when the awareness of the potentialities of its use is also low some politicians can twist information for various parochial ends.
- Trade union leaders are opposing the use of computerized information technology, especially in organizations which provide employment to a large number of white collar employees.

- Total dependency on computerized data in elections and political life will do away with the role of emotions and human values.

19.2. Summary

The harnessing of natural resources is facilitated in quicker and more effective ways. The flow of information and communication channels provided by computers together with modern communications facilitates the removal of barriers among different societies and can develop global brotherhood. Members of the society acquire many conveniences which take away the drudgeries and tensions of living in metropolitan areas. The unemployment problem posed by the adoption of computer technology compounds such other phenomena like recession and leaves the society in great turmoil.

There is a fear that future children and growing children may lose all their commonsense abilities, especially numerical ability by total dependence on computers.

19.3. Technical Terms

19.4. Model Questions

- 1) Explain about Employment Opportunities and patterns?
- 2) What are the Harmful and beneficial aspects of computers and politics?
- 3) Discuss about computer and living styles?

19.5. References

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Lesson 20: Legal Aspects of Computers

Objectives

- The objective of the lesson is to study of legal aspects of computers

Structure of the Lesson

- 20.1. Introduction
- 20.2. Computers and Law
- 20.3. Purchase or Sale of Computers
 - 20.3.1. Purchase/Sale –A contract
 - 20.3.2. Purchase/sale of software
- 20.4. Legal Aspects of Use of Computers
 - 20.4.1. Patents
 - 20.4.2. Copy Rights
 - 20.4.3 Trades Secrets ad Confidentiality

20.1. Introduction

In the earlier Units, you have learnt about computers and importance of computerization in tourism sector. The computerization process begins with the purchase of computer and computer software packages. The proper knowledge about the process of acquiring them is very important. In this Unit, you will learn about the legal aspects of computer purchase and its programs. The laws made in pre-computer era tend to over look the technological advancement over the years and therefore it ids very much important for a computer buyer and user to know the different legal aspects and also the loopholes in the law. This Unit discusses various issues related to them

20.2. Computers and Law

The occasions when a computer user can benefit by knowledge of law applicable to the field of Computer and its applications are many a few:

- When you are buying or selling a computer, both hardware as well as software and peripheral systems,

- When you are using a computer,
- When you are trying to change over from manual to a computerized system or when you are trying to upgrade your computer system ,
- When you incur loss or damage as a result of the use of computer by others,
- When you cause harm to others by your using of computers,
- When you want to do programs and patent them or secure copyright,
- When you want to keep some parts of you're your technology of hardware or some aspects of your software confidential,
- When systems connected to or operated through computers go faulty and you suffer as a result of such faults,
- When your privacy is affected by storage of information relating to you in computer ,
- When malpractices are committed in computer and you suffer damages as a result of such malpractices,
- When you engage the services of consultant or firm to provide you information services, and
- When your health is affected by the use of computer.

Each country attempts to deal with computer related legal matters within the framework of the existing laws by re interpreting the legal provisions. In a few cases some countries found it necessary to amend, add or modify existing laws suitably to deal with special situations arising from computer related matters. These aspects will be discussed in subsequent sections.

20.3. Purchase or Sale of Computer

Computer technology being relatively new to developing countries like India, the consumer is rarely aware of even the fundamentals of computers. Also consumerism is still very weak in developing countries. As a result the sellers dump their products on the consumer. The customer often buys a computer as children buy toys. Most consumers buy with out knowing what they actually want to do with the computer or whether the computer which they are buying will really suit their specific requirements. The situation is true both of individuals and organizations. In many cases the computers remain merely as show pieces after purchase and are often used for playing games.

20.3.1 Purchase/sale –A Contract

Every purchase of any movable article is a contract covered by the provisions of a branch of contract law known as sale of goods. In India, for example, sale of goods is governed by the provisions of the **sale of goods act 1930**.

Off- the-Shelf purchase

Sale or purchase of goods can be broadly of two types, one in which a specific product with specified features is offered by a seller. Here the sellers fully disclose all the features of the merchandise to the buyer through literature in the form of pamphlets, manuals, etc. the buyer may buy with or without inspection relying upon the specifications disclosed. Here the buyer buys a product with full knowledge of what it can accomplish, provided the equipment works according to the features offered. In such a deal the buyer cannot complain later that the equipment purchased did not fulfill requirements. The purchase is similar to any other purchase of consumer articles which are purchased from shops, as for example a branded packet of cornflakes. The buyer has a cause for action only if the flakes are found to be not cornflakes or that it is spoiled, etc. The customer cannot say that the children did not like the taste of cornflakes and that therefore the purchase price should be refunded. Similarly when a customer buys a computer of a branded variety of say, a P.C, by brand name, all that one can demand later is that should have capabilities and features described in the pamphlets or manuals. If due to the volume of data to be handled or the high speed required for specific purposes, one finds the P.C. unsuited to fulfill the requirements one cannot raise a claim against the seller.

Purchase Based on Buyer's Specification

Let us now take the second kind of purchase in which the buyer specifies the actual requirements and relies upon the seller to give equipment that will meet the actual requirements. In such cases, the buyer, if the equipment fails to suit purpose, can proceed against the seller and claim a replacement or damages. Suppose a buyer explained to a seller that he or she wanted a grinder to grind wet cereals and relied upon the seller to choose an equipment and later found the grinder which was sold will only grind dry, then he or she can compel the seller to give a replacement that will grind wet or if this is not possible claim damages or refund.

The above principle of buying is so fundamental to all types of buying of movable properties and therefore it would benefit both buyers and sellers equally to be aware of and adhere to it. The principle binds individuals as well as organizations, if the buyer is clear of what he or she wants and buys on a specification based on needs and the seller sells an equipment supposedly to meet the buyer's needs, then the buyer is on strong grounds. It would, therefore, be in the interest of the buyer of a computer to spend some time on why and for what specific requirements he or she wants a computer. The situation is all the more applicable to organizations since organizations usually make larger investments. Of course in the current scene of little or no awareness of technological aspects of hardware and software, it might be necessary for the buyer to seek help from consultant. With or without the help of a consultant a reasonable good systems analysis has to be done before investment. Also the hardware and software requirements have to be translated into specifications for purchase. When both these steps do not take place the buyer will have to be satisfied with shelf products.

A word of caution regarding specifying the speed of hardware. Many users mistake the speed of computer which they see in some demonstrations as the speed at which they will get results. When volume of data is large as in most Dbase applications in real life, time involved in

processing is grater. It would not be practicable to include in specifications that the hardware should be capable of completing the processing of a certain large number of transactions say, accounting shall be computed with in a given time, because time required to process is dependent on the kind of software used also. Further, when an individual or organization has its own computer system it may be more economical to use the capacity fully and hence it may not be worth while to invest much in fancy speeds.

This brings us to another aspect of computer buying, where the buyer is in a dilemma as to what capacity of computer should be specified – whether to specify a capacity to suit current needs or future needs. There are some options here. A buyer can invest just enough to meet current needs or future needs. There are some options here. A buyer can invest just enough to meet current needs and forgot about future. After all one may argue that the technological changes taking place are so fast that is not much merit in buying current technology with reserve for future at large investment, since under the fast changing technology, larger capacity units may even be cheaper and more powerful in the future.

Another option is that upgradability be made part of specifications and seller bound by contract to provide up gradations as and when the buyer chooses to have. The main point which has legal implications is that upgradability has to be specifically made a condition of purchase, failing which the buyer cannot have a later remedy for outdating. This aspect has much significance in the current market conditions since competitive edge in prices is achieved by many a manufacturer by providing absolutely minimum capabilities, that too with no features supporting up gradation.

Compatibility with Peripherals etc.

Compatibility with peripherals like printers, communication equipment like fax, telex, digital camera, scanner, etc. also are better specified in advance, so that if the buyer wants to link the computer with such facilities later, he or she may not end up with problems. In situations where the buyer is already having one system and is trying to upgrade it or expand it, the compatibility aspect will be all the more important, it is generally claimed that hard disks can be added to an ordinary P.C quite easily, but when it comes to actual applications many suppliers try to wriggle out of this type of upgrading.

After Sales Service

Still another area where the buyer is advised to specify clearly is the after sales service facilities. Computer is after all a piece of equipment and would need frequent servicing. In the current Indian scene third party maintenance is yet to pickup and there fore after sales service in the form of annual maintenance contracts or other type of periodical maintenance on actual cost basis etc. have to be specified by the buyer.

Compatibility with Software

Compatibility with the software as also the purchase of software are two aspects deserve much attention and specification by the buyer . The usual sales talk as well as computer advertisements try to lure buyers to invest on hardware as if software is something which is automatically available with hardware as if software is something which is automatically available with the hardware(of course this would never be specifically mentioned). The demonstrations of the product are also usually so organized that the unknowing buyer is led to believe that once he or she buys the hardware he or she has only to take it home and hook on to the plug for getting the

output. It is only after investing on the hardware that the unknowing buyer is told that for operating the computer software is to be purchased separately. This aspect of software purchases will be dealt with separately

Networking

Still another aspect of hardware purchasing deals with incorporation of specifications for networking of computers. Not all makes and all types of computer can be networked. Further both additional hardware and software are required to do networking. If one hopes to do networking later then one should specify at the time of purchase of the computer system that he or she wants a model which will enable networking at a later date.

Inspection before purchase

It is one of the basic principles of the law of sale of goods that when a buyer has purchased after inspection of a sample, the goods delivered should conform to the sample, failing which the buyer can proceed against the seller. However, this is a double-edged sword for the seller may also try to take advantage of the position what one is bound to provide are only such features as were incorporated in the sample. When inspection of the sample is not thorough the buyer will suffer. Again there may be several features of a product which cannot be revealed during inspection. The buyer has there fore to be clear of what aspects he or she wants to understand by samples and what aspects by actual use subsequent to installation.

Conditions, guarantees and warranties

This brings us to the question of the liabilities of seller for conditions, guarantees and warranties and training of operators and installation and commissioning. Conditions of sale payment conditions etc are so vital to the contract of sale that non-fulfillment of such conditions may even render the whole sale void abattoir. If for example delivery is to be made within a certain period after certain period is over the seller is not bound to deliver. In leasing and hire purchase schemes etc, the ownership of the equipment passes on to the buyer only when the final installment is paid .Until such time one has only physical possession. If payment is not made according to the terms or payment is delayed the seller can take away the equipment. Guarantees and warranties on the other hand have different consequences. When a computer such a way a p.c is guaranteed for performance for one year (may be subject to certain conditions such as that in case of a problem the supplier or the authorized agent only shall attend to repairs etc) then if the equipment fails within the guarantee period the supplier is bound make it work at his or her cost either by repairs or replacement. Warranties, on the other hand relate to features of the equipment which are not so vital to the performance of the equipment. Hence do not attract the same consequences. The seller can choose to repair the shortfalls or agree to pay damages. For example, if the sample PC inspected by the buyer had another company the seller may argue that both VDUs provide same performance. The buyer can, if he or she proves that the supplier has saved in cost by using the latter VDU claim a reduction in price. Of course, there is no end to such debates and a prudent buyer will confine all attention to major vital components of the computer.

One more fundamental principle of sale of goods is that a seller professing to sell particular equipment which is commonly known to perform certain essential functions must make available equipment which will perform substantially such functions irrespective of guarantee clauses and warranty clauses. Thus, a seller who sells a car with or without guarantee conditions has to make available to the buyer a minimum of what a car will do. Therefore a seller of car cannot take shelter under the absence of guarantees clause to sell four wheels and body without any engine.

Therefore, if an ignorant buyer buys a “computer”, then he or she can always compel the supplier to provide him or her with equipment that will perform the essentials of what a computer will do. However, considering the sophistication and advancements that have come up in the field of computers there can be never-ending disputes on what a “computer” should essentially possess. Only a court of law, after protracted examination of evidence can decide such issues. The more prudent step for a buyer is to eliminate disputes as far as possible by making clear what he or she wants and then bargain for the purchase of what he or she wants.

20.3.2 Purchase /Sale of Software

Software is the brain of computer. Without the relevant software even the most powerful computer cannot accomplish anything.

Considering the fact that software is as costly or even more costly than hardware the buyer has to be quite alert and vigilant about the conditions of procurement, compatibility with hardware, usability for specific purposes of the buyer, etc. as already mentioned the manufacturers and suppliers of computers project hardware in such a way that the ordinary citizen does not realize that software is not included in the bargain. However, competition has forced many companies now to include in their sale price the cost of essential software for using the computer.

There are two types of software, the system software and the application software. Without the system software such as Disk Operating system on the UNIX or other types the use cannot proceed to use the computer at all. Even many a reputed manufacture/supplier keeps the price of operating suppliers demonstrate the capabilities of the computer using several sophisticated application software’s and the ignorant buyer may believe that all those are part of the hardware.

To take an example, suppose a PC/XT costs Rs.30, 000. A professional like a chartered accountant would need to invest about Rs 2,000 in MS Dos, Rs. 20,000 in DBase, about Rs15, 000 in lotus and about Rs 75,000 in a WordStar for using the computer for his or her various needs. The cost of an 80-column printer would be about Rs10, 000. The other alternative for the chartered accounting would be to go in for an MS Dos and then specific application packages for financial accounting and a WordStar which costs about Rs.17, 500. But then the computer can be used for only limited purposes which the financial accounting package and the WordStar will facilitate. It would therefore be negotiating the purchase of hardware.

Another form of software purchase is when the buyer contracts with the supplier of the equipment to provide tailor made software for the specific needs of the buyer. This is the usual practice in the case of organizations. The supplier then has to do systems analysis and develop application programmers to suit the needs of the buyer. In some cases it may be that the customer has some software and needs a system which will enable him or her to use the software. This often happens with professionals who go abroad and bring software which they find attractive. Another situation may be one in which the buyer has both a system and software, but then wants to expand and network the system for larger use. In all such cases the buyer and supplier have to sit together and understand the ambit of supply negotiate lay down the responsibilities of the supplier, the suppliers have walked away after dumping costly hardware on the buyer and the buyer keeping the equipment as a mere showpiece.

Computer Services

There are also situations where computer services are obtained by individuals or organizations through agencies which provide such services. Here the talker of the services is not bothered

about hardware and software, but is paying for only a specific service. While there are many advantages for the taker of such services, there are also disadvantages such as loss of privacy, high service cost, too much dependence on an outside agency, etc. There is practically no sale of goods in such cases and the transactions are governed by the terms of service contract.

20.4. Legal Aspects of Use of Computers

Apart from the contractual obligations arising from the sale/purchase of computers and software, there are many other legal consequences that follow when a user uses a computer. Some of the more important aspects of these patents, protection of trade secrets etc, will be discussed here.

20.4.1 Patents

As has already been discussed, hardware alone is useless without software. If the user has programming capabilities than he or she can develop his or her own software using any language like Basic, COBOL or C etc. Alternatively one may use DBase, Lotus, unify, Ingress or other general purpose packages to develop suitable application software. Without taking the trouble to do either of the above, one can buy readymade execution programs for specific purpose. One can also engage consultants to develop specific software from languages or general purpose software. Somebody has to develop programs. Suppose a user or consultant makes a own creation by becoming a owner of it in certain sense. If this were possible then when others want to use it they can be made liable to pay certain charges on agreed basis. The law on patents deals with such situations. Each country has its own legislation on patents. Here the software created is treated as something similar to an invention in, say engineering or a new software drink formula etc. patenting involves certain procedures. The applicant has to make full disclosure of what he or she has developed. The patenting authority should get convinced that it is not a mere reproduction of something already patented. Again the field of patents and law connected with it are riddled with lots of debates and disputes. Mere intellectual advancements to knowledge such as say a theorem in mathematics etc. cannot be patented, since if that were the situation, free and unfettered advancement of knowledge would be inhibited. It would appear that patenting would be possible of commercial applications. Ordinary computer programs cannot be patented.

20.4.2 Copy Right

Copy right is another form of legal protection which software people can resort to protection of their products. Copy rights can be claimed for data as well as programmers. The former is concerned with the use of information which is copyrighted and stored in retrieval systems. The latter relates to protection of programs which marketed to the general public using computers

The remain as number of problems in deciding how far the law or copyrights relating to intellectual property can be applied to computer programs

The basin protection afforded by copyright is directed against reproduction of the form of the original material. If material such as rules of a game can be used with out copying, then copy right is not infringed. To obtain copyright protection it is necessary to obtain registration and also affix copyright notice to a computer programs. In order to preserve copy right protection it is essential that there is no unauthorized publication of programs by purchasers or licensees without explicit reservation of the copyright

20.4.3 Trades Secrets and Confidentiality

Another method by which a person can protect his other computer programs are relying on common law relating to trade secrets and confidentiality. There is no doubt that computer programs are eligible for this form of protection, so long as they have progressed beyond the stage of general idea to approach some specific problem. In deed associated documentation such as user's manual or a flow chart would also be eligible for protection. In fact this branch of law probably supplies the most widely adopted form of protection for computer programs as of now. This is especially so in the case of programs which are written in house for use by a firm upon its own machine. Here the programs need never be divulged to any one outside the firm, and employees can be restrained by contractual provision from making the programs available to third parties either during their service to the company or even after its termination, at least with in reasonable limit. Contractual provision may be similarly made in aid of the secrecy of abuse, identification of offenders, and certainty of remedy are all enhanced by comparison with patent and copyright protection.

20.5. Tortious Liabilities in use of Computers

A tortious liability arises when one suffers loss because of the action of another (such as say, use of computer) even though there is no contractual relation between two persons. The computer is not, by and large, a physically dangerous machine. It does pose some electrical and fire hazards, and peripheral equipment has some moving parts. occasional cases of physical injury may arise but rare and legally uninteresting. This really leaves only three basic categories, cases of fraud or deceit, cases of negligence and cases of breach of statutory duty. There may of course, be other remedies than warranties, etc. One of the most common situations in negligence is that of the computer salesperson who makes a careless claim to attempt to sell a system

Determination of damages in contracts and torts

Two main aspects of determination of liability for torts/contract violations are:

- a) The measurement of damages for loss which is the result of the tort (or breach of contract in cases of violation of contract)
- b) The remoteness of the loss.

The general principle would seem to be that only estimated/ actual of real losses would be awarded as damages. Remote losses are usually not allowed by courts. However, American courts are seen to be more liberal in the interpretation of claims from considerations of remoteness.

20.6. Privacy and Confidential Information

With the introduction of computers for information processing computerized systems hold in their databases several pieces of information relating to individuals and organizations. The security of such information is a problem which has started receiving attention. Politicians, lawyers, publishers, scientists, police and other governmental agencies are all concerned with this problem.

The concern mentioned above springs from certain notions prevalent or getting prevalent. These are:

- Privacy of individuals is being intruded into more in present times
- Modern technology is partly responsible for this intrusion
- Much of the information that is stored in computers is inaccurate and goes unchecked. However, users take the information to be correct.
- The stored information is available to any one who wishes to have it either through legal or illegal access
- In comparison with the speed with which technological changes have taken place the legal remedies available are far inadequate

20.7. Summary

Much can be argued for and against the validity of the above propositions. Several solutions to the problems by the way of legislations and otherwise have been suggested. A lot of debate is going on in different parts of world on the subject. Some countries have taken the initiative to legislate on the subject. Some countries rely on existing legislations only.

20.8. Technical Terms

OS : Operating systems
PC : Personal Computers

20.9. Model Questions

- 1) What are the legal aspects of uses of computers?
- 2) Explain in brief about computers and laws?
- 3) Discuss about how to purchase or sale a computer?

20.10. References

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