INFORMATION, COMMUNICATION AND SOCIETY

Dr. B. R. AMBEDKAR OPEN UNIVERSITY
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COURSE TEAM

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COURSE - 01 : INFORMATION, COMMUNICATION AND SOCIETY

The course `Information, Communication and Society' conforms to the syllabus of the Master of Library and Information Science (MLISc) offered by Dr B R Ambedkar Open University. As you have done BLISc we understand that you are familiar with the structure of the programmes, syllabus and the course material developed by the open universities. For the sake of convenience, the syllabus is divided into blocks, each of which comprises a number of units. Each Unit generally covers a specific area of the subject. The Units are prepared by specialists in accordance with the format so designed to enable you read and understand them without much difficulty. Each Unit begins with the contents list and a statement of its aims and objectives, followed by an introduction to the content of the Unit. The content of the Units are divided into sub-themes and are numbered upto three levels for easy reference. Each Unit ends up with Let Us Sum Up, Assignments, References, Recommended Books and Model Examination Questions.

Information and knowledge are considered a social wealth. All the members of the society have a right to share the benefits of this social wealth. In order to make the generated information freely accessible to all it should be communicated and transferred through various media, including mass media. Thus the present day society is aptly called Information Society. The library and information systems and services have undergone several changes in the last few decades to cope up with the developments in the communication and computer technologies. These developments have a direct bearing on the education for library and information science. Indian universities which had teaching Universe of Knowledge at the MLISc till a few years ago, have drastically modified their syllabus/course contents and introduced this paper `Information, Communication and Society' to replace it.

The Course aims to provide a foundation to the various courses to be studied at the Master's level in library and information science with an exposition on the interrelationship between information, communication and society.

The specific objectives of the Course are

- to introduce the concept of information, its nature and properties; communication models and theories; structure and development of knowledge

- to provide an overview of generation, flow and diffusion of information and the role of mass media

- to familiarise the learners with various information transfer media - conventional as well as non-conventional and information and communication technologies

- to describe the role of information in the socio-economic development of the society

- to familiarise the learners with information policies of United Kingdom, United States and India

- to provide an understanding of the need and facilities for education, training and research in library and information science with special reference to India.

Our University hopes that the course material will help you to get yourself acquainted with the contents of Course-01: Information, Communication and Society. The Counselling-Cum-Contact sessions provided at your Study Centre will help you to get clarification of your doubts.

CONTENTS

BLOCK - I : NATURE OF INFORMATION

Human progress was considered to be the outcome of the exploitation and utilisation of natural resources. Later, men, materials and money were considered to be the resources for economic growth and progress of the society. This has been the situation till recent times. The situation has changed now. For economic growth and consequent social change the full utilisation of human resources and the use of nascent, authentic information suitably tailored to the needs on hand are the two things that are considered essential now. Nations that can put information to the optimum use are being benefited.

Information processed and communicated becomes knowledge. Knowledge in turn generates information. This information gets communicated again. This is a continuous dynamic and turbulent process that goes on and on and its use as a powerful resource for human progress and development has been well established.

This Block deals with the nature of information, communication and knowledge.

Unit-1 explains the concepts `Information', `Communication' and `Knowledge'. It describes the process by means of which information gets distilled as knowledge.

Unit-2 describes the nature and properties of information. Various authors defined information in different ways. These definitions essentially describe the several facets of information. The unit also identifies patterns and models of growth of information. The classification or taxonomy of information is also given.

Unit-3 deals with communication. Different types of communication like verbal and non-verbal, vocal and non-vocal, etc are explained. Communication process and models and theories of communication are described.

Unit-4 covers the universe of knowledge and knowledge structure. The sources of knowledge, the models of formation of subjects and the social epistemology is described. Since research is one of the sources for the growth of knowledge, its methodology is described.

UNIT-1 : INFORMATION AND KNOWLEDGE

Structure

1.0 AIMS AND OBJECTIVES

This is the first unit of Block-1: *Nature of Information.* In this unit an attempt has been made to explain the meaning, definitions and scope of the terms `Knowledge, data, information and communication'. Further a comparison is made among knowledge, data, information and communication.

The unit aims at introducing you to knowledge and information and the interrelationships among information, data, knowledge and communication.

After reading this unit you will be able to

- explain the meaning and definition of information, data, knowledge and communication;
- discuss the inter-relationships of information, data, knowledge and communication;
- distinguish the meaning and relation between private and social knowledge;
- describe the process of learning.

1.1 INTRODUCTION

Information, communication and knowledge are essential for the development of society. They are considered the wealth of society. In the contemporary society there is an ever increasing value for information. It is now considered an essential source for human development.

The development of knowledge or growth of knowledge occurs mainly due to human interaction with nature. Man learns or acquires knowledge through observation, perception, apperception etc. The acquired knowledge through these processes can be ventilated through proper communication mechanism. Therefore, there is an urgency to understand the relation between information, knowledge, data and communication. Each term has its own meaning and scope.

Individuals can keep knowledge to themselves or share with others. When an individual shares knowledge with others it will become public knowledge, otherwise it is known as private knowledge. It is very important to understand the relation and difference between private and public knowledge and how private knowledge becomes public knowledge at a later time. All these aspects are discussed in this unit.

1.2 DEFINITIONS OF TERMS

1.2.1 Information

The term `information' has been derived from two Latin words `Farmatio' and `Forma' which imply giving shape to something and of forming a pattern. Information refers to fact, news, data intelligence and knowledge which can be used, transferred and communicated. Information is the product of brain, may be abstract or concrete.

According to *Webster's Third New International English Dictionary* `Information' is defined as the "process by which the form of an object of knowledge is improved upon the apprehending mind so as to bring about the status of knowing".

Shera defines information as `Information is a fact, it may be a single isolate fact, it may be a whole clusters of facts but it is still a unit, a unit of thought'.

Brillowin says `Information is the raw material and consists of a mere collections of data'.

Davies views information as `data that has been processed into a form that is meaningful to the recipient'.

In the words of Shannon `Information is the unit which carries a message'.

Information is knowledge, intelligence and facts which is the result of experience, observation, interacting and reading.

1.2.2 Data

The term `data' usually being used in science subjects (experiments) and also in computer science. Some data may be used by different people to draw conclusions in their perspective. In other words data is flexible to all. Data may be defined as a raw, unevaluated, unprocessed and unorganised facts. It is the records of the results of experiments and observations, the measurements and calculations made by scientists.

The word `data' is Latin in origin, and literally, it means anything that is given. According to Robert Hayes `Data' is that which is recorded as symbols from which other symbols may be produced. That may represent `facts' as statements of truth but generally it is anything recorded in a form which can be processed.

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 is 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'.

Unesco defines data as `facts, concepts or instructions in a formalised manner suitable for communication, interpretation or processing by human or automatic means'.

Shuman defines data as `Quantitative facts derived from experimentation, calculations, or direct observation'. According to him data is the symbolisation of knowledge'.

So, data are raw facts and frequently unrelated to each other, but when processed intellectually they become information and add to knowledge. Thus data forms the basis of knowledge. It is one of the important items for scientific and industrial research.

1.2.3 Knowledge

The totality of ideas information and principles conserved though a civilization is known as knowledge. Robert Hayes defines knowledge as "accumulated data which has been systematized, formulated and evaluated with reference to the discovery of general truths."

The Oxford Concise Dictionary defines knowledge as "familiarity gained by experience; persons range of information".

According to S.R. Ranganathan, when knower and knowee are brought in relation, the knower knows the knowee and knowledge emerges. It implies that there are three entities involved in knowledge, the subject which knows, the object which is known and the process of knowing. Knowledge cannot emerge unless the knowee and the knower are brought together or come in contact.

Ladd says that in knowledge, the knower appears to himself as an active and sensitive intellect.

`Knowledge is justified true belief' is a widely accepted definition to knowledge. That is a kind of belief is supported by the fact that both knowledge and belief can have the same objects and that what is true of someone who believes something to be the case is also true, among other things, of one who knows it.

1.2.4 Communication

Communication is as old as mankind but it is relatively modern as a discipline. Communication is essential for man's existence. Man must communicate with himself and with his fellow beings also. The term communication is derived from the Latin word `communicae' which means `carrying' or `sharing'. It is the mode of interaction between or among two or more individuals.

Communication implies exchange of information, ideas, thoughts between individuals by the use of symbols, words, pictures, figurers and graphs etc. It is the act or process of transmission that is usually called communication.

According to *Oxford English Dictionary* `communication' means `the imparting, conveying, or exchange of ideas and knowledge whether by speech, writing or signs.

The *Encyclopaedia of Library and Information Science* says "Communication is the continuous pervasive and comprehensive, collecting of all mechanising, organisations and the physical universe".

In the words of Shera `Communication is essentially a social phenomenon, because of its importance to the structure, organisation and behaviour of the society as well as the character of the individual'.

Peter Drucker defines `Communication as the ability of various functional groupings within the enterprise to understand each other's functions and concerns.

1.3 RELATIONSHIP OF THE TERMS

The terms `Information', `Data', `Knowledge' and `Communication' cannot be used interchangeably. But they are inter-related.

1.3.1 Information and Communication

The essence of communication is the transfer of information. Communication is the act or process by which information is transmitted from the communicater to the receiver. Information is the message or an element of communication. The information or message when transmitted should evoke a response, it means the message should be understood and appropriate action should be initiated. Communication is an activity. Further, communication is interpersonal and information is impersonal..

1.3.2 Information and Knowledge

The totality of ideas and information conserved by civilization is known as knowledge. It is a result of an act or state of understanding. Knowledge is always about an actual or supposed object and exists as soon as a person has acquired it through invention, discovery or some other means knowledge is that which an individual, group or culture knows and there can be no knowledge without a knower. It refers not only to propositional facts but also to logical and empirically established relationship.

Information on the other hand refers to informing, telling or things told. It is a message, a signal or stimulus which is to be transmitted by an act or process of communication, and it evokes response from the recipient. So information is the input of knowledge and mostly received through senses. It is the collective noun for the sum total of that which can be known. Though both information and knowledge are often used interchangeably, some writers have observed a distinct difference between them.

Farradane observed that `information is physical surrogate of knowledge (i.e. language) used for communication. It is neutral in the sense that it does not have to be new to the recipient. While knowledge is memorable records as an outcome of a process in the brain; something available in the mind, its creation in the mind is at present quite unexplained. However, scientists are working to explore this area.

While differentiating between the two terms, Peter Drucker says "only when man applies information in doing something it becomes knowledge. Knowledge like electricity is a form of energy that exists while doing work".

According to Brooks "Information modifies the knowledge structure to give a totally new knowledge structure by inputting it. This is shown by a formula.

$$K(S) + \Delta 1 \text{ ----->} K\ (S + \Delta\ S)$$

Where K(S) is the knowledge structure which is modified by the information input Λ1 to give a totally new knowledge structure K(S + Δ S)

From the above discussion the following differences between the two (knowledge and information) can be drawn:

1) Knowledge is systematic and organised but information is random and scattered.

2) Information is timely proposition, transitory or evenephemeral whereas knowledge is of enduring significance

3) Information is piecemeal, fragmented and particular whereas knowledge is structured, coherent and universal

4) Information is a flow of messages whereas knowledge is a stock, largely resulting from the flow, in the sense that the input of information may affect the stock of knowledge by adding to it, restructuring it or changing it in any way.

5) Information refers to evidence,results, indications, hint, advise, facts told or communicated, whereas knowledge is identified with truth, insight, learning, expertise or wisdom.

6) Knowledge is restricted in the individual who gains it, while such knowledge if it is shared by means of commu nication it becomes information.

7) Acquisition of information leads to development of knowledge and knowledge in turn becomes information when it is communicated to a person who is ignorant of it.

8) Information becomes knowledge when man applies it to do a particular work.

1.3.3 Information and Data

Data is the raw material from which the others derive information. Data is that which is recorded as symbols from which other symbols may be produced. The data may represent 'facts' as statements of truth but more generally it is anything recorded in a form which can be produced.

Information is the result of processing of data. That processing may be one simply of data transmission, data selection, data organisation and data analysis. So, information and data are quite distinct from each other. Data is raw, unappraised and unorganised but becomes information when refined, selected; organised Information carries a specific meaning and is available in a usable form.

The following are some of the differences between data and information:

1) Data is information when communicated or told.

2) When data is properly processed and evaluated it turns into information.

3) Data does not carry any meaning whereas *information is a refined data* and is meaningful.

4) Data sometimes forms the source of information since information is obtained by collecting related pieces of data.

5) Data is usually presented in tabular form but information is available either in tabular or textual form.

1.4 ACQUISITION OF KNOWLEDGE

To acquire knowledge there are certain methods used by man throughout his life. Man learns or acquires knowledge through different methods in various situations. Some of these methods are discussed below.

There are five essential ways through which knowledge is acquired. They are

i) Cognition

ii) Perception

iii) Apperception

iv) Concept

v) Idea

1.4.1 Cognition

The activity of knowing, the acquisition, organisation and use of knowledge is cognition. The activity or process of knowing involves a complex process including thinking, sensation, problem solving, perception, recognition, imagination and recalling.

The origin of the concept of cognition and its study can be traced as far back as Aristotelian days. However, it was not until the twentieth century that the study of cognition emerged as a specific area of inquiry. Until the emergence of computers they were studied by Gestalt psychologists. The appearance of computers changed this phenomenon.

Their importance in inspiring an interest in cognition did not stem primarily from the role in gathering and analysing empirical data. Rather, it stemmed from the fact that computer operations come to be viewed as having important parallels to human cognitive process. This suggested that complex cognitive processes were real and could be studied in terms of programmes, routine, subroutines, storage, input, output, retrieval and so on. It is the interest in computer that led to the emergence of relatively new disciplines like artificial intelligence and cognitive science.

1.4.2 Perception

It is one of the processes of learning knowledge. The experience or feeling developed by that which is perceived. Through this method man learns many things and adds to existing knowledge. This is a process which enables the individual to learn many things. The perception is linked to five sensory organs. For example by listening to a particular sound, the child could recognise the items - sound of aeroplane, sound of rail engine etc; by listening to the foot sounds some of us recognise who is coming towards us. By experiencing these five sensory organs, the individual learns himself and experience the observed phenomenon and the results become knowledge.

1.4.3 Apperception

According to *Webster's Students Dictionary* apperception means "perception characterised by clearness and the relating of what is newly presented to the mind with knowledge previously acquired". This is another kind of process of learning and usually follows the process of perception. In this process the acquired knowledge through perception will get clarity and refinement. For example while moving outside, if rain starts, we immediately look for a shade or umbrella. Through perception, the individual has already known that the rain makes one wet, but using umbrella or shade to escape from rain - is the knowledge from apperception.

1.4.4 Concept

The word concept is derived from two Latin words i.e. `Cum' meaning `with' and `capere' meaning `to grasp'. A concept may be defined as a general notion or idea representative of a whole class of things. It is the result of analysis of individual things and a synthesis of their common characteristics.

Webster's Dictionary defines it as something conceived in mind - an idea, a thought, a notion. Thus concept is imagination about something with definite and determined content.

Ranganathan described a concept as "the formation, deposited in memory as a result of association of percepts".

1.4.5 Idea

An idea denotes a percept, which means, a meaningful impression gained through primary senses or a mental image formed out of association of several percepts. An idea also refers to a product of mental reflections and imagination. It can also be an entity of thought obtained by intuition. A entity can be simple or complex. Ideas need to be expressed in different levels of medium for the proper communication. It can be communicated through basic constituents of media such as signs, symbols, signals, impulses, gestures, sounds and pictures, and the like. Once the idea is expressed in any media, it would be called knowledge or information. Out of all media, the language medium has broader scope for its expression.

1.4.6 Knowledge

The totality of experiences gained by individuals in their life time can be called as Knowledge. Some scholars give the meaning to knowledge as if we know `what we don't know'. Knowledge denotes clear perception of facts. The communicated knowledge is often referred as information. So knowledge is gained by actual experience and practical skill. According to Weiss, promoting knowledge can only mean fostering an intrinsic growth. He shows that fundamentally our knowledge grows the way a living body does. Some other append the meaning to knowledge as knowledge is justified true belief.

1.5 LEARNING - PROCESS AND THEORIES

Through information and learning human beings gain new knowledge and skills. Information available in plenty around us can be put to use when it is communicated and the communication is received by the recipient. The information so received is to be retained, strengthened and reinforced if we want to enrich or enhance our knowledge.

1.5.1 Learning Process

Learning is a process by means of which new knowledge and skills are gained by human beings. Through learning and assimilation of what is learnt we gain new knowledge.

Philosophers, psychologists, behavioural scientists tried to find out the learning processes in animals and humans through speculation, research and experimentation. Scientists believe that learning involves changes in the nervous system. They are trying to discover the learning process that occurs in the brain. Researches are still going on worldwide in the area of learning process.

"The basic activities in learning processes include the following internal and external features:

i) taking in information;

ii) searching for and assigning meaning and value to information;

iii) utilizing information;

iv) making decisions, acting and receiving feedback on the consequences of actions; and

v) interacting with objects and other persons; and

vi) using additional sources of information." (Srivastava. A.P.;1993)

It is further observed that "a learner, as an adult, generally possesses greater experience, adopts multiple strategies than a child as a learner. An adult learner shall also possess effective patterns of meaning than a child".

1.5.2 Theories of Human Learning

There are several theories of learning propounded by renowned psychologists. Most of the theories of learning are based on the classical and instrumental conditioning experiments. These theories can be divided into three groups. They are i) Behaviourism, ii) Cognition, and iii) Humanistic theories.

i) Behaviourism (Stimulus-Response Relationship) :

The behaviourist psychologists say that all learning is the forming of habits. When we learn a stimulus and a response bond is established which did not exist before and thus a habit is formed. We come across different types of habits which range from simple to complex. The more complex habits are involved in more learning skills. We solve the problems either through the responses learned from past experiences or by using trial-and-error approach of trying one response after another.

ii) Cognitive Approach :

Cognition means the act of knowing or perception. The cognitive psychologists feel that understanding concepts and ideas is a complex learning process and it is difficult to explain it through classical and instrumental conditioning. This approach emphasises the importance of the learner's discovering and perceiving new relationships. The cognitive theorists believe that people grasp things as a whole. Learning is both a question of 'insight' formation and successful problem solving and not a mechanical sequence of stimuli and responses. The comprehension of concepts lead us to the solution of new problems.

iii) Humanistic Theories:

Humanistic theorists look at human beings as information processors, thinkers and creators. Learning results from the need to express creatively. Curiosity keeps man alive. Learning as a goal-directed activity satisfies the curiosity of the learner. The theorists believe that people must become involved in challenging activities as learning at its best is thinking. People gain a sense of control, growth and knowledge from such activities. People must have qualities such as freedom to make own decisions, inner drive, freedom from anxiety, self respect, etc which will lead them to learn.

It is not necessary that you should know the details of various theories of learning propounded by individual psychologists. But it will be sufficient if you know that there are several theories of learning like,

i) Humanistic Theory of Rogers (1959)

ii) Psycho-analytic Theory by Sears (1967)

iii) Reinforcement Theory (1970)

iv) Curiosity and Exploration Theory by Berlyne and others (1965)

v) Competency Motivation Theory by White (1959)

vi) Attribution and Personal Causation Theory by Weiner (1972)

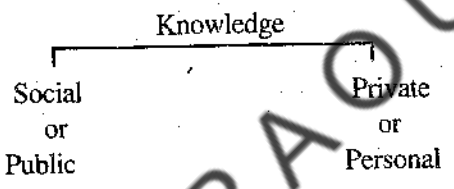
1.6 PRIVATE KNOWLEDGE AND SOCIAL KNOWLEDGE

Knowledge can be classified or clubbed into different groups. By applying the characteristic 'question of accessibility of knowledge' it is grouped into two types:

i) Private knowledge (also called Personal Knowledge)

ii) Social knowledge (also called Public Knowledge)

In many instances the epistemologists equate public and private knowledge with social and personal knowledge respectively

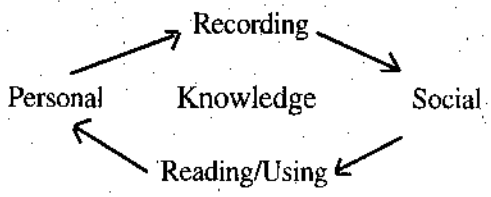


The important difference between these two types of knowledge lies in the question of its availability. Social knowledge is made available to public through consultations of the records. The recorded knowledge is pooled at a place for public use and libraries are one of the important places in this context. The knowledge in the documents in a library is a part of social knowledge.

Personal (private) knowledge on the other hand is not available to all, for it to become social knowledge or public knowledge it has to be made available to public either by recording or publishing them. Social knowledge is the prime source of personal knowledge. Main ideas and perceptions to a great extent are influenced by the social system encircling him. Society or social system provides an opportunity to the individuals to enrich the existing knowledge, i.e. personal knowledge. In this way social knowledge influences private knowledge for its growth.

All social knowledge at sometime or other had been the personal knowledge of individuals. New ideas, concepts, facts can originate only in the minds of the people. An idea, so conceived only contributes to the personal knowledge of an individual who has it. Eg: Newton's works on Law of Gravitation.

The concept of Gravitational force was perceived by Newton, which in turn enhanced his personal knowledge. At that stage the knowledge on laws of gravity with Newton was to be considered as his private knowledge. When it was recorded made available to people at large, universally accepted it became social knowledge. So the relation between these two types of knowledge can be established in both ways. They supplement each other. This relation other wise can be termed as symbiosis between private and public knowledge. It is diagrammatically shown as:



Thus, the relation between these two kinds of knowledge is identified as neither mutually exclusive nor independent. It means neither of them appears independently or retains its status permanently. Most of the knowledge that exists in the world's libraries is first known or held in the minds of some persons before it is made public and thereby it can also be called as their personal knowledge.

Social knowledge depends for its existence on personal knowledge and much of personal knowledge is derived from social knowledge. So the difference between these two may be concluded in degree rather than absolute dichotomy. Most of the knowledge existing in society may be conveniently called as `semi-social knowledge'. Since the recorded knowledge was not always available and which are not intended to be available to all members of the society, for instance, the documents or reports prepared by government bodies. These are semi-published documents and access to them is restricted. So also other set of documents which concern a particular fragment of society. Eg. personal records, bank accounts, income tax returns, etc.

The extent to which knowledge is to be regarded as social or semi social depends on the extent the records containing it are available to all or some. On the other hand not only the knowledge in one`s mind but also his personal correspondence and the notes form part of his personal knowledge. It must be noted here, that the social knowledge is not always the knowledge found in records. Much of it is learned from own experiences, lectures, exhibitions etc. So it need not be merely confined to records.

The relationship between public and private or social and personal knowledge is subtle and it is because of their evolution or development. However, the philosophers do not equate public knowledge with the idea of social knowledge and private knowledge with personal knowledge. According to the philosophers the public knowledge is the knowledge about the external world which individuals perceive through their senses, irrespective of the fact whether it has been recorded or not. On the other hand, social knowledge is the knowledge usually recorded and made available to others.

Private knowledge is about the inner feeling, emotions of an individual which can be derived by him alone through his senses and perceivable by another person. Personal knowledge may not be always of individual himself but it can be about the external world which has not been recorded.

The identification of difference among these two pairs of terms - public and social; private and personal is not always easy and many a time these terms are used interchangeably within themselves. That is to say public knowledge is spoken as social knowledge and private knowledge as personal knowledge.

In a library or information centre we find only recorded knowledge made available to the public. Unrecorded knowledge as such has no place in libraries and information centres. By now we very well aware about the use of the term `recorded'. Information even in the form of a picture or a sound record is recorded information. Private letters, diaries, notes of great

personalities may sometimes find place in a library. In such cases they become public/social recorded knowledge.

Organisation of Social knowledge

The social or public knowledge is to be organised properly for its ultimate use by people. There are three aspects in organisations of public knowledge.

i) Organisation by creation
ii) Self organisation
iii) Bibliographic organisation in libraries

i) Organisation by Creation

Along with the creation of knowledge, proper organisation of knowledge is also to be done simultaneously. Then only it will reach and be conserved by the public at large. To precipitate a particular concept or idea, the organisation begins from letters, letters to words, words to sentences, sentences to paragraphs, paragraphs to chapters and finally documents. Once the idea is documented following the stages mentioned, it becomes social knowledge and can be used by all. Thus the knowledge is being organised during its creation.

ii) Self-Organisation

To develop or create a particular concept the author might have used a good number of sources. While explaining the concept, sometimes the author refers to other authors' work from whom the idea is borrowed. The provision of these references is known as self organisation. The user would get a chance to see the original work to understand further or to verify the concept mentioned.

iii) Bibliographic Organisation

The moment a document is published for its further use it should be included in various lists. Such lists include abstracting journals, indexing periodicals, information services etc. These lists (Bibliographical aids) enable the users to find documents of his/her their choice on a particular subject, of a particular author etc.

1.7 LET US SUM UP

This unit is intended to introduce you to concepts like data, information, communication and knowledge and their inter-relationship.

Data according to UNESCO means facts, concepts or instructions in a formalised manner suitable for communication, interpretation or processing by human or automatic means. In information data has been processed into a form that is meaningful to the recipient. Accumulated data that is systematised, formulated and evaluated in the context of newly found general truths is knowledge. Communication helps the society in sharing ideas and knowledge be it by speech, writing or signs and symbols. Thus all these terms are inter-related.

Human beings acquire knowledge through several means for several reasons. Different theories were propounded by philosophers and thinkers on human learning. Knowledge can be broadly classified as public knowledge and private knowledge; or as social knowledge and personal knowledge. Knowledge can also be recorded and unrecorded. In libraries and information

centres recorded social or public knowledge alone is available for use. Sometimes, private or personal records may also be available in libraries and information centres. But it goes without saying that unrecorded knowledge cannot find a place in libraries and information centres.

1.8 REFERENCES AND RECOMMENDED BOOKS

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1.9 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Differentiate and explain the terms `Information', `Communication' and `Knowledge'.
2) Bring out the differences between private knowledge and public knowledge.
3) Explain how social knowledge is organised ?

II. SHORT NOTES

a) Idea
b) Cognition
c) Apperception
d) The process of knowing
e) Bibliographic organisation

UNIT - 2 : NATURE AND PROPERTIES OF INFORMATION

Structure

2.0 AIMS AND OBJECTIVES

In the earlier unit you have learnt the meaning and scope of information, knowledge, data and communication. In this unit an attempt has been made to explain the broader meaning of information, its definitions, types, attributes, value and importance, modes of information transfer, growth of information etc.

By the end of this unit you will be able to

- describe the scope and meaning of Information
- explain the nature, attributes and value of various types of information
- discuss various models for information transfer, growth and obsolescence of information.

2.1 INTRODUCTION

Information plays a key role in economic, social, and cultural realms of the society. It is very important in speedily transforming society and a vital resource and input in the over all development and growth of a country. In the contemporary complex world, management of multifarious organisations is a stupendous task. In order to achieve efficiency proper decision making is important. Information constitutes most valuable tool for decision making and reducing uncertainty. The supply of correct and reliable information at the right time to the right person helps in minimising wastage of resource and avoids duplication of work. It is regarded as resource of resources i.e., that on which depend all other resources for their evolution and utilisation. Information plays a vital role in:

1) Growth of Knowledge and Wisdom
2) Research and Innovation
3) Development and Design
4) Production and Marketing
5) Decision Making and Management
6) Education and Training

Information is the message which can be transmitted between individuals. It is the product of human brain in action. Information is power. It helps a great deal in minimising uncertainty and enables a person to arrive at a suitable decision. The amount of information required varies from person to person, from time to time and from place to place varies.

2.2 INFORMATION - DEFINITIONS, APPROACHES AND TYPES

2.2.1 Definitions

The term information has been derived from two Latin words `formation' and ` forma which imply giving shape to something and of forming a pattern. Information refers to fact, news, data, intelligence and knowledge which can be used transferred and communicated. It is a stimulus which we receive through our senses or it is the product of brain in action.

Information is defined by UNISIST Guide to Teachers (prepared by UNESCO) as "a sensible statement, opinion, fact, concept or idea or an association of statements, opinions and ideas".

Balkin defines information as `that which is capable of transforming structure'.

According to *A L A World Encyclopaedia of Library and Information Science,* `Information is a property resulting from or produced by a process that produced the data. The process may be simply data transmission, data selection, data organisation, or data analysis.

According to Webster's English Dictionary, information is defined as the process by which the form of object of knowledge is improved upon the apprehending mind so as to bring

out the state of knowledge. Shera defines information as `a fact, it may be a single isolate fact or it may be a whole cluster of facts but it is still a unit, a unit of thought'.

Information as defined by Communication Theories

According to the Mathematical Theory of Information the amount of information in a message is related to the probability ratio of the message. The more it reduces probability the more information it has. This theory believes that the prior knowledge of the recipient may reduce the amount of information in a message (Shannon and Weaver).

The Semantic Theory of Information on the other hand suggests that a prior knowledge may increase the amount of information in a message. The Mathematical theory views information from technical angle, while Semantic theory is concerned with the conveying of the desired meaning through the transmitted symbols.

An Information Scientist or a Librarian has some interest in both the theories of information. But he is more concerned with behavioural problem i.e. with the effect which the meanings of the transmitted symbols produce on the recipient. If the behaviour or conduct of the recipient is not affected, no information is said to have been conveyed to him.

Rajan says that no universally accepted definition of information has yet crystallised, perhaps it will never be crystallised. However Wersing and Weveling give the following approaches to information.

2.2.2 Approaches to Information

The following are the SIX approaches to information as suggested by Wersing and Weveling:

i) The Structural Information

ii) The Knowledge Approach

iii) The Message Approach

iv) The Meaning Approach

v) The Effect Approach

vi) The Process Approach

i) The Structural Information: In this approach information is viewed as structures of the world of static relations between physical objects which may be perceived or not.

ii) The Knowledge Approach: This approach records knowledge that is built on the basis of perception of the structure of the world. But the problem with this approach is that the term information may erroneously be used for the term `knowledge'.

iii) The Message Approach: The mathematical theory of communication uses this approach. It is concerned with the transmission of symbols representing a message.

iv) **The Meaning Approach**: In this approach the semantic contents of a message are accepted as information.

v) **The Effect Approach**: This approach says that information occurs only as a specific effect of the process and

vi) **The Process Approach**: According to this approach the process of information occurs in the human mind when a problem and useful data are brought together.

On the basis of the above approaches the learned authors concluded that information is a social process and should be defined in relation to information needs either as reduction of uncertainty caused by communication data or as data used for reducing uncertainty.

Otten gives the following three aspects of information after concluding that a single definition for this concept will not do.

1) Order of structure of information
2) Probabilistic information
3) Semantic information

These different categories or approaches of information, he says, manifest themselves in various forms and operate at three different levels.

2.2.3 Types of Information

Jesse Shera categorised information into six types:

1) Conceptual information
2) Empirical information
3) Procedural information
4) Stimulating information
5) Directive information
6) Policy information

1) **Conceptual Information**: The ideas, theories, hypothesis about the relationship which exists among the variables in the area of a problem.

2) **Empirical Information**: Experience, the data of research may be drawn from one's self or through communication from others. It may be laboratory generated, or it may be product of literature search.

3) **Procedural Information**: This methodology enables the investigator to operate more effectively. Procedural information is related to the means by which the data of investigation are obtained, manipulated and tested; it is certainly methodological and from it has been derived the scientific attitude. The communication of procedural information from one

descriptive or field of investigation to another may illuminate vast shadows of human ignorance.

4) **Stimulating Information**: Man must be motivated and there are but two sources for such motivation; himself and his environment. Stimulatory information that is environmentally derived is probably most effective when it is transmitted by directed communication - the contagious enthusiasm of another individual but whether directly or indirectly communicated, it is probably the most difficult of all forms of information to systematize.

5) **Directive Information**: Group activity cannot proceed effectively without coordination and it is through directive information that this coordination is achieved.

6) **Policy Information**: This is the focus of the decision making process. Collective activity necessitates the definition and objective and purpose, the fixing of responsibility, the codification of rights and privileges and the delineation of functions.

Basing on the nature of information, it can also be categorised into two distinct types. They are:

i) Discursive Information

ii) Non-Discursive Information

i) **Discursive Information** : Discursive information is the message conveyed by a systematised body of ideas or its accepted substitutes having the attributes relating to its treatment or expression such as

a) Ranging over a wide field

b) Proceeding logically or coherently from topic to topic

c) Reasoning from premises to conclusion or proceeding from logical abstraction to logical interpretation.

ii) **Non-Discursive Information** : Information that is not discursive is non-discursive information. A message consisting of a unit or atomic fact conveyed by a systematised body of ideas or its accepted or acceptable substitutes is non-discursive information. It does not contain any of the attributes of discursive information. The non-discursive information can also be divided into:

a) Qualitative Information

b) Quantitative Information

a) **Qualitative Information**: It is conveyed by expressions concerned with unit facts in terms of some attributes of an entity.

b) **Quantitative Information**: It is conveyed by expressions concerned with unit facts in terms of some quantity of an attribute of an entity.

There is a close relationship between qualitative and quantitative information, for instance qualitative information may form the basis of quantitative information. So also nondiscursive information may form the basis of discursive information.

2.3 NATURE, CHARACTERISTICS AND VALUE OF INFORMATION

Need for information arises depending upon the needs of a recipient. The need may be to take a decision or to solve a particular problem or to reduce uncertainty or just to satisfy the intellectual curiosity. So depending upon the various environments, the information types also vary.

2.3.1 Nature of Information

Information is as varied as human motives in general. The following are some of the varied forms of information.

1) **Technical Information**: This type of information emanates from research and development carried out by various research institutes including universities. This information is a product of innovation, invention and as such it adds to the existing knowledge. Such an information is required by researchers, scientists, producers and students.

2) **Commercial Information**: Commercial information is the information pertaining to products, marketing, management, import and export etc. This kind of information aims to maximise profits. Such type of information is usually needed by producers, traders etc.

3) **Social Information**: Social Information encompasses traditional information. It also concerns about social development, the growth of cities, of social welfare and planning and of democratic government etc. Social information enhances the quality of life of the people considerably.

4) **Administrative Information**: The coming together of people in larger group creates a need for administrative information. It contains information about the work environment, its rules regulations policies and decisions of the administration. All the citizen and administrators need such an information because of the ever increasing involvement of government in the life of the community and the growth of community participation in administration.

5) **Occupational Information**: It is a kind of information which is associated with the occupation of each citizen engaged in, such as the work produces whether it is manual, clerical, technological, supervisory, managerial, educational etc.

2.3.2 Characteristics of Information

Information basically acts as a trigger to set a human being into an action plane. Information may be compared to kinetic energy which moves a thing while the recorded knowledge of a human being may be compared to potential energy which provides the reservoir. It is the information that makes a human being advance more than his counter part.

According to Peter Drucker information is now our classical resource, but its inherent characteristics are different from those of natural and man-made physical resources.

Borland Cleveland has outlined seven characteristics of information

1) Human
2) Expandable
3) Shareable
4) Compressible
5) Transportable
6) Diffusive
7) Substitutable

1) **Human**: Information is the product of activity in human brain. Hence it is the human beings who stimulate or conceive information by interaction, observation and experience.

2) **Expandable**: Information tends to expand as it is used. It is infinite and unlimited. There are no boundaries to it except those set up by human capabilities. Information spreads through periodicals, books, television and other media. According to D' solla Price information gets doubled in every fifteen years. He also points out that seven out of eight scientists are alive who are responsible for proliferation of literature.

3) **Information is Shareable**: Information by nature cannot give rise to exchange transactions, only to sharing, says communication theorist `Colin Cherry'. Information can not be exchanged, it can only be shared. It does not disappear or deteriorate. Information if shared gives rise to more information. The use of information generates in its turn new information. The usage increases it value.

4) **Compressible** : Information is compressible both systematically and semantically. It can be put in to different formats so as to enable easy and effective transfer from generation to use.

5) **Transportable**: Information has to be passed on or to be communicated from one place to another to be useful. Words and numbers can be transmitted at close to the speed of light. As a result remote news is now a mere matter of choice than geography.

6) **Diffusive** : Information tends to diffuse, the more it diffuses, the more it creates new information. The leakage of information is pervasive and continuous, though it is not the inherent tendency of natural resources to leak. Information reproduces itself rather than consumed through use.

7) **Substitutable** : Information can replace capital, labour and physical material.

Williams has noted six parameters of Information:

1) Quantity
2) Content
3) Structure
4) Language
5) Quality
6) Life

1) **Quantity**: Quantity of information is measurable by the number of documents, pages, words, characters, bits, drawing, pictures etc.

2) **Content**: It refers to the meaning and value of information.

3) **Structure**: The format or organisation of information and its logical relationship between statements and elements.

4) **Language** : The symbols, alphabets, codes and syntax with which the ideas are expanded. Languages play a vital role in carrying the correct meaning of information.

5) **Quality** : That which characterises the completeness, accuracy and relevance and timeliness of information.

6) **Life** : The total span of time in which value can be derived from the information. According to Weisman information has the following characteristics:

   1) Existence
   2) Availability
   3) Language or recognisable representation
   4) Meaning

McGarry summarises the following attributes of information:

1) Information can be regarded as a near synonym of fact.

2) It has a transforming or reinforcing effect on what is known, or believed to be known by a human being.

3) Information is the freedom of choice one has in selecting a message.

4) Information is a necessary piece of something which we are faced with a choice. The amount required depends upon the complexity of the decision to be made.

5) Information is used as an aid in decision making.

6) Information is the raw material from which knowledge is derived.

7) Information is exchanged with others and not merely received.

8) Information can be defined in terms of its effort in the recipient.

2.3.3 Value of Information

Since information is an essential ingredient for socio-economic and scientific advancement, its acquisition, storage and dissemination has become important activity.

i) Benefits of Scientific and Technical Information

The benefits that are likely to result from a large availability of scientific and technical information are:

1) Improve the capability of a country to take advantage of existing knowledge and know-how achieved elsewhere.

2) Rationalization and systematization of a country's research and development efforts in the light of knowledge already available.

3) Wider knowledge base for the solutions of problems.

4) New alternatives and approaches to the solution of technical problems and opting for minimising future ones.

5) Improved effectiveness and efficiency of technical activities in the production and service.

6) Above all better decision making in all sectors and at all levels of responsibility.

Information is power and plays a vital role in bringing prosperity to nations. Hence the study on its production, storage dissemination has attracted the attention of the people.

ii) Information for Decision Making

It is universally accepted that relevant and current information delivered when and where required and in a suitable format becomes a major asset for planners and manager in decision making.

Decision making process is a key to any human activity. It is selecting an alternative from a set of possible alternatives with a view to maximising certain benefits and minimising costs. So the decision makers in general face a variety of possible actions and an uncertainty about the possible consequences of each action. This uncertainty may be reduced or completely removed by obtaining sufficient information in support of the decision.

2.4 MODELS OF INFORMATION TRANSFER

The following are the models of information transfer:

1) Technical Models of Information Transfer

2) Semantic Models of Information Transfer

3) General Models of Information Transfer

2.4.1 Technical Models of Information Transfer

These models are valuable to all professionals concerned with linking user and sources of information. Models coming under this type are more used by information specialists rather than librarians. Shannon and Weaver model of communication is the best example under this category. Their work is regarded as classic in the field of information study but which should be more accurately called communication theory. This theory uses advanced mathematics to analyse the effects of information transmission failure or noise on the accurate transmission of message. Berlo (1960), a prominent communication scientists has simplified the Shannon-Weaver Model into Source / Message / Channel / Receiver.

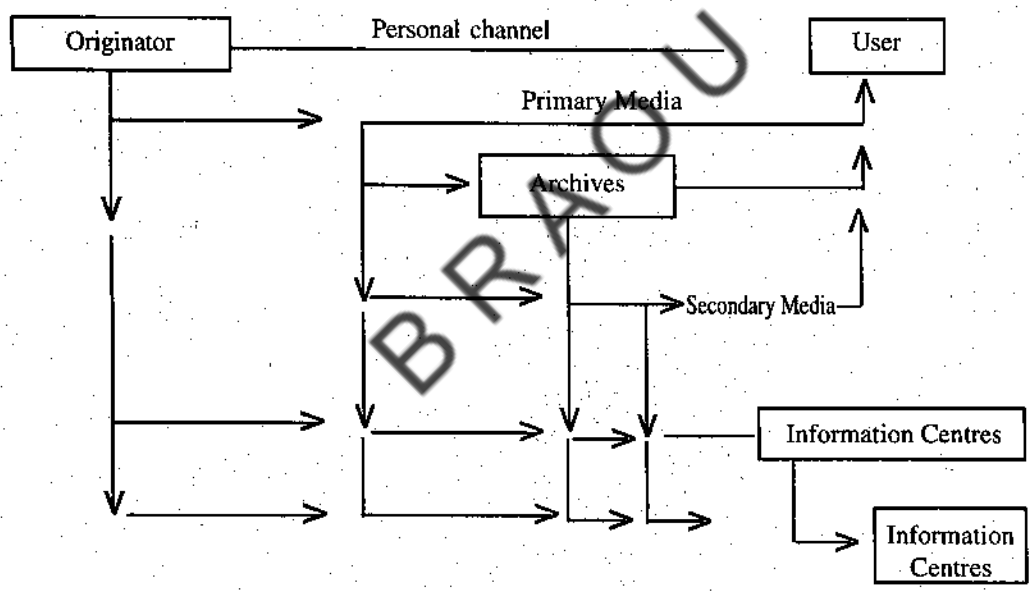
2.4.2 Semantic Models of Information Transfer

The semantic problems in information transfer were identified by Bar-Hillel (1964). It helps develop theoretical principles for the development of information science as a true science.

Yovits and Ernst evolved certain concepts and principles. Based on these developments Wittermore and Yovits made an attempt to define information. They found on Quantifying information in terms of the minimum amount of data which will be required to change the state of the decision makers. Further they stated that this measure of information must be relative as the amount of information in a message will vary with the time, the situation and the individual decision makers.

2.4.3 General Models of Information Transfer

Murdock and Liston (1967) presented not only a general model based on the classic sender/channel/receiver model, but also a variety of channels for information transfer, including direct and indirect transfer, through various media over time.



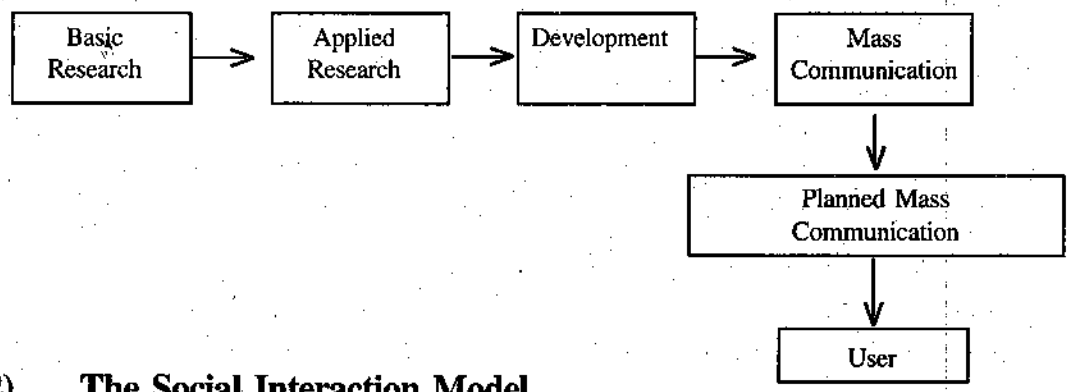
Under this category there are four types of models which collectively provide an extremely valuable and overall view of the process of information transfer.

1) Research, Development and Diffusion Model
2) The Social Interaction Model
3) The Problem Solver Model
4) Linkage Model

1) Research, Development and Diffusion Model

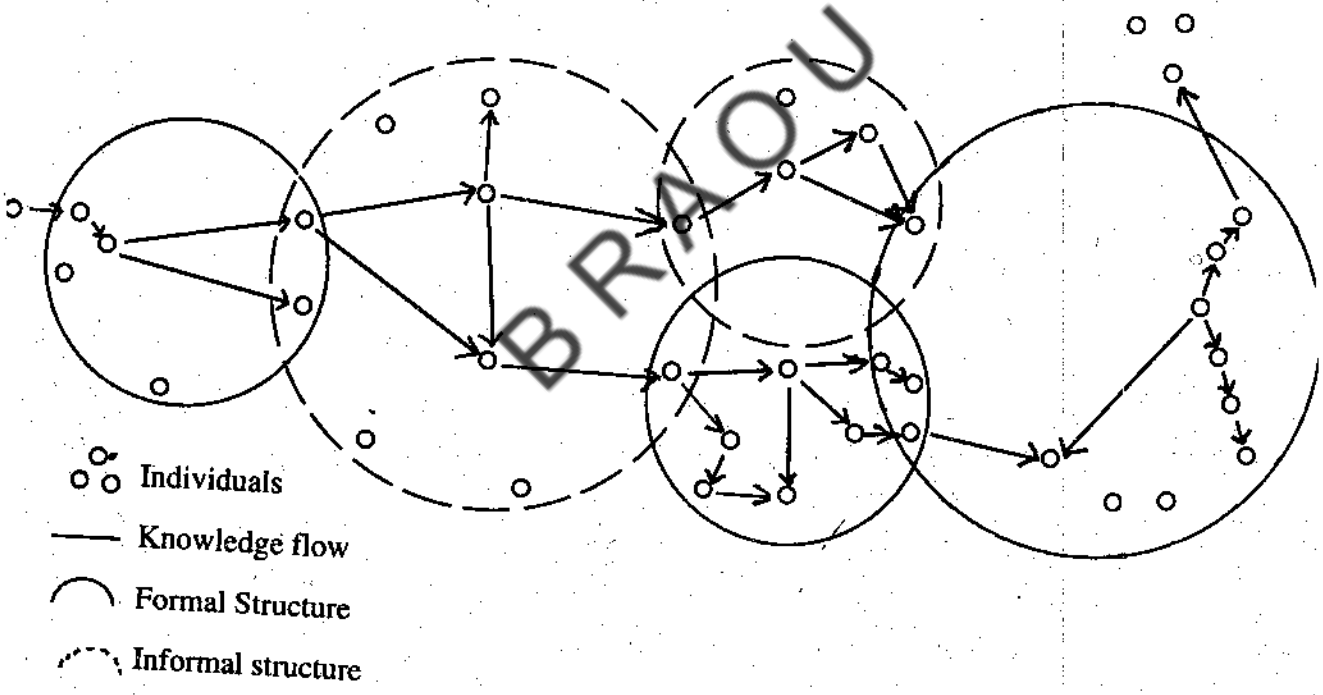
This model divides the information transfer process into research, development, production, dissemination, and consumer roles. These roles can exist separately within the different sub-cultures of

research communities, product organisations, practitioners and consumer groups. This model is popular and appropriate for dealing with dissemination and utilization issues, whether these are concepts or products, at the policy and macro-system levels. This model is more research oriented rather than user-oriented.



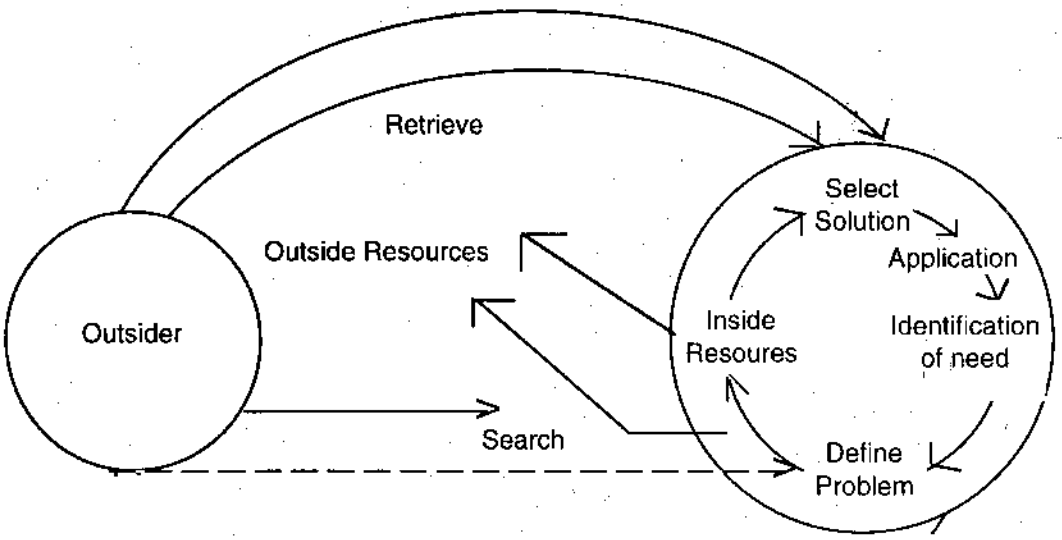
2) The Social Interaction Model

The Social Interaction Model suggests that concepts, whether in the form of products or practices, are communicated from one individual to another over a period of time within the context of a social system and these concepts are adopted, adapted, or rejected.



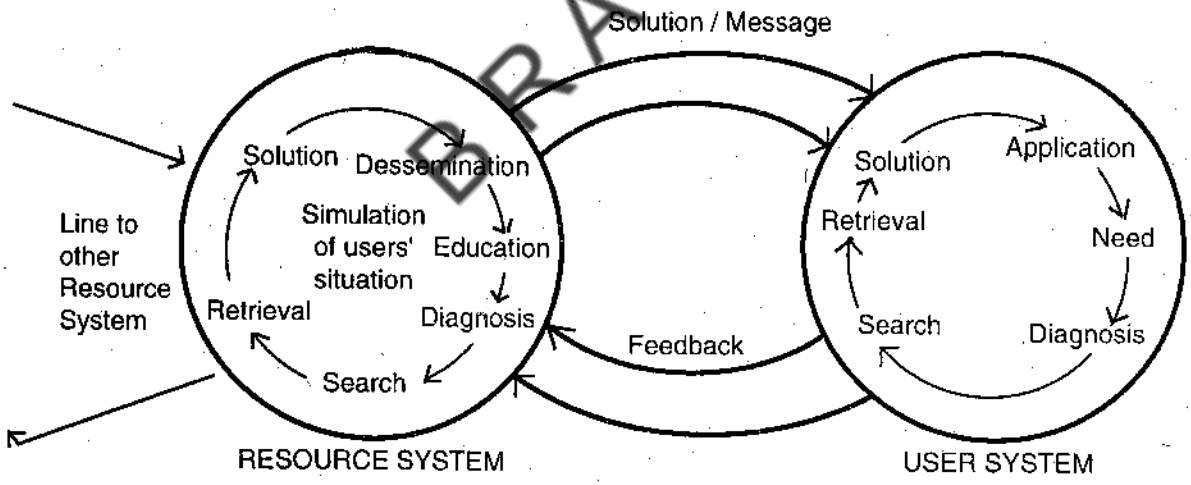
3) The Problem Solver Model

This model adopts a psychological and user oriented approach to the problem of dissemination and utilization issues. Based on the psychological theory of a need reduction cycle, which begins with the identification of a need and ends with the reduction of that need, the model is a general one and can be applied to the process inside an individual, a group or an organisation. An important limitation of this model stems from its emphasis on the user seeing a need, diagnosing a problem and making use of his internal knowledge and retrieval sources. As a result it tends to minimise the role of outside resources as well as the scope and diversity of these.



4) Linkage Model

This model based on the internal problem solving cycle of the individual, also stresses the importance of the user being meaningfully related to resources outside his own knowledge and experience. This model incorporates the features of the earlier three models. It attaches great value to the user and resource system, exchanging information in a series of turn way interaction process, through which the user is connected with a variety of resource systems, including research, development, and practice, as well as library and information services.



2.5 GROWTH AND OBSOLESCENCE OF INFORMATION

2.5.1 Growth of Information

Till the invention of printing press by Gutenberg the scientific information was mostly available through long, expensive process of copying by hands. That situation was replaced after the invention of movable printing press. Book became one of the major ways of transmitting information to the scientific community. But this mode of production lacked the speed necessary for the rapid diffusion that was needed for the priority claims that many researchers need to make

by the seventieth century. During this period scientists thought of using postal services to overcome the problem of easy diffusion of information. It was mere exchange of letters between scientific community. This method resulted in the birth of the first English scientific journal in 1665 named *Philosophical Transactions*. This journal was brought by the Secretary of the Royal Society, Henry Oldenburg and contained most current information on research.

In spite of this effort, books would contain most of the scientific work. By the late nineteenth century this habit of the monograph format had been replaced by an almost complete use of papers in journals to transmit information. Some considerable changes appeared in the publication of journals in subject specialisation. Along with time the use of journals as a method of dissemination has been stimulated by the improved postal services and the removal of taxes on the imported literature.

During the late nineteenth century speed of publication again became a major problem and this problem paved way to new journals of supplementary nature. The importance of publication of more journals was realised in the 19th century. This situation resulted in the creation of abstracting journal. Up to the Second World War the diffusion of information remained basically the same. After the Second World War there was great change in the application of information. To overcome various problems caused by war destruction, a good amount of research was necessary. As a result societies and institutes published journals, which grew in size and number. During this period the scientists used the journals as personal copies. Till this time the journals published to keep abreast of the related scientist groups in their research activity.

After the World War many societies and institutes published journals on commercial basis to make profits besides the primary aim of diffusion of information. In spite of the changes that appeared in the publication of journals, the journals were still considered an individual dissemination tool. But the development of journals influenced the libraries in many respects. So the responsibility of dissemination of information slowly shifted to the librarian. There was considerable delay in the publication of journals and it was solved by publishing newsletters and short note bulletins in specific fields.

So the journal was the main media to diffuse information in the seventeenth century. The dissemination of information after Second World War was carried out on a different pattern and invited many criticisms. The time taken between submission of the research and publication in journal was more than 6 months. The entire information or all articles of a journal were never used by individual researcher. Therefore the rest of the information available in the journal was not at all used by the researcher.

The publication of a number of journals on a specific subject paved way to indexing abstracting journals. The major problem with the abstracting journals was editing and condensing the articles. Many times the content of the article may not be represented in the abstracting.

To overcome the problems of journals used for diffusing information some alternatives were suggested.

1) Idea of using individual paper as medium rather than the journal which groups them together arbitrarily.

2) The individual papers would then be kept in centres based on disciplines or branches and would be disseminated by branch abstracting services.

3) Paper used as media in journals was not ideal for the rapid and accurate dissemination of information. This very idea paved way to the use of microfilms as media.

4) Use of computer media like compact disc, floppy etc. The computer media is much cheaper, easy to use, and cannot be tampered with so easily etc.

Thus the growth of information is influencing the media from time to time.

2.5.2 Obsolescence of Information

The term obsolescence refers to outdatedness. In the context of library science we refer to obsolescence of information as that information in libraries which becomes irrelevant with the passage of time. In other words it is the slow reduction over time of the utility of information.

i) Reasons for Obsolescence

1) The information is still valid, but it is now incorpo rated into later work.

2) The information is valid but it is now superseded by later work.

3) The information is valid, but is now in a field of declining interest.

4) The information is no longer valid.

Rowley and Turner suggested that there can be three other possibilities also.

i) The information is considered invalid, but becomes recognised as valid.

ii) The information is valid, but inadequate theory or technology delays its exploitation.

iii) The information is valid and in a field of increasing or renewed interest.

Thus published material will change in terms of utility over time and sometimes obsolescence may suddenly be revised by fashion or technological change. For example areas such as solar energy which were supposed to be obsolescent information are now much sought after.

ii) Assessment of Obsolescence

Obsolescence can be assessed in terms of its measure of utility. They are

i) Citations or references in subsequent literature

ii) Usage in a library.

Both of these are subject to problems. Citation in subsequent papers may, for a number of reasons, not be linked to the actual utility of original article. Alternatively library is affected by the biases of library's acquisition policies and the knowledge of the users - in other words users may make heavy demands of an item because of lack of any better alternatives.

Assessing that we accept one or the other of our measures, the results obtainable are interesting. The growth of published scientific and technical information showed an exponential curve; the usage of the same material shows a negative exponential curve.

By plotting the proportion of literature remaining useful against time, one produces the negative exponential obsolescence curve.

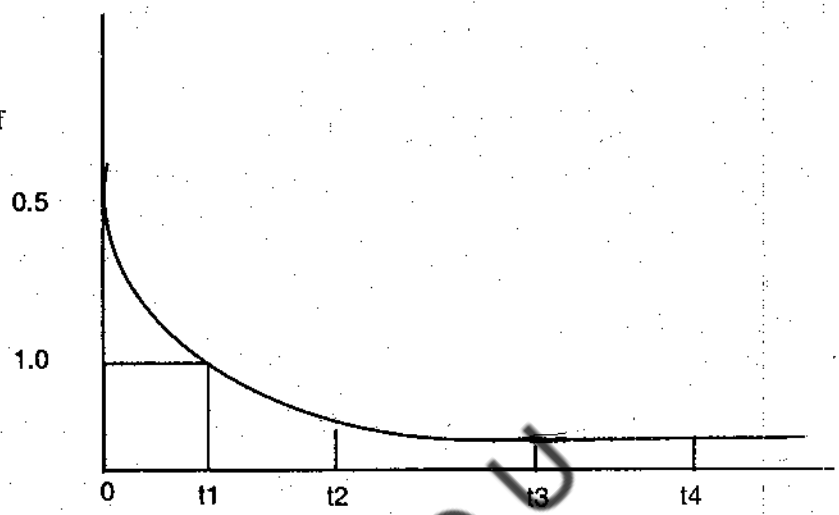


Fig-6 : Obsolescence Curve: Active literature plotted against time

Papers have a high utility during a short period of time after publication and then their utility diminishes rapidly as time progresses. Obviously the speed at which the papers become obsolete will vary between subject fields.

2.6 LET US SUM UP

In this unit we explained the meaning and scope of the term Information along with various definitions. Later six types of approaches to information have been presented as discussed by Jesse Shera. Various forms of information are discussed thoroughly explaining the nature of information. Later the characteristics of information given by various authors are presented. The value, various models of transfer, growth and obsolescence of information are described with illustrations.

2.7 REFERENCES AND RECOMMENDED BOOKS

GUPTA, B.L. *Knowledge, communication and library.* Jaipur: Printwell, 1987.

ROWLEY, J.E. and C.M.D. Turner. *The dissemination of information.* London: Andre Deutsch, 1976.

2.8 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Define `Information'. Explain various approaches to information and the types of information.

2) Explain the nature and characteristics of information.

3) List out various models of information transfer and briefly explain about each model.

4) How are the studies on growth and obsolescence of information useful to library and information scientists ?

II. SHORT NOTES

a) Scientific and technical information

b) Conceptual information vs. Empirical information

c) Obsolescence Curve

d) Linkage model of information transfer

UNIT- 3 : COMMUNICATION MODELS AND THEORIES

Structure

3.0 AIMS AND OBJECTIVES

In the earlier two units of this block the concepts 'knowledge' and 'Information' are explained to you in considerable detail. In this we attempt to explain various models of communication and multimedia in communication.

After reading this unit you should be able to

- explain the meaning of communication and process of communication;
- distinguish the difference between verbal and non-verbal communication, and interpersonal and intrapersonal communication;
- describe the models of communication; and

3.1 INTRODUCTION

The basic idea of communication is transfer of information. Knowledge, data and information are important and inevitable aspects of human life. If these items are to be transmitted from individual to individual(s), generation to generation(s), man to himself a sound communication mechanism is essential. For various reasons different comunication systems have come to interlink people. The value of either data or information or knowledge will be based on the communication system that is bieng used.

3.2 COMMUNICATION - MEANING, DEFINITIONS AND CHANNELS

3.2.1 Meaning

The word communication comes from Latin word 'communicare' which means sharing, and is related to such terms as 'communication', 'commune', 'communist', etc. The word communication encompasses all methods used by living beings to express or convey a kind of thought or feeling. Out of all living beings man's inherent nature is always to share his experiences with others always. This very idea could be the foundation for the evolution and development of communication. The technique of 'using communication' is being practised by all in many ways knowingly or unknowingly. Since the society is increasingly becoming complex, so the communication between individuals is getting highest importance. This is one of the reasons how communication has become an independent discipline.

Communication is something that everybody knows and does, but it is equally difficult to assign or give a specific meaning to the term communication. This aspect is already discussed in the earlier unit. Accoriding to I.A.Richards "Communication takes place when one mind so acts upon its environment that another mind is influenced as in that other mind an experience occurs which is like experience in the first mind and is caused in part by that experience".

Almost all the definitions and meanings on communication contain mainly two characteristics.

1) First, communication, when defined as the process of sending or recieving a message, implies that there will be a response to the message. So, communication is termed as a two-way process.

2) Second, the successful transmission of ideas is dependent upon mutual understanding between communicator and the recipient.

3.2.2 Definitions

Communication is defined in many ways and some of the definitions are discussed here which are suitable to the field of library and information science.

The Oxford Dictionary gives the meaning of communication as "the imparting, conveying or exchanging of ideas and knowledge whether by speech, writing or signs". In the words of Peter Drucker communication is" the ability of various groups within the enterprise to understand each others functions and concerns".

According to Dr. S.R. Ranganathan "communication is the transmitting, conveying or exchanging of ideas, knowledge or information etc., whether by speech, writing, signs or other symbols expressed audiably, visually or graphically or in any other manner. Columbia Encyclopaedia defines it as the transfer of the thoughts and messages as contrasted with the transportation of goods and persons. The basic forms of communication are by signs (signals) and sounds (hearing).

3.2.3 Channels of Communication

From the definition and meaning of communication one can easily come to the conclusion that the media and the method used to communicate ideas through is very important, therefore some attention is to be paid to learn and understand the forms and channels of communication.

The channels of communication are two types:

1) Oral Communication

2) Documentary Communication

1) Oral Communication

The Oral Communication is further divided as follows

i) One person to person
Eg. face to face talk, talk on phone, etc.

ii) One person to several
Eg. Group or committee meeting

iii) One person to many
Eg. Speech at a meeting

iv) One person to a wide public
Eg. A radio talk public meeting

v) Several persons to several
Eg. Group discussions, conversation.

2) Documentary Communication

The Documentary communication is further divided as follows:

i) Personal
Eg. letters, author's personal diaries, workbooks, etc.

ii) Unpublished or semi published
Eg. Theses, Records etc.

iii) Exhibitions (including one person to several type of communication)

iv) Demonstration

a) personal observations
Eg. Accidental/ incidental observation items

b) Films Eg. public films special film

c) Television

d) Visual aids to oral and written communication

Each type of channel and form of communication is suitable in different situations, so each form has its own limitations.

3.2.4 Ingredients of Communication

In spite of the fact that each type of communication is suitable in a particular situation still certain entities are common in all types. These are known as ingredients or essentials of communication.

1) The act of communication has to orginate from a *source*

2) The communication or the idea of communication is to be encoded - use of symbols. The process of translating, ideas, feelings and information into a code is called *encoding.*

3) The idea, now represented by a set of symbols / code is the source *message.* The message is another important ingredient of communication.

4) The method used to carryout the message is called *channel.* The success and failure of a communication is mainly depends on the channel used.

5) The last ingredient of communication is *reciever.*

3.2.5 The Nature of Communication

Depending on the ingredients of communication, certain working principles are derived.

5) **Gestures:** This is also one of the methods of non-vocal communication. In this method communications are carried through body movements, facial expressons etc. Eg: Nodding head; Putting index finger on nose.

6) **Proxemics:** Proxemics involves the ways in which people in various cultures utilise both time and space as well as body positon and other factors for purpose of communication. This is nothing but an influence of practices of culture over other. The result is development of new practices. Eg: knowingly and unknowingly Indians borrowed many practices from British people.

ii) Verbal (or Vocal) Communication

The major differences between non-vocal and vocal are mattters more of degree than of kind. Signal, signs, symbols and possibly icons may, at times be easily verbalised, although most people tend to think of them as visual meaning of expressions. Man's vocal instrument as a device of communication represents an apex of physical and intellectual evolution. It has the potential to express the most basic instinctual demands as well as a range of highly intellectual process, including the possible mastery of numerous complex languages each with an enoromous vacabulary. The vocal organs permit the production of sound effects animal noises, bird calls and such amusing high manipulations of speech.

3.3.2 Intra and Inter Personal Communication

i) Interpersonal Communication

In human society the problem of exchange of communication rests on interpersonal relationships. As a result all kinds of communication depend on the participants who must be willing and readily disposed to establish interpersonal relations. According to Max Weber a relationship in its most generic sense is the existence of a substantial probability of interaction between two or more persons. On the other hand, interpersonal relation is defined by Mc Gall and Simons as one that necessarily involves each participant as personal entity i.e. each of the parties must recognise the other as distinctive individual of whom he has some prior knowledge.

Asch describes a typical interpersonnel communication situtation in the following words:

1) 'A' percives the surroundings, which include 'B' and himself;

2) 'A' percives that 'B' is also oriented to the surroundings such that 'B' includes himself and 'A' in the surroundings;

3) 'A' acts towards 'B' and notes that 'B' is reponding to his action;

4) 'A' notes that 'B' responding to him sets up the expectation that 'A' will grasp the response as an action of 'B' directed towards 'A'. The same orderings must be existing in 'B' This means that each percives the situation as shared by both. Communication can occur only when the same or similar content is present in the participants and when the content possesses for each the property of being also the content for the other.

Advantages of Interpersonal Communication

1) To develop a spirit of inquiry, a willingness to examine one's own behaviour and to experiment with one's role in the world.

2) To develop an awareness of more things and about more people.

3) To develop ability to act in a collaboration and mutually dependent manner with peers, superiors and subordinates rather than in an authoritative or submissive manner.

4) To develop the ability to resolve conflicts and disputes through problem solving rather than through coercion or manipulation.

To conclude, for effective interpersonal communication we must know certain skills and tactics, particularly when we come across new people to establish rapport quickly. This is very much essential in the case of a librarian. To be effective we must be able to control the communication situtation. This does not mean we must act in a dominant way. Control without dominance can be seen in an experienced librarian. Assesing competance in every day interpersonal situations is very difficult.

ii) Intrapersonal Communication

In this mode of communication man talks to himself. It includes his thoughts, experiences and preceptions during a communciation event. Behaviour that we see on all other levels of communication begins in the intrapersonal level. According to Wiseman and Branner this model is discussed at two levels.

1) Internal stimuli; and
2) External stimuli.

Internal stimuli indicate the organisms psychological and physiological states whereas external stimuli come from the communicator environment. BO is explained this model in four areas:

1) electro chemical, including all the electrical and chemical reactions in man;
2) selfmoving, including the sensory perceptions, the auto matic movement of organs, and purposeful movement;
3) feeling, including emotions, drives, needs, and values;
4) thinking, involving symbolization such as decoding and communicating with self.

Types of Intrapersonal Communication

The various types of intrapersonal communication are:

1) postures
2) muscle tension
3) sleep
4) use of tranquilizers
5) Emotions

1) **Postures:** The way we sit, stand and walk communicates a lot to others and to ourselves about the way we feel about ourselves. A person who sits relaxed, back straight, usually feels self-confident. A person who slouches or is bent over usually does not feel self-confident. The way one stands can indicate how solid one feels (feet on the ground), walking often shows aggresiveness (chest struck out), sexuality (movement in the pelvic area), importance of intellect (head struck out, literally head before body), looseness, openness or tightness (defensiveness).

2) **Muscle Tension:** Often emotions express themselves in the body by creating masculer tension. The phrase "You give me a pain in the neck," literally translated, means I am so angry at you that my neck muscles are painfully tense.

3) **Sleep:** Irregularities in sleeping or the inability to sleep is a rather gross indicator of emotional upset.

4) **Use of Tranquilizers:** Drugs, food, alchol, tobacco television, even sex can function basically as transquilizers. When you find yourself overindulging in transquilizers yourself is a good feedback. This is good feedback. What impulses to action (what energy expenditures) would be used if you were not tranquilizing yourself? More specifically, what are you afraid of?

5) **Emotions:** Emotion provides a much more direct and immediate feedback process than body awareness (muscle tension, posture etc.) However, we often are not sensitive to our emotions. In fact the awareness of emotion and the ability and openess to express emotion is perhaps the single most important characteristic which differentiates the psychologically healthy and interpersonnally comptent from the neurotic.

3.4 COMMUNICATION MODELS

Models simplify reality, select key elements and indicate relationships among key elements. Many models of communication include certain basic concepts, such as a sender, a process of encoding into signals or symbols, a messge, a channel, a reciever, a relationship, a process of decoding, a range of things to which message refers (referents) and an actual or probable effect, intended or not. Some models include a feedback line between reciever and sender also.

The communication models help us to understand how the communication system works. There are some important points to learn how communication models help us to understand a communicatation system.

1) There is selectvity in attraction, perception and retention of messages by the reciever.
2) communication is essentially transitional with the receiver playing an active role in the course of any communication process.
3) communication does not always flow directly from one sender to one receiver but by way of intervening processes.
4) Mass communication processes invovle professional mediation between senders and receivers and
5) communication takes place in complex social systems ,ather than in isolated acts of transmission and reception.

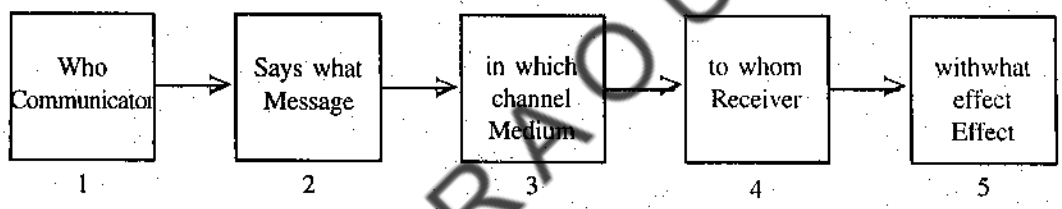
According to Edward de Bono the communication model is a method of transfering relationships or processes from its actual setting to one where it can be more conveniently studied'.

There are several models of communication but prominent among them are:

1) Lasswell model or formula
2) Shanon and Weaver model
3) George Gerbner's model
4) The Schramm model

3.4.1 Lasswell's Model

Lasswell a U.S. Political Scientist developed a verbal model in 1948 as 'who says what in which channel to whom with what effect ?'. This model is very useful to split the communication process into various components. The value of this model lies in its use as a structuring device and in situations in which the sender has a clear interest to influence the receiver.



The Lasswell's model of communication can be analysed in the context of library as follows:

Who ?	___	Authors, publishers, research bodies, translators, professional bodies etc.
What ?	___	symbolic contents of knowledge, use of language notations, symbols etc.
Which Channel?	___	Books, journals, manuscripts, reports, conference proceedings, A.V. materials, computer media etc.
Whom ?	___	library users or members of the society.
What effect?	___	knowledge addition to individuals of society or users of library.

3.4.2 Shanon and Weaver Model

In 1949 Shanon and Weaver designed and developed a communication model using mathematical principles. Quite often it is refered to as mathematical model of Shanon and Weaver. The following are the components of this model.

1) Source

2) Message

3) Transmitter or Channel

4) Receiver or Destination

The communicated message from source to reciever through the signals can be more or less distorted due to interfering noise. Thus the receiver at times may not be able to receive identically the way the communicator sends the message. This is called noise in the model. The model was orginally designed for application of technical information but it can also be used to understand different types of human communication. If the noise in the model is limited, the communicated information retains its orginal and the value of information will be more or less same; otherwise, the receiver definitely gets adulterated information.

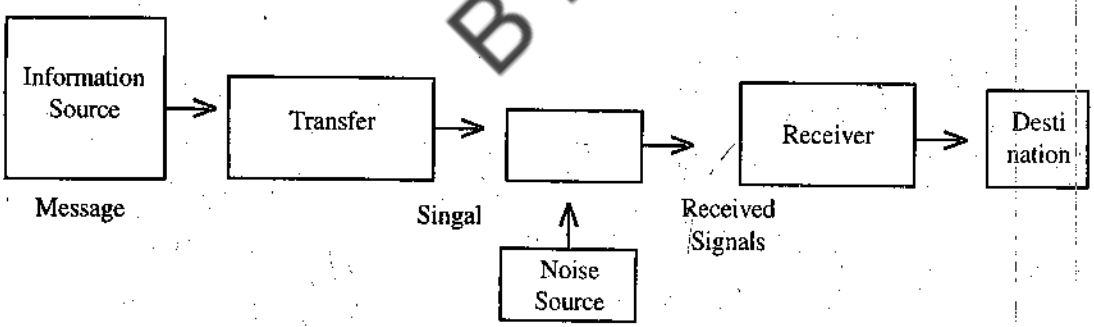
Eg: If the punctuation marks are not taken proper care in message they get different meanings.

Entropy: Outside influences diminish the integrity of communication and possibly distort the message for the receiver.

Negative entropy: It may occur in the instances in which incomplete or blurred messages are neverthless received intact, either because of the ability of the receiver to fill in missing details or to recognise, despite distortion or a paucity of information both the intent and content of the communication.

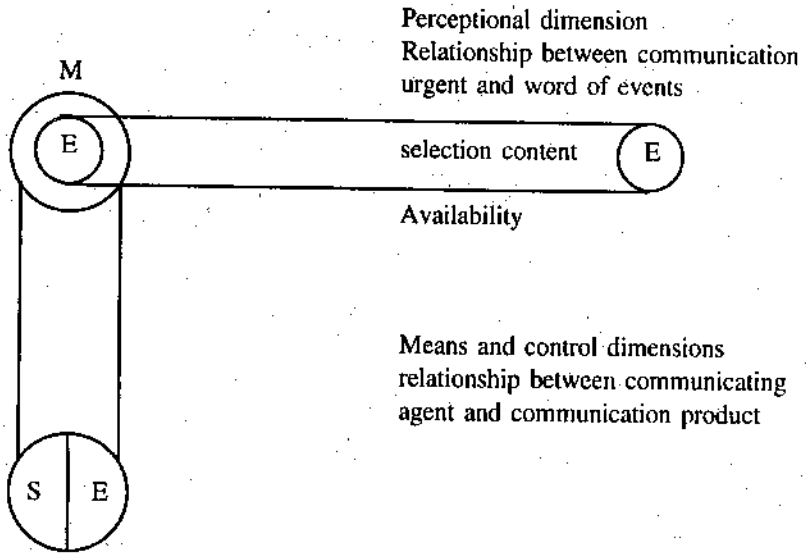
Redundancy: The repetition of elements within a message that prevents the failure of communication of information is the greatest antidote for entropy.

A schematic diagram of Shanon's General Communication System:



3.4.3 George Gerbner's Model

This model is conceptually different from the earlier two models. It involves the complication of human communication and the development of devices for handling mass communciation or communication in other fields. In 1956 Gerbner developed communication models based on "some one percives an event/ and reacts/in a situation/ through some means/ to make available materials / in some form / and context / conveying content / with some sequence. The essence of the model is to connect the communication situation and the participant perception of and response to the situation and the communication process. This model can incorporate machine as well as human process in different combinations and at various stages.

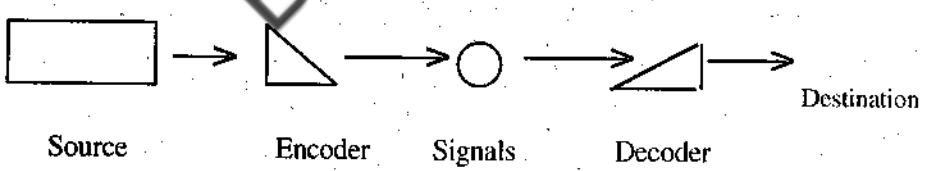


George Gerbeners General Model of Communication

3.4.4 The Schramm Models

Schramm (1954) attempted to develop a human communication model giving emphasis to expierences of two individuals and the interaction between the those two was later designed as models. He developed three models to explain the proposed cocept or theory.

Model-1 : This is almost similar to Shanon's Model.

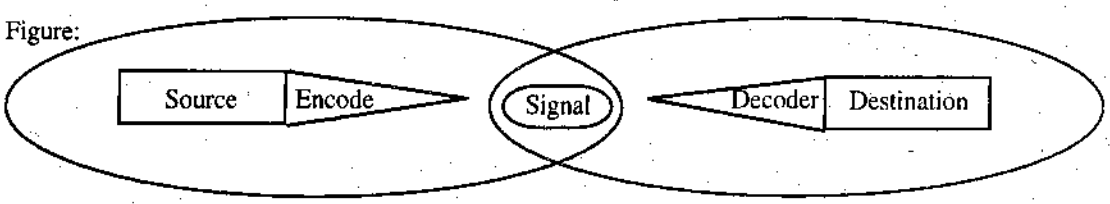


Communication starts from source (i.e 1st individual) and it is encoded, transmitted through signals. These signals are decoded either manually or mechnanically and reach destination (i.e. 2nd individual).

Model - 2 :

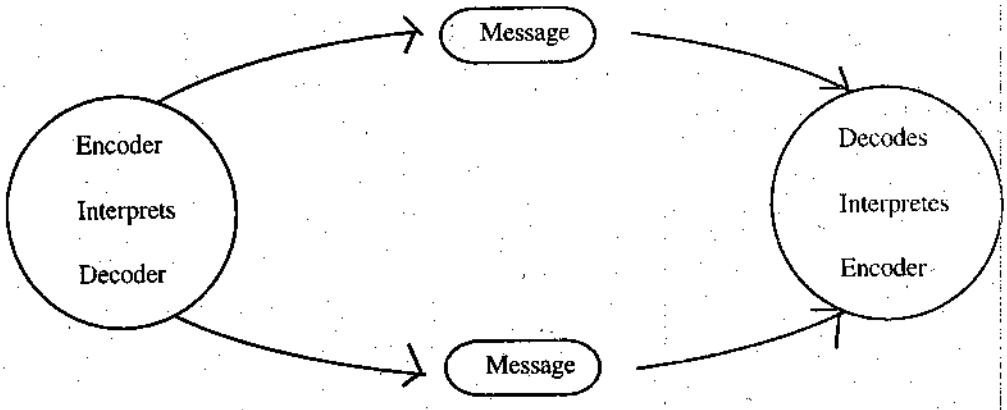
In this model he introduces the idea that only that which is shared in the fields of experience of both the sources and destination is actually communication because only that portion of the signal is held in common by both source and destination.

Figure:



Model - 3 :

This model deals with communication as an interaction with both parties encoding, interpreting, decoding, transmitting and receiving signals. In this model feedback and the continous loop of shared information can be noticed.



Each model explains certain points its creator feels are relevant in the communication process or structure. No model can "do it all". Even if it could, it would defeat the purpose of the model as a simplified representative of the real world. So, we select the models which best suit our purpose for the immediate problem at hand to be solved.

3.5 MULTIMEDIA IN COMMUNICATION

To communicate ideas from one and to another a kind of medium is necessary. Depending on the availabiltiy and convenience a good number of media are being used in communications. As a result of advances in science and technology a variety of media are being developed. Usually it requires a gadget to make use of the modern media. This kind of media cannot be read normally. Based on this very character 'normal reading and special type of reading' the entire media is grouped into two categories.

1) The print media; and

2) The electronic media.

3.5.1 Print Media

The information available in this media can be read with naked eye and does not require any kind of gadgets. It includes books, periodicals, proceedings of seminars and conferences, popular magzines, newspapers and so on. Usually this kind of media performs two functions: 1) provide information and 2) entertainment. The audience of these media could be a particular group or people in general. The print media periodicals are usually used by a specialised group and newspapers and popular magzines by all people.

Books: These are records of human knowledge. The main advantage of this media is its longevity. The production of book takes considerably long time, thereby the information cannot maintain recency and sometimes it may become outdated. The informtion available in this media may be used for information, persuasion and entertainment. Usually books have limited readers than any other print media.

Periodicals: These are also known as learned periodicals or journals. These are meant for specialised readers unlike the book media. They contain primary information which is highly useful to readers of that subject. This acts as communication tool between specialised group of readers. Usually the periodicals contain original research. Unlike book media the periodical media is a publication that appears at regular intervals.

Proceedings of Seminars and Conferences: The availability of these publications to researchers is very important. The information available in these print media will be nascent in comparison with periodicals. Usually a minute topic of current subject interest is taken and deliberations are held on that chosen topic and suitable solutions and conclusions are drawn upon for further refinement of that area.

News papers: Unlike the periodical and conference media the newspapers are being used by people from all walks of life. The importantance and value perishes within a day or a few days (in case of popular magzines). But the information made available in it is very recent and of current interest. The range of information in the media in any area is quite long i.e. it suits lay man to specialist, small businessmen to industrialist, youth to old people etc.

Besides the above mentioned variety of media the print media also encompass the indexing and abstracts, journals, yearbooks, directories, etc. This print media does not contain the required information but provide suitable clues to the source of information. These are also known as secondry sources. After the invention of electronic gadgets people turned towards electronic media partially for various reasons. Now there is a great competition from electronic media to print media for its very existence. But the print media is still living because of its characteristic features like easy to carry, permanence, easy to maintain and cost-effectiveness.

3.5.2 Electronic Media

The primary difference between this media and print media is the earlier one needs a seperate machine for its use whereas the later does not. The electronic media has advantages over print media, it is compartively cheap, solves space problems, receives informtion from far off places, etc. There are different electronic media: telegraph, telephone, computer floppy, electronic eail, video-text, telex, fax, cable TV system. All these media can be grouped into two: person to person communication media Broadcasting media (person to many persons)

The first kind of media refers to such media where messages are sent by telephone, telegraph, fax, telex etc. whereas the second one reaches many people with live messages through radio and Television.

Telegraph: This was the first device used to communicate between person to person by using electronic knowledge. And also this was the first device used in telecommunication. In the year 1830 the electronic telegraph was invented by the American, Samuel Morse. In this system the spread of communication made equal to the speed of light. In this media the information was communicated through manual key operation.

Telephone: This is an improvement over telegraph. Communicated information is transfered into electronic media automatically using good electronic gadgets. The interaction between receiver and sender is made very easy and effective. As a result of information technology many people can share their ideas sitting at different places through 'teleconference'.

Electronic Mail: It is very similar to conventional postal mail in appearance but it uses telecommunication technologies. This media is useful in successful functioning of information networks. The sender's message or requirement is kept in a computer of the receiver and is available automatically to the person(s) whether that person is physically there or not.

Computers: The main advantage of this media is that a large amount of / information can be stored and may be retrieved the way the user needs. Manipulation of information is possible in this media.

3.6 LET US SUM UP

The idea of communication the meaning of communication, and the definition of communication are discussed. The form and channels of communications are represented diagrammatically to have a better and clear understanding. the essentials or ingredients of communications are dealt with briefly. Various functions of communication are listed under types of communication; verbal and non verbal systems are discussed indetail. An attempt has been made to elevate the importance of inter personal communication. The communication models are discussed at length. The importance of multimedia was discussed at the end.

3.7 ASSIGNMENT

1) Survey the literature of communication science and list out various models of communication. Examine their application to the field of library and information science.

3.9 REFERENCES AND RECOMMENDED BOOKS

GUPTA, B L . *Knowledge Communication and Library*. Jaipur: Printwell, 1987.

NEELAMEGHAN, A. "Information, communication and society". *Library Science with a slant to Documentation*. 17(1); 1980; p.1-5.

3.10 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Define communication. Briefly explain the nature, channels and functions of communication.

2) What are the various types of communication? Explain verbal and nonverbal communication with examples.

3) Listout various communication models and explain in detail any two of them.

4) Discuss the role of multimedia in communication.

II. SHORT NOTES

a) Nonvocal communication

b) Oral communication

c) Communication channel

UNIT - 4 : KNOWLEDGE - STRUCTURE AND DEVELOPMENT

Structure

4.0 AIMS AND OBJECTIVES

This unit aims at introducing the meaning, definition and characteristics of Knowledge. It explains the modes of formation of knowledge and knowledge growth. The unit further discusses how knowledge can be classified and speaks about the social epistemology of knowledge.

After studying this unit you should be able to

- explain the concept and meaning of knowledge;
- list out the characteristics of knowledge;
- acquaint with the sources of knowledge and the formation of subjects;
- explain the salient feature of 'Spiral of Scientific Method'

4.1 INTRODUCTION

In the earlier three units of this Block you have been explained the relationship between information and knowledge; the nature of information and various communication models and theories. Now, you will be learning more about knowledge, its structure and development.

The genesis of knowledge can be attributed to man's relentless endeavour to conquer nature to make life more and more comfortable. This has been the motivating force behind persistent human efforts to discover and invent things. Knowledge as we know today is the product of the general development of human civilization. Humans and knowledge are supremely complimentary to each other.

The totality of ideas conserved through a civilization is known as Knowledge. It is considered synonymous with science, learning, scholarship, erudition, information and lore. It is interesting that the definition of knowledge as that which is known is considered by some scholars to apply only to that which is known by the society. The sum total of that what is known, the whole body of truth, fact, information, principles or other objects of cognition acquired by mankind.

4.2 KNOWLEDGE-DEFINITIONS, STRUCTURE AND CHARACTERISTICS

4.2.1 Definitions

Robert Hayes defines knowledge as "accumulated data which has been systematized formulated and evaluated with reference to the discovery of general truths".

The Indian School of Epistemology assumes that there are three factors involved in knowledge - the subject which knows, the object which is known and the process of knowing.

According to Ranganathan when knower and knowee are brought in relation, the knower knows the knowee and knowledge emerges.

There can be no knowledge without a knower. Admittedly, not all things may be known to us, but many things beyond our knowledge are knowable, to all kinds of knowers, to all the modes of knowledge and all the methods of knowing.

According to the psychological interpretation, knowledge is what is perceived by our senses. Therefore, knowing a material phenomenon is ever present in all living things but invarying degrees of perfection.

As noted above there are three important components to knowledge - the knower, knowee and knowable. Knower is the originator of knowledge, knowee the recipient and knowables are the whole environmental entities on which knowledge is created. Knower is very much keen on knowing the unknown knowable.

According to *Webster's New International Dictionary of English* knowledge is "familiarity geared by actual experience, practical skill, technical acquaintance".

According to Ranganathan the "totality of ideas, conserved through human civilization is knowledge".

4.2.2 Characteristics

Several characteristics can be identified for knowledge. Knowledge is infinite, continuous, multidimensional, turbulently dynamic, cumulative, coherent and multidirectional.

i) Infinite

Knowledge is an ever growing organism. Human mind's zeal to unveil the unknown makes it never to be contented with the known. Though knowledge at any time may be finite, the things yet to be discovered are unlimited and infinite. Thus several disciplines have evolved and many are still evolving. Say for example, from the subject 'Biology' has evolved new subjects like

General Biology

Cellular Biology

Microbiology

Socio-biology & Psycho-biology are some of the new subjects developing recently. One cannot say what more is in store in the future.

ii) Continuum

Modern age is an age of problems and solutions. Due to social pressure scientists are engaged in continuous research. An unending spiral of relay research has been created. This results in inventions of new facts or commodities or ideas which in turn give rise to new varieties of subjects/disciplines. Ranganathan writes in this context "At present organised relay research is producing a continuous cascade of new micro subjects, each stimulating another in succession in every area of subjects. This cascade makes the universe of subjects a growing and deepening continuum".

iii) Turbulently Dynamic:

Dynamism is an important characateristic of knowledge. The boundaries of knowledge are ever changing. A continuous flow of new microthoughts that are being produced by organised research makes universe of knowledge a dynamic continuum. Ranganathan is of the opinion that the dynamic nature of knowledge may be measured by the rate of discoveries in a particular period and also by the growth of research expenditure in a given period.

But, we cannot say that knowledge will grow only at a particular place or in a particular discipline. The eruption of knowledge may be at several places. The fundamental law that lies passive for a long time may suddenly give rise to several probable discoveries. Thus knowledge has the characateristic of a disorderly and violently progressive tendency. The greater the strength of the fundamental law the more will be the turbulence.

iv) Manifold and Multidimensional:

As a result of growing scholarship and team research and increased facilities for dissemination and utilisation of new ideas, the universe of knowledge has acquired manifold and multi dimensional characteristics. Manifold characteristic of universe of knowledge represents the quantitative growth of knowledge.

Dimension is the degree of manifoldness of a system fixed by a number of parameters necessary and sufficient to distinguish any one of its entities or parts from all others. The multidimensional nature can be explained using the different dimension in a classification system. They are facet dimension, phase dimension and array dimension.

a) Facet Dimension:

Zoology of Arthopoda – One dimensional

Ecology of Arthopoda – Two "

Ecology of Arthopoda of mountains – Three "

b) Array Dimension:

Universe	–	Dimension 1
Continent group (Asia, Europe etc.)	–	Dimension 2
Country	–	Dimension 3
State	–	Dimension 4

c) Phase Dimension:

Phase is a component of a complex subject. It can be a basic subject for e.g., Mathematics and Engineering. Normally phases are two dimensional. But interaction of subjects resulting three or four dimensional phases are also possible. Economics has a bias towards politics sociology. This is three dimensional.

v) Cumulative:

The universe of knowledge is increasing in amount by one addition after another. In other words it is creational. Even if earlier ideas may become obsolete after some time, it

still exists as knowledge. Knowledge grows by cumulative process in which new knowledge is dependent upon already existing knowledge. In short, it means, new knowledge is added to the existing knowledge. Hence the universe of knowledge has a cumulative characteristic.

vi) Coherent:

By Coherence we mean each and every element in universe of knowledge is interrelated and a change in one element will effect the denotation of the whole. For example, if the basic subject component is changed in a compound subject having a basic subject the subject denoted by the totality of ideas in it would be completely different, e.g.

Medicine, Female	–	Female Medicine
Psychology, Female	–	Female Psychology

In a compound subject the change of position of component ideas may affect the facet structure and may also change the denotation of the subject because of the change in relation between components. e.g.

Bacteria destruction	Paint
Paint destruction	Bacteria

When the order of any element in a subject is changed, the denotation of the subject also gets changed.

vii) Multidirectional:

The growth of knowledge occurs in many directions. Because of interdisciplinary approach a subject may have interaction with many other subjects. And this interdisciplinary interaction of subjects takes place in different directions. For example, the subject biology interacts with other subjects resulting in new subjects.

4.2.4 The Information Transfer Chain

The information transfer chain can be described as follows:

1) The information process comprises separate steps or unit operations, generation, recording and exposition, cataloguing, storage and dissemination retrieval and exploitation by the user.

2) The first two steps in the chain - generation and recording and exposition are performed by the technical man and the organisations that support him, the later steps by the professional documentalists and the organisations that handle information as well as by the users.

3) The Information chain operates like a switching system. The ultimate aim is to connect the user, quickly and efficiently, to the proper information. But perfectly precise switching is neither possible nor desirable. One cannot define in advance what information is proper; the switching system must always allow for some browsing in neighbouring areas. Moreover the capacity of the user to absorb information limits the system.

4) The Information switching system to be effective should select, make compact and review material for the individual user so that he actually assimilates what he is exposed to and not exposed to too much that is unimportant or irrelevant. Its fundamental task is switching information and not documents.

5) The information problem is concerned with mostly the later steps i.e. analysing information for the purpose of identification, placing information in its proper place in a classification system, storing information, alerting and matching stored information with requests for information.

6) The Information problem is aggravated by this seperation between what is done by the documentalist and what is done by the author.

7) The Information Process as part of the Research Process.

The Information process is an integral part of research and development. Research and development cannot be envisaged without communication of the results of research and development.

4.3 KNOWLEDGE - A GROWTH PROCESS

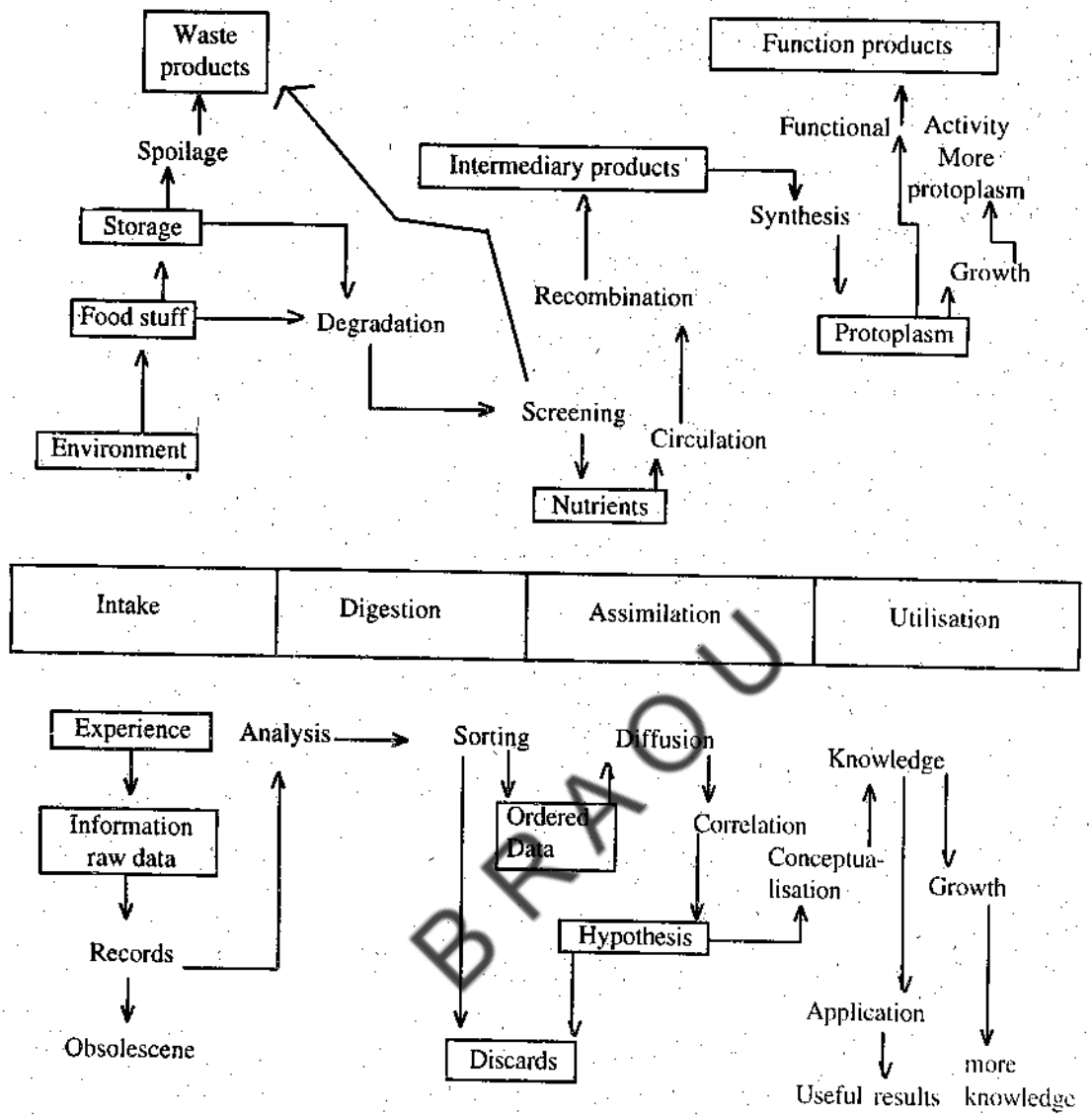
Promoting knowledge or fostering its intrinsic growth requires insight into the nature of the growth process. Knowledge grows like an organic tree but not as compilation of collector's items. Facts, discoveries, observations etc are the nutrients on which the tree of knowledge develops.

Growth of an organic body takes place in four major steps: Intake, digestion, assimilation and final utilisation. The raw materials (intake) are passed for elementary processing. Digestable items are broken down to more manageable compounds, which are then sorted-out into useful and useless varieties. The wastes together with undigestable varieties are eliminated. The useful items i.e., the true nutrients are circulated to the tissues whose cells pick what they need and recombine and modify it to suit their necessities and some of it to be recirculated for use of other cells and some still to be discharged as waste. Finally, culminating the synthesis, each cell constructs from its supply pool, selectively the substances and structures uniquely characteristic of its own.

This model shows that in its growth an organism never adopts foreign matter outright, but reorganises and assimilates it to fit its own particular pattern.

This process of growth is closely mirrorred in the growth of knowledge, beginning from its source of expierence.

Growth Process of Higher Animals



Growth Process of Knowledge

Raw data of information/experience which is stored as records for future are analysed forthwith. The products of analysis are then scrutinised, screened and sorted out according to relevance. Irrelevant ones go out into discard. From this sorting out the pile of data emerges as an ordered system catalogued and classified.

In various stages of evaluation such packed information is circulated widely and correlated with countless contributions from other sources. From this synthetic process 'Hypotheses' emerge, which upon further verification turn into integral parts of the body of knowledge - theorems, principles, rules and laws.

At this stage the assimilated data loses its individual identity and becomes an integral part of the organised (universe of) knowledge. A patchwork of unrelated facts has been transformed into a rationally connected thought structure of inner consistancy, viable, durable, subject to the tests of survival and adoptive improvements of evolution; a veritable model of an organism.

As in the organism the culminating phase is branched. As basic knowledge grows, part of the increment accrues to its own body, yielding more basic knowledge while another part is converted into differentiated products.

In short one can say that information is not tantamount to knowledge. Information is but the raw material, the precursor of knowledge. The key agent in the growth of knowledge has always been the human mind, which is imaginative, critical and integrative. Promoting knowledge implies giving full-scope to the exercise of the faculty for assimilation and synthesis by which mind converts facts into knowledge.

4.4 MODES OF FORMATION OF SUBJECTS

This topic attained prominence in the library profession particularly for the systematic arrangement of books. Classificationists (those who design classification systems) should have a thorough understanding of formation of subjects to evolve a viable classification system. A good classification system should be able to provide notation not only for the existing subjects but also for those that may evolve in the future. Only through a comprehensive understanding of the modes of formation of subjects, a classificationist will be able to evolve a good number of normative principles to classify the documented knowledge.

In this context it is necessary to understand some of the terms used in describing the modes of formation of subjects. They are defined as under.

4.4.1 Definition of the Terms

Idea : The product of thinking, reflecting, imagining, etc. got by the intellect by integrating with the aid of logic; a selection from the apperception mass and / or what is directly apprehended by the intuition and deposited in the memory.

Knowledge: The totality of ideas conserved by the humans. In this sense

Knowledge = Universe of Ideas

Universe of Knowledge: Totality of all ideas of past, present and the anticipated future in which

i) The number of known entities are finite

ii) The number of unknown entities are infinite and

iii) Some of the entities which are not known at the moment will be known in future from time to time.

Subject: An organised or systematic body of ideas, whose extension and intension are likely to fall coherently within the field of interest and comfortably with in the intellectual competence and the field of inevitable specialisation of a normal person.

Isolate: A generic term to denote isolate idea, isolate term or isolate number.

Isolate Idea: Any Idea or idea - complex fit to form a component of a subject, but not by itself fit to be deemed to be a subject. For example, child, gold, India, 1950.

These are isolate ideas, because by themselves these are not fit to be independent subjects, but these may be components to one or more subjects. For example, Child: child medicine, child psychology, child education, etc. Gold: gold minery, gold metallurgy, gold smithy, chemistry of goldetc. India: history of India, agriculture in india, 1950. Child medicine in 1950's.

Basic Subject: A subject without any isolate idea as a component.

Example: Medicine, Psychology, History, LIterature etc are basic subjects.

Compound Subjects: A subject with a basic subject and one or more isolate ideas as components.

4.4.2 Modes of Formation of Subjects

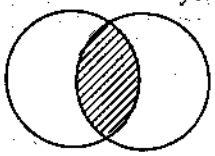
Ranganathan realised the importance and necessity of studying modes of formation of subjects and stated: "It will be an advantage to examine the modes of formation and the structure of the subjects in the universe of subjects and of the isolate ideas in the universe of isolate ideas as a preliminary to the theory of freely faceted classification that is the analytico synthetic classification guided by postulates and principles". According to Ranganathan the following are different modes of formation of subjects.

1) Lamination
2) Loose Assemblage
3) Fission
4) Fusion
5) Distillation
6) Aglomeration
7) Cluster

1) Lamination:

The word lamination is derived from the Latin word 'laminae' meaning things in separable layer. In this mode one or more isolate/facet or basic class are compounded over one another to form a compound isolate or a compound subject. This process may occur in two ways:

i) Lamination Kind - I
ii) Lamination Kind - II



Lamination Kind - I: In this mode one or more isolate facets are combined with one basic subject giving rise to or forming a compound subject. It may be defined as "Lamination is construction by overlying facet on facet, even as we make sandwich by laying a vegetable layer over a layer of bread. When the basic layer is a basic subject and the other layers are isolate ideas, compound subject is formed".

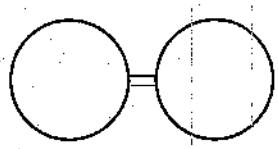
Eg. Agriculture of Corn in India.

Lamination Kind - II: In this mode two or more isolates from the same schedule of isolates are compounded giving rise to compound isolate.
Eg. Rural women.

2) Loose Assemblage:

In this mode of formation two or more subjects come together but none of the isolates or subjects loose their identity. The result of this mode of formation is complex subject, complex isolate idea or complex array isolate idea. So the loose assemblage is viewed in three ways.

i) Loose Assemblage - I
ii) Loose Assemblage - II
iii) Loose Assemblage _ III



i)**Loose Assemblage - I** : Relation between two or more subjects (Intra-Subject Phase Relation).

Eg. Biology for Engineers

ii)**Loose Assemblage - II** : Relation between isolates of two or more facets of a subject (Intra Facet Phase Relation).

Eg. Difference between Hinduism and Christianity

iii)**Loose Assemblage - III** : Relation between two or more isolates of same array of a subject (Intra - Array Phase Relation).

Eg. Sociology of Rural and Urban People.

In any of the above three kinds of subject formation, the relation between the items (phases) identified as given below.

a) General relation
b) Bias "
c) Comparison "
d) Difference "
e) Influence "

3) Fission:

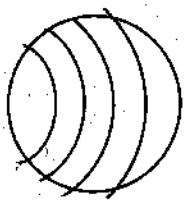
In this kind of mode of formation of subject the universe splits or divides usually uneven so the result of this mode of formation is formation of unequal subjects.

Eg. Physics - Matter, Mechanics, Heat, Sound, Light, Magnetism etc.

4) Dissection:

In many respects this mode is similar to that of the earlier one but not the same. In this mode too the universe is divided into many parts, but usually equal.

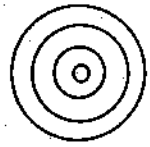
Eg. Animals into invertebrates and vertebrates



Dissection

5) Denudation:

Denudation is the progressive decrease of the extension and increase of intension of a basic subject or even anisolate idea. The result of this mode of formation is specialisation of subjects.



Eg. Asia, India, Andhra Pradesh, Visakhapatnam library Science, Library Classification, Dewey Decimal Classification.

6) Fusion:

Many times the denudation mode of formation may create necessity of bringing two or more subjects together to solve the problems collectively. This mode is also known as inter-disciplinary mode of formation. The order of the day is specialisation in subjects. Usually knowledge from different branches of various disciplines is required for such a specialisation. So this mode of formation has gained great importance in contemporary society.

Eg. Bio Chemistry, Engineering Chemistry, Geo Chemistry Librametrics.

7) Distillation:

In this mode too two or more subjects come together like in fusion mode of formation but the subjects never form a single subject nor use the knowledge of other subjects totally. But the required amount of knowledge is derived from the subjects to form a new subject. So, to form a new subject in this mode, the required items are taken and the rest is untouched.

Eg. Personnel Management - This branch is nothing but the combination of sociology, psychology, mathematics etc.

Space Science - it is combination of Physics, Chemistry Biology, Engineering, Psychology, Environmental Science etc.

8) Agglomeration:

The term agglomeration literally means to wind or roll in to a ball, or to gather together in a rounded manner. In this context a new subject is formed by bringing together different subjects into one group.

Eg. Physics, Chemistry, Biology etc are brought together and grouped into Natural Sciences. In the same manner Sociology, Economics, Political Sciences etc form Social Sciences.

9) Cluster:

This mode was also known as subject bundle. Cluster means a collection of things of the same kind, grouped together. The collected things or subjects need not possess any meaningful relation between them.

Eg. Indology - Indology consists subjects like Indian sociology, Indian economics, Indian politics, scientific research in India etc. In true sense there is no direct relation between Indian politics and scientific research and Indian sociology & scientific research & so on.

But this mode is not equal to agglomeration. In agglomeration the identified subjects posses definitely a kind of commoness whereas in cluster it is not so.

4.5 SOURCES OF KNOWLEDGE

The inherent nature of man is to share his experience, thoughts, knowledge etc with others. There are many methods to acquire knowledge from nature. Since man has edge over other living beings to think and reason about things around him 'man is called a rational animal'. In the early days, primitive man learned many things by trial and error method and it is being improved further by next generation. Epistomolgists focused enough light on source of knowledge. The major sources of knowledge are given below

4.5.1 Centred Mode of Thinking

Authority: Authority is the power or right to enforce opinion, or moral or legal supremacy or right to command or power to influence the conduct and action of others. Thus, authority refers to commanding highest regard and respect over a social, religious or political group. When some entity - be a person or a thing- commands such a respect as it may enforce its opinion or influence to the conduct and action of a group, then the entity becomes authority. Most of our knowledge develops or breeds from the source of authority. It is common in Indian system of family, whatever the head of the family decides it would be accepted by the rest of the family like an order.

In this kind of knowledge the student receives it from the teacher through authoritative mode only. Whatever teacher clarifies about the questions raised by student, the student in turn accepts them like principles. In the field of religion also the knowledge is transferred from a religious head to people through authoritative mode. Particularly, in early days people had to believe the ideas expressed and clarifications given by religious heads like acts in constitutions. Individual has to depend on this type of source of knowledge to create a primary base of knowledge in himself. In this source of knowledge there is little scope for analysis, argument or logic; faith in authority plays a crucial role.

An analysis of authority-centred mode of thinking would reveal that it may culminate into two forms of behaviour - reasonable and fanatic. Reasonability of referring to an expert opinion for substantiating one's views, consulting a doctor for medicine or treatment, consulting a religious scripture for a sacrement or rite or procedure for prayer is reasonable. Some times authority-centred mode of thinking may infuse in the followers the position of fanaticism, which may prove dangerous and disastrous to the society. It may create turmoil leading to removal of popular government or fanatic killings in the name of false ideology.

Eg. Killing of Mahatma Gandhi, terrorism in the name of false ideology etc. This is because blind faith is the base of this mode of thinking and it is not open to independent reasoning.

4.5.2 Speculative Thinking

Speculative is the adjective form of 'speculation', a word which is derived from the Latin word specere meaning to look or from *speculari,* meaning 'to spy out'. Literally it means a mental view, reflection, or guess. Speculative thinking can neither be proved nor be certain. For example, any theory or statement concerning life after death will be speculative. So is the case with the forecasting share prices in the market.

Therefore, speculative mode of thinking is based on conjectural thoughts, reflections and intuition but not on reasoning, observation and experimentation. This mode of thinking in philosophy is known as 'Teleology'. For speculative thinking one should possess considerable knowledge on those disciplines, where one wants to speculate. In ancient world many great men used speculative mode of thinking and made many statements and revelations which later on proved true and valid. For example, ancient saints like *Parashara, Varahmihira and Aryabhatta* gave radical theories of Astronomy.

4.5.3 Positivistic Thinking

The term positive is derived from the Latin word *positives* which means explicitly laid down or definite or admitting no question.

Positivistic mode of thinking is a mode of thinking which is based on definite facts which can be turned as positive facts. These facts are scientific or reason based, hence one is confident or rather cock - sure about it.

Positive mode of thinking is developed from a system of philosophy called as positivism. This was propounded by a French philosopher named Auguste Comte in the 19th century. In this mode of thinking only a those facts which stand the test of scientific method are considered.

Hence it rejects all that which is based on metaphysical, epistemological, logical, traditional and speculative considerations. Positivism also accepts philosophical or observational knowledge but it should also be analysed, tested and proved by experimentation. The entire process of positivistic mode of thinking can be divided into three stages.

1) Perception stage

2) Metaphysical stage

3) Positive stage

In the first stage man perceives from object or fact which he comes across. He analyses it and tries to explain it with his existing knowledge which he acquires through authority, tradition, intuition and intellect in the second stage. In this stage he examines the fact with aid of observation and experimentation. In the final stage he finds the results which enable him to establish positive facts or findings.

Characteristics of Positivistic Theory: The positivistic mode of thinking has following characteristics.

1) It recognises only those facts or occurrences which are evidenced by observation and experimentation.

2) It analyses the given fact or occurrence in relation to other facts or occurrences.

3) If some fact is not proved by constant observation and experimentation, it is rejected by this mode of thinking. In other words,if after sometime a proven fact is found to be faulty, it would be rejected.

4) Therefore this mode does not accept anything 'Universally true but only probably true'.

5) It welcomes and is open to criticism, accepts valid criticism and is willing to modify or change its view if found unscientific.

6) It does not keep any fact or finding secret.

7) As against other modes of thinking, it has not only subjective but objective aspects. It is subjective because the 'knower' experiences the facts and is personally involved in the process of observation and experimentation as also happens in other modes of thinking. In addition, it is objective too, because it is not prejudiced to authority, tradition or tenacity, but is based on scientific method and is open to argument and valid criticism.

4.6 CLASSIFICATION OF KNOWLEDGE

Easy and systematic learning of subject or concept is possible if it is properly organised or classified. The earlier attempts, particularly philosophers on classification of knowledge was not to achieve fixed goals or purpose but for other reasons like entertainment. As we know the classification can be of little value or no value unless its purpose is mentioned clearly. An exhaustive classification may suggest a definition; a merely illustrative classification would leave the definition open, but may still suggest most of what is meant by the term in question.

To meet different situations, knowledge can be classified in various ways by accepting suitable characteristics. In libraries, we always classify the knowledge to identify the real relations and assumed relations among various subjects.

Various Methods of Classifying Knowledge:

1) Basic and Applied
2) Scientific and Historical
3) General Abstract and particular concrete
4) Analytical and Empirical
5) Knowledge of Enduring (permanent) and of transitory interest (temporary).
6) Scheler's trichotomy of knowledge

a) Herrschaftswissen - Instrumental knowledge

b) Bildungswissen - Intellectual knowledge

c) Erlosungswissen - spiritual knowledge

7) Machlup's five classes of knowledge

a) Practical knowledge

b) Intellectual knowledge

c) Small-talk and pastime knowledge

d) Spiritual ''

e) Unwanted ''

8) Subjectively new and socially new knowledge

9) Knowledge as product - consumption or Investment cost

10) Benjamin Bloom's tripartite division of knowledge

a) Knowledge of Specifics - the recall of specific and isolated bits of information.

b) Knowledge of ways and means of dealing with specifics organising, studying, judging and criticising ideas and phenomena.

c) Knowledge of universals and abstraction in a field - an understanding of the major ideas, schemes and patterns by which phenomena and ideas are organised.

11) Anthony Downs has divided knowledge into

a) entertainment knowledge

b) production or consumption or political knowledge.

12) Adler and Gorman identified knowledge in six ways.

a) According to diversity of objects

b) According to the faculties involved in knowing

c) According to methods of means of knowing

d) According to degree of assent

e) According to the end, or aim of knowing

f) According to the media of communicating knowledge

13) Private knowledge and public knowledge or personal knowledge and social knowledge

14) Classification of knowledge on Modes of formation as mentioned by S.R. Ranganathan.

4.7 SOCIAL EPISTEMOLOGY

According to Prof. Platt of the University of Chicago man requires 'the need for novelty along with the other four traditional requirements - air, water, food and shelter. To satisfy or augment the fifth requirement 'the need for novelty' man needs information for a continious, novel, unpredictable, non redundant, and surprising flow of stimuli. The brain, constantly processing new information, is an inherent characteristic of the nervous system of at least the higher animals. It leads to intellectual growth and learning. Man's brain starts functioning in response to external stimuli so also the society. So the need for information drives the individual as well as the societies. The brain deteriorates if it is deprived of information, so also the society. To avoid this situation we must make constant provision for the acquisition and assimilation of new information. To get full advantage of the information to all members of society it must be communicated and communicable. To communicate the knowledge a set of symbols are essential what we call language. Therefore, knowledge and language are inseparable in their social context.

The first mode of communicating ideas was oral or speech. This mode could not satisfy man's need for information. The oral communication was greatly limited by the temporal boundaries of human memory and the spacial parameters of human contact. The second great step in the communication process came when man discovered that it was possible, by means of some form of graphic record to transcend space and time to become independent of human memory and physical contact. The result of these two basic forms of communication process - the direct oral and indirect or graphic - to the development of human culture is difficult to exaggerate. Indeed it is quite impossible for one to consider a society without them.

Subsequently the recorded history of the world of thought suggests that man's knowledge increased in volume and complexity; the situation paved way for the development of 'Science of Communication'. It is a discipline to learn knowledge about knowledge itself (Epistemology). Both epistemologists and psychologists have not developed an order and comprehensive body of knowledge about intellectual differenciation and the integration of knowledge within a complex social organisation. But the socialists have paid scant heed to the intellectual focus that shape social structure and institutions. Thus a new branch - social epistemology which provides a framework for the effective investigation of the entire complex problem of the intellectual processes of society, a study by which society as a whole seeks a perceptive relation to its total environment - emerged. The focus of this new discipline will be upon the production, flow, integration and consumption of all forms of communicated thought throughout the entire social pattern.

The affinity between social epistemology and librarianship is very close and important. The librarianship is based on epistemological foundation. The fundamental objective and aim of librarianship is to maximise the social utility of graphic records. Therefore, if librarianship is to serve society to the fullest extent of its potentialities it must be much more than a bundle of tricks for finding a particular book on a particular shelf for a particular patron with a particular need. So the responsibility of librarianship is the management of knowledge for its ultimate use. To discharge the responsibility in practice the librarian should know the importance and role of knowledge in the society that he serves.

4.8 SPIRAL OF SCIENTIFIC METHOD

Before we discuss the Spiral of Scientific Method, we should know first what is meant by 'Scientific Method'.

4.8.1 Scientific Method

Scientific Method is less of a method, but more of a general philosophy of research. Professors Cohen and Nagel regard the scientific method as the most assured technique for controlling things and establishing stable belief. It is based on systematic doubt and it aims at discovering the actual fact and the rational interconnection of facts. It wants to establish general propositions through weighing the evidence.

Encyclopaedia Britannica defines Scientific Method thus: "a collective term denoting the various processes by the aid of which the sciences are built up". In a wide sense, any method of investigation by which scientific or other impartial and systematic knowledge is acquired is called a Scientific Method.

Scientific Method is a method of research and investigation. But it does not mean that it is a method of study and research in science. This method can also be used in other subject fields, viz., Social Sciences and Humanities. The term 'Scientific' does not refer to "research in the field of science but to a procedure, which is 'scientific'. By the inclusion of the word 'Scientific' this method may be defined as "a rigorously organised, systematic and meticulous method of research based on observation and experimentation which accepts only such conclusions as one provable by all available facts or evidences".

Scientific method involves the following steps:

1) Identification of the problem
2) Formulation of a hypothesis
3) Collection of all possible data and verification of hypothesis
4) Generalisation

4.8.2 Spiral of Scientific Method

Ranganathan has indicated that scientific method works like never ending circle and conceptualised a Spiral of Scientific Method in order to explain vividly the steps and phases involved in scientific methodology. It means that the scientific research never ends, it is a continuous process. It identifies a problem, formulates hypotheses, verifies them, makes generalisation and thus solves the problem. But it never accepts the solution as final. It accepts the solution only when it stands proved by the evidences or facts. Future may produce a contradictory fact or the solution itself may give rise to yet another problem. The scientific method again starts its journey along the spiral. This process is an ever-going one.

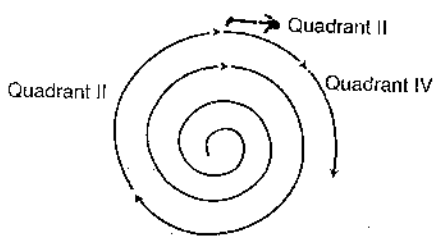


Fig 2: Quadrant of a Spiral

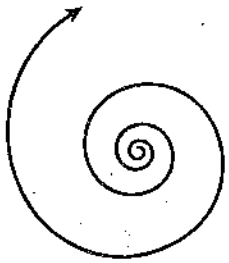


Fig. 1 : Spiral

i) Meaning of Terms:

We come across various terms in the study of Spiral of Scientific Method. You should learn the meaning of these terms to understand the Method.

Spiral: An unending circle or succesion of curves arranged like the thread of a screw as shown in the figure.

Quadrant: The literal meaning of quadrant is to divide the given circle into four and taking into consideration one fourth of a circle. Thus, each spiral has four quardants.

Cardinal Points: As shown in the above figure all the four quadrants start at a particular point. These points are known as Cardinal Points. So each spiral has four cardinal points. These points are named as

Nadir (N) - beginning of first quadrant
Ascendant (A) - beginning of second quadrant
Zenith (Z) - beginning of third quadrant
Decendent (D) - beginning of fourth quadrant.

Phases: There are four phases in the spiral of scientific method. They are

1) Empirical phase
2) Hypothesising phase
3) Deductive phase
4) Verification phase

1) **Empirical phase** : This is the first phase of research where the investigator or researcher identifies or establishes a problem with the assistance of his earlier knowledge and experiences. This phase begins from nadir i.e. the first quardant and ends at ascendant i.e. the second quardant of the spiral. S.R. Ranganathan explains the empirical phase as we start with fact or individual experience at the nadir. This arises out of the apprehensions of the phenomenal world through the senses with guidance of the intellect.

2) **Hypothesis phase**: During this phase the researcher formulates hypotheses based on the preliminary data and also inductive reasoning and intuition. It means formulation of hypothesis need not be based on established facts or proved data. It starts from ascendant and ends at Zenith. This phase appears in the second quardant of the spiral.

3) **Deductive phase**: In this phase certain normative principles, deducted laws are formulated. These normative principles and laws would help the researcher in future to verify the hypothesis and to reach valid conclusions. It starts from Zenith and ends at descendant. In the spiral this phase appears as the third quadrant.

4) **Verification phase**: During this phase the deduced laws are tested and generalisations are made on the basis of collected data. It starts from descendent and ends at nadir. This is the fourth quadrant. In this way the spiral continues again and again with out an end.

Procedure: The spiral of scientific method of research or scientific method of research never ends and it is a continuous process. It identifies a problem, formulates hypotheses, verifies them makes generalisation and thus solves the problem but the solutions arrived or conclusions are not final. So again some type of research activity begins from this point.

Work in Quadrants:

Q1 = Nadir to Ascendant

Q2 = Ascendant to Zenith

Q3 = Zenith to Descendant

Q4 = Descendant to Nadir

A schematic representation of the four phases or quadrants on the spiral is given below:

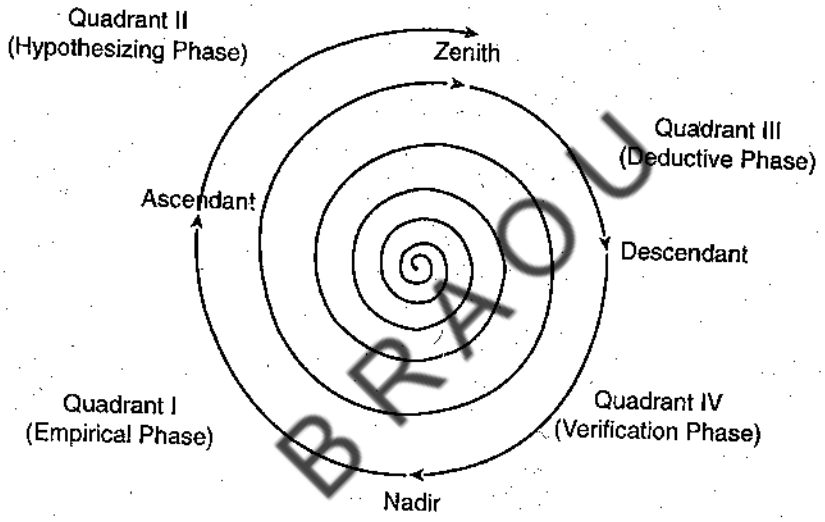


Fig- 3 : **Four Phases of Scientific Method**

ii) Four Phases of Scientific Method

Research starts from Nadir and ends temporarily also at Nadir. It begins with a problem. The investigator observes, identifies a problem only after understanding the preliminary facts on analysing his previous experiences and knowledge. In a way to formulate a problem sufficient prior knowledge is said to be essential. During this phase the researcher has to apply logic, reasoning and intelligence to perceive a problem. The second phase is known as Hypothesis phase. In this phase the researcher has to formulate hypotheses. The hypotheses are nothing but directions for carrying out research. It requires much imagination and intuition to form hypothesis. In the third phase deductive laws are derived basing on the hypothesis that is formulated. This phase requires considerable amount of intellect of the researcher to deduce laws. In the last phase the verification of hypothesis is done by analysing deduced laws using the collected data.

iii) Work in Different Quadrants:

The work in different Quadrants is shown in the following table:

Quadrant	Span	Phase	Based on
I	N - A	Empirical	Experience and observation of facts
II	A - Z	Hypothesizing	Intuitions and imagination
III	Z - D	Deductive	Intellection
IV	D - N	Verification	Observation and Intellection

The steps or phases in scientific method of research and spiral of scientific method are similar. But Ranganathan used a variety of terms to explain the procedure involved in the spiral of scientific method. Like scientific method of research spiral of scientific method is a viable method to provide solutions for problems in social sciences.

4.9 METHODS OF PURE AND APPLIED RESEARCH

Research is primarily an academic activity. It is considered an essential ingredient to study the existing situation or to provide suitable conclusions to various problems. To understand the problem in social science disciplines, a kind of systematic approach is essential. A good number of reasons are influencing the society and creating a set of continuous problems. To provide solutions to these problems research in social sciences has become so important.

4.9.1 Objectives of Research

The purpose of research is to provide solution to problems through the application of scientific procedures. The ultimate aim of research is to find the solution which is hidden and which has not been discoverd yet. Though each research study has its own specific purpose, we may think of research objectives as falling into a number of broad groupings.

1) To gain familiarity with a phenomenon or to achieve a new insight into it (studies with this object in view are termed as exploratory or formulative research studies).

2) To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as descriptive research studies).

3) To determine the frequency with something occurs or with which it is associated with something else. (The studies with these objectives in view are known as Diagnostic Research Studies).

4) To test a hypothesis of causal relationships between variables. (Such studies are known as Hypothesis Testing Research Studies).

4.9.2 Definitions of Research

The *Advanced Learner's Dictionary of Current English* lays down the meaning of research as "a careful investigation or inquiry specially through search for new facts in any branch of knowledge".

Redman and Mory defined research as a "systematised effort to gain new knowledge".

According to Clifford Woody research comprises defining and redefining problems, formulating hypothesis or suggested solutions, collecting, organising and evaluating data, making deduction and reach conclusions, and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis.

D. Slesinger and M. Stephenson in the *Encyclopaedia of Social Sciences* defined research as " the manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in practice of an art".

According to *Shorter Oxford Dictionaryof English*, research is "an investigation directed at the discovery of some facts by careful study of a subject or a course of critical or scientific inquiry or investigate or to study closely".

In the words of J.S. Shera it is "an intellectual process whereby a problem is perceived divided into its constituent elements and analysed in the light of certain assumptions..."

So, research is thus an original contribution to the existing stock of knowledge making for its advancement. It is the pursuit of truth with the help of study, observation, comparison and experiment. It gives answers to various problems.

4.9.3 Significance of Research

1) Research inculcates scientific and inductive thinking and it promotes the development of logical habits of thinking and organisations.

2) Research provides the basis for nearly all government policies in our economic system.

3) Research has its significance in solving various operational and planning problems of business and industry.

4) Research is equally important for social scientists in studying social relationships and seeking answers to various problems.

4.9.4 Species of Research

i) Descriptive v/s Analytical

ii) Applied v/s Pure

iii) Quantitative v/s qualitative

iv) Conceptual v/s Empirical

v) Some other types of Research

i) Descriptive v/s Analytical:

Descriptive research includes surveys and fact finding enquiries of different kinds. The major purpose of descriptive research is explanation of state of affairs as it exists at present.

In analytical research, the researcher has to use facts or information already available and analyse these to make a critical evaluation of the material.

ii) Applied v/s Pure (Fundamental):

Applied research aims at finding a solution for an on-going problem being faced by society. On the other hand the pure research is mainly concerned with generalisations and formulation of theories.

iii) Quantitative v/s Qualitative:

Quantitative research is based on the measurement of quantity or amount. Qualitative research is concerned with qualitative phenomenon,i.e. phenomenon relating to or involving quality or kind. Eg. Motivation Research - Qualitative

iv) Conceptual v/s Empirical:

Conceptual research is that related to some abstract ideas or theory whereas empirical research relies on experience or observation alone, often without due regard for system and theory

v) Other types of Research:

a) One-time research or longitudinal research - from the time point of view.

b) Field setting research or laboratory research or simulation research depending upon the environment in which it is to be carried out.

c) Clinical or diagnostic research - based on case study methods or indepth approach to at arrive the basic causal relation.

d) Exploratory or formalised Research - development of hypothesis rather than their testing or specific hypothesis to be tested.

e) Conclusion oriented and decision oriented - total freedom to do research or research according to policies but not to the interests of researchers.

4.9.5 Research Process

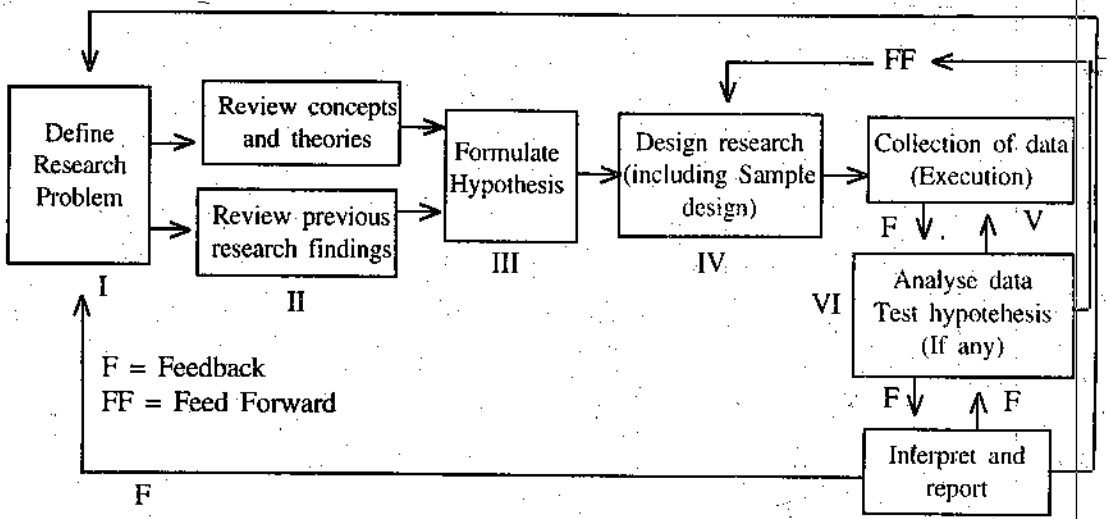


Fig- 2 : **Research process in Flow Chart**

Research process consists of a series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps. The research process begins with the formation of a problem and ends with valid conclusions or report.

1) Define Research Problem

Before defining the problem the researcher should discuss the problem with his colleagues or experts in those areas. The researcher must at the same time examine all available literature to get himself acquainted with the selected problem. If necessary the researcher may rephrase the problem to get a more meaningful one. The task of formulating or defining, a research problem is a step of greatest importance in the entire research process. The problem to be investigated must be defined unambiguously. closely. Care, must, however, be taken to verify the objectivity and validity of the background facts concerning the problem.

2) Reviewing the Literature

After the problem is formulated and finalised , a brief summary is to be prepared on the selected problem. For this act an extensive literature search is essential. The researcher has to consult primary, secondary and tertiary source to tap the available information. At this stage of research, Indexing and abstracting services of concerned field of specialisation are to be consulted thoroughly. At last the researcher will come to know the related research done already on the selected problem.

3) Formulation of Hypothesis

After reviewing the available literature a clear hypothesis should be formulated. The formulated hypothesis acts as a focal point for research. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested. The role of hypothesis is to guide the researcher by delimiting the area of research and keep him on the right track. It shapes his thinking and focuses attention on the more important facets of a problem. It also indicates the type of data required and type of methods of data analysis to be used.

4) Research Design

After selection of problem, the researcher has to design the research work. The preparation of design facilitates research to be as efficient as possible yielding maximum information. In other words, the function of research design is to provide for the collection of relevant evidence with minimal expenditure of effort, time and money. As far as possible the research design should be flexible. The preparation of the research design appropriate for a particular research problem, involves usually the considerations of the following:

i) The means of obtaining the information;

ii) The availability and skills of the researcher and his staff (if any);

iii) explanation of the way in which selected means of the obtained information will be organised and the reasoning leading to the solution;

iv) The time available for research; and

v) the cost factor relating to research i.e. the finance available for the purpose.

5) Collection of Data

After design of sample from a defined universe, a suitable method is to be chosen to collect data. The collection of data also varies from problem to problem like in design of sample. The undermentioned are some of the methods:

a) By observation

b) Through personal interviews

c) Through telephone interviews

d) By mailing of questionnaires

e) Through schedules

The execution of research starts during this stage. The researcher has to verify the dependability and accuracy of data collected from time to time. If the researcher wants to use the mechanical and electronic gadgets, separate techniques should be applied at the time of collection of data.

6) Analysis of Data

This is the intellectual phase of research. After the data collected the researcher turns to the task of analysing then. The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences. The collected data should necessarily be precipitated into a few manageable groups and table for further analysis. Analysis of data begins with coding. Editing improves the quality of the data for coding. Next stage is tabulation. Tabulation is a part of the technical procedure wherein the classified data are put in the form of tables. At this stage mechanical devices, electronic device can be used for efficiency and accuracy.

At the end of this phase the testing of hypothesis takes place. The results of analysis will either support the formulated hypothesis or reject it. At times the result may accept or reject the hypothesis. If the researcher had no hypothesis to start with, generalisation established on the basis of data may be stated as hypotheses to be tested by subsequent research in times to come.

7) Interpretation and Report

After verification of hypothesis, the researcher has to make generalisation on his research work to develop a 'theory'. To arrive at valid generalisation the researcher has to interpretthe analysed data systematically and scientifically. The last stage of research is report writing. The following points should be carefully followed in report preparation.

i) The lay out of the report (including preliminary pages, main pages (text) and the end matter)

ii) Report should be written in a concise and objective style in simple language and avoid vague expressions

iii) Charts and illustrations in the main report should be used only if they present the information more clearly and forcibly.

iv) Calculated 'coincidence limits must be mentioned and various constraints experienced in conducting research operations may as well be stated'.

4.10 LET US SUM UP

In this unit we have discussed about the structure, characateristics and development of knowledge. The following are the salient points of the unit.

1) Knowledge is systematised and evaluated facts. The three components of Knowledge are knower, knowee and knowable.

2) The characteristics of knowledge is infinite, continuous, multidimentional, turbulently dynamic, cumulative, coherent and multidirectional.

3) The growth process of knowledge can be compared to that of an organic body as both follow the four major steps: intake, digestion, assimilation and final utilization.

4) S.R. Ranganathan listed seven modes of formation of subjects. They are lamination, loose assemblage, fission, fusion, distillation, aglomeration and cluster.

5) The sources of knowledge enumerated by epistemologists are centred-mode of thinking, speculative thinking, positivistic thinking etc.

6) Spiral of Scientific Method is a method of systematic and meticulous method of research based on observation and experimentation. The Spiral has four phases: Empirical, Hypothesizing, Deductive and Verification. It is a viable method to provide solutions for problems in social science research.

4.11 REFERENCES AND RECOMMENDED BOOKS

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4.12 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) What are the various components of knowledge ? Briefly describe the characateristics of knowledge.

2) Compare the growth process of knowledge with that of an organic body.

3) List out various sources of knowledge and describe each of them briefly.

4) What is Spiral of Scientific Method? Describe the various phases and cardinal points of the Method diagrammatically

5) List out various steps of research and explain each step briefly.

6) Explain various modes of formation of subjects propounded by Dr.S R Ranganathan.

II. SHORT NOTES

a) Speculative thinking

b) Compound Subjects

c) Applied Research

d) Machlup's five classes of Knowledge

BLOCK - II : INFORMATION GENERA TION

In Block I you have been introduced to the concepts like `Information', `Knowledge', Communication' and how they are interrelated in considerable detail.

Information is being generated continuously by human society. It may be coherent or incoherent; it may be useful or not useful - but it is a part of human activity. Information, further passes on from individual to individual or to a group or to a larger mass of people. Thus, information flows and diffuses. Studies have been made and are still gaining on the flow, diffusion, generation patterns, transfer techniques and impact of information on social change, economic development and human progress.

In this Block you will be knowing about information generation, flow and diffusion. How mass communication helps in information diffusion is also discussed in the Block.

Unit-5 discusses about human need for information and how information is generated. The modes of information generation and the forms of information.

Unit-6 explains some of the existing theories on information flow.

Unit-7 gives the meaning of information diffusion and the details about diffusion process models and services. Role of communication in information transfer among scientific and research communities is emphasised. The several barriers to information transfer are also detailed in this Unit.

Unit-8 provides knowledge about mass media by giving its definition, scope, advantages and limitations. Mass media helps in the information diffusion on a wide scale to a larger group.

UNIT - 5 : INFORMATION GENERATION

Structure

5.0 AIMS AND OBJECTIVES

In Unit 2 of Block I information is defined and its nature, properties are discussed. In that unit you have also learnt about the growth of information and the obsolescence of literature.

The aim of this unit is introduce you the various forms of information and to tell you about the information generation. There are different modes of information generation and various factors influence information generation. Information generated is collected, stored, transmitted and disseminated for different purposes. This process again results in the generation of new

information. Thus information generation cycle continues. The vast amount of information generated continuously throughout the world is so overwhelming that we are now using the term 'Information Explosion' to describe it.

After reading the Unit you will be able

- to explain the various forms of information;
- to describe how information is created;
- to state and explain the term 'Information Explosion'.

5.1 INTRODUCTION

Information, in one form or another, has consistently been a significant element in the development of human society. It has become a part and parcel of human life such that there is no life in modern society without information. Information has become an essential commodity for the humans to perform their day to day duties. Information is a resource of immense economic and social value. It is vital to the proper functioning of a democratic society, a crucial tool in a productive economy and an effective government, a focal point of the growth and well being of individuals.

Information is the data of value for decision making. Information is needed for any action viz., research activities, planning and development, cultural activities etc. As such the need for information and the situation-activity are closely related. In this context first we will study the need for information and next forms of information.

5.2 NEED FOR INFORMATION

Decision making is essential at every stage of human existence. In reaching a decision one needs the ability not just to ask the right questions and judge the right answers but also to gather and assess the relevant information. In the modern society an ever widening range of decisions, public or private, group and individual depend on wise use of information. The use of information depends on its form, its knowledge to the decision maker and the technique to locate and make use of it. The need for information can be viewed from two angles:

i) Factors that generate differential information needs; and

ii) Types of information needs.

5.2.1 Purpose and Need for Information

According to William Garvey the scientists engaged in research and development activities are in need of information out of the following purpose (1):

1) To aid in perception or definition of the problem

2) To formulate a scientific or technical solution

3) To place work in proper context with similar work already completed.

4) To relate, work to ongoing work in area

5) To select a design/strategy for data collection

6) To select a data gathering technique

7) To design equipment or apparatus

8) To choose a data analysis technique

9) To enable full interpretation of the collected data

10) To integrate findings into current state of knowledge in area

Melvin Voigt's study revealed that the same person could interact with the information system in different ways at different times depending upon the purpose in relation to his/her work, stage of work, general interest, amount of information already available and so on. He has identified three types of information needs (2). Later on a fourth type was added by other scientists in the field. They are

i) Current Approach
ii) Everyday Approach
iii) Exhaustive Approach
iv) Catching up or Brushing-up Approach

i) **Current Approach** : This is the need for information and about current research and development activities in one's own field of specialisation and also in the broader field or fields of interest or areas. The developments in the field of study influence the course of the present work of a researcher.

ii) **Everyday Approach**: This is the need for information of particular items, essential to the day to day work of scientists. This need for a specific piece of information or data, a method or an equation etc., is felt by them in the course of their daily work. The nature of information sought in such a situation is very specific and right answer is usually expected.

iii) **Exhaustive Approach**: This is the need to find and to check through all of the relevant information existing on a given subject to determine the current state of the art in a given subject field, problem or technology. The need arises when a researcher starts a new research topic.

iv) **Catching-up Approach**: This is the occasional need. A research worker may at times need to have a brief but complete picture of the recent developments of a related subject or a subject in which he was not very much interested or which did not come within the area of his main interest.

5.2.2 Factors Influencing Information Needs

When the user needs information, it must be accessible and available relevant, reliable and timely, and in a readily usable form, must be free of cost or at a cost he is able to afford.

However, according to Paisely, information needs are affected by a variety of factors (3), such as:

1) The range of information services available

2) The extent to which information will be put to use

3) The background, motivation, and professional orientation, and other individual characteristics of the user.

4) The social, political and economic systems surrounding the user.

5) The consequences of information use.

Further Paisely viewed information need as an objective need oriented towards particular tasks, problems etc.

The need for information differs from person to person and the many roles they assume daily, viz., worker, parent, citizen, decision-maker, patient, teacher, consumer, judge etc. More over, information is a strange commodity, although it has definable costs of production and distribution, it is of undeniable value to a user. The rapid changes that are taking place in the social environment are affecting the need for information and its usage.

5.3 INFORMATION GENERATION

Information generation is an unending process like evolution. The social problems like population growth, shortage of foodgrains, the fear of AIDS disease, the pollution of air, sound and water etc. mould the human to find the solutions by way of research. The result of this activity is nothing but information production. In this process the human makes use of the existing information by processing it to his convenience. Thus it has become a cycle, where the man is the information generator, processor and user of information. Before going deep into the subject of ways of information generation, let us know at first what information generation is.

5.3.1 Meaning of Information Generation

Modern society incessantly produces and uses information. All technical activity - in science, industry, commerce or government - now takes place in such a complex environment that it must be based on especially acquired information. At the same time, every act gives rise to information and recorded knowledge growth. Information in the published form of articles, books, monographs etc., or in the form of data, is considered as resource and also serves as stimulus for the generation of new information. The information thus generated is the cause

and cure of the problems. This shows that there is a link between society, man, his needs and information generation.

Human beings are endowed with unique power of thinking and creation. This art of creativity is confined relatively to a very small proportion of world's population, who could devise new methods, reorganise existing ideas and offer improved solutions to the familiar problems. Following are the different definitions given on the concept of information generation.

According to Foskett "Creativity in art or in science consists in the ability to present information in a light which has not appeared before but which nevertheless adds to a coherent pattern already publicly available.(4)

Parker describes creativity as the art of seeking out, trying out and combining knowledge in new ways". (5)

Beveridge views creativity as perceiving significantly new patterns in bits of knowledge - data and theories - already available.(6)

Mackinson expresses that, creativity is a process which has a time dimension, and which involves originality, adaptiveness and realization. Creativity is a long process comprising -

(a) period of preparation during which a problem is selected;

(b) a period of concentrated effort to solve the problem;

(c) a period of withdrawal from the problem, i.e., a period of renunciation of the problem or recession from it.

(d) a period of insight accompanied by the exhibition, glow, and elation of the 'aha' experience; and

(e) a period of verification, evaluation and elaboration of the insight which one has experienced. (7)

Information generation is the result of human thinking aimed at finding solutions to problems by processing the available data. Thus it is the process wherein the relating ideas come together to bring forth new things to solve the problems. Churning of the existing knowledge leads to the generation of new information.

David Bawden relates the following specific aspects to scientific creativity. (8)

i) the role of chance in discovery,

ii) the great value of analogies,

iii) the importance of careful examination of exceptions to and inconsistencies within the accepted scheme of things.

iv) the damaging effect of commonly held ideas which are infact false, and

v) the importance of inter-disciplinary research.

i) Chance

J. H. Austin distinguishes four kinds of chance relevant to scientific creativity: (9)

Chance 1 : 'Blind luck', unattributed to any actions or qualities of the recipient.

Chance 2 : 'Happy accidents', when unconnected events impinge upon the matter in hand. Favoured by exposure to seemingly unconnected facts and experiences.

Chance 3 : 'Prepared mind', 'Pastenur principle'. New relation ships are perceived because of exposure to many facts related to the problem in hand.

Chance 4 : Chance favouring the particular individual, because of distinctive knowledge, interests or life style, seemingly far removed from the problem at hand.

ii) Analogies

Reasoning by analogy leads to creative thinking. Dr.S.R. Ranganathan takes the analogy of origin of the river Ganga from the Ramayana for comparing the life of a classification scheme. "The King Bhagiratha goes in advance in his chariot carving a suitable course for the river Ganga and the river is tamed and trained to follow that course. Similar is the relation between the universe of subjects theory of classification, and scheme for classification". (10)

iii) Careful Study of Exceptions and Gaps

"The Creative writer looks for flaws in the paradigm, for gaps and inconsistencies in our general picture of reality".(11) The gaps and lapses in the research works are taken up and filled by the forthcoming people in any subject by way of further research.

iv) False Knowledge

Outdated knowledge and false knowledge acts as a barrier to new ideas. To avoid this problem one should have the capacity of forgetting the false knowledge. Then only his thoughts become innovative.

v) Interdisciplinary Research

In the modern world this kind of research has become inevitable. Scientists have recognised the importance of interdisciplinary research. This has led to the growth of subjects viz., applied physics, applied mathematics, biochemistry, virology etc.

5.3.2 Modes of Information Generation

Information is generated every moment and it is now a universal phenomenon. Human beings gain information through several sources. Sensory experience of every human being results in the awareness of certain information which may ultimately lead to the enhancement or modification of the individuals' knowledge.

With the experience of information human effort again will be to create new information. Thus information generation is an ongoing cycle. Information may be generated by an individual or group of individuals through observation, intuition, research, innovation and the like process.

1) Observation

As we observe objects in the physical world we gain information. It is through sensory experience we are gaining information. Observation often results in association of ideas. It tries to correlate the new knowledge with the already existing knowledge of the individual. Repeated and systematic observation will strengthen our knowledge.

2) Intuition

Intuition means a quick and ready insight. It is "a power or faculty of attaining to direct knowledge or cognition without rational thought and inference". It is the innate capacity of an individual to quickly know about certain truths.

3) Research

We, human beings are not just contended with what we know and what we receive as information. The information received is put to use for decision making and action. Human curiosity is such that with the available information we delve into further investigation and research. Research is defined as "investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts or practical application of such new or revised theories or laws".

4) Innovation

The introduction of something new is called innovation. It may be a new idea, a new device, or a new method. Innovations thus generate new information.

5.3.3 Information Generation Cycle

Information generation is an endless cyclical process which is influenced by the social problems, personal ambitions of humans and their interest in finding new things for better survival. This cycle may be compared with Dr.S.R.Ranganathan's 'Spiral of Development of New Subjects' - which has the following chief stages (12) leading to the growth of knowledge:

1) Fundamental Research : Research in pure Science

2) Applied Research : Application of the findings of fundamental research to a specific utility - field

3) Pilot Project : Establishment of new process of production of an already known commodity or of a new commodity

4) Design and production of new machinery

5) New Material

6) New Product

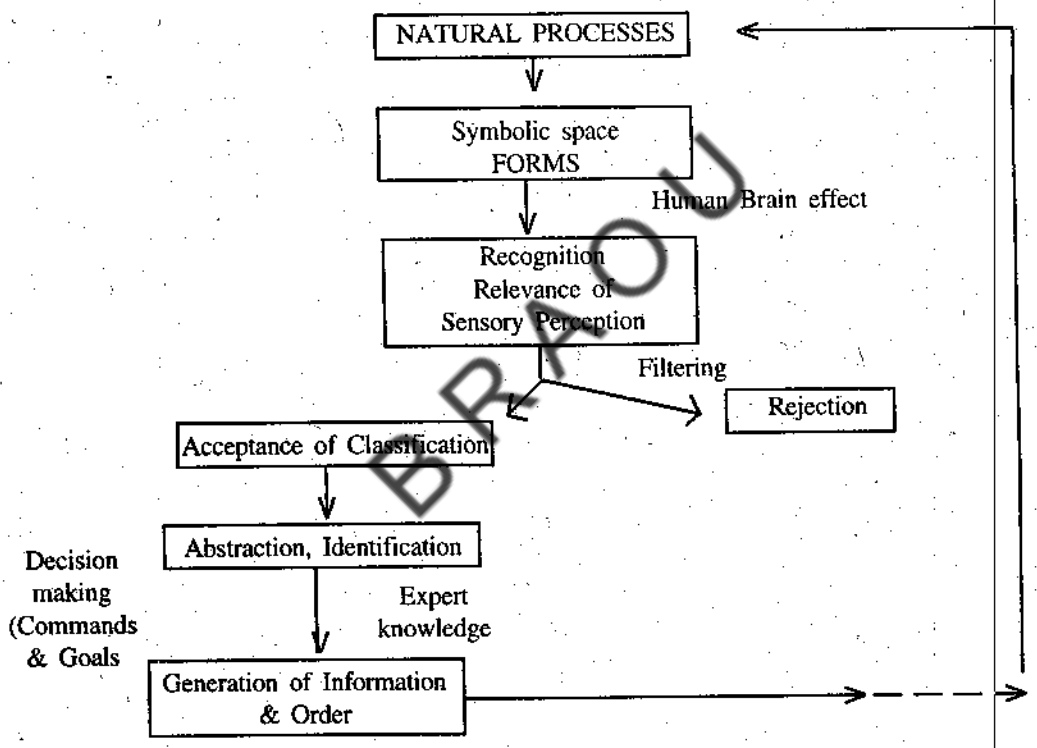
7) Using the New Product: either as an intermediate or an ultimate commodity

8) New problems created by new product sooner or later

9) Fundamental research again to solve the new problems and the continuation of the spiral ad infinitum.

The published information may be in the form of articles in journals, papers presented at seminars and conferences, publication of books, research project reports, brochures, etc.

Information is both an input and output of human perception. Information input in human mind gets retained or rejected. Once it is retained on most of the occasions gets assimilated with one already existing knowledge or information of an individual. Information put to use may in turn create new information. Diagram illustrates the generation of information and usage. (13)



Information is often generated by research. Arthur D.Little identified three different eras in information generation. They are i) Discipline oriented era upto world wars, ii) Problem oriented era, during world wars, and iii) Mission oriented era after world wars. During this era we are noticing interdisciplinary, multidisciplinary and microsubject research. (14)

5.4 FORMS OF INFORMATION

Form according to *Webster's New International Dictionary* is the shape and structure of something as distinguished from its material. Information can be recorded and unrecorded.

For all recorded information we can use a collective term 'document'. Even within a document a certain portion, a paragraph, a sentence, a formula, a symbolic or graphic repre-

sentation or even a word or letter may be useful as information. For example data, facts, figures, scientific and mathematical formulae, etc. can be useful information sometimes.

5.4.1 Recording of Information

Broadly speaking information is recorded by humans and machines - manual recording and machine recording of information. Even machines need human manipulation. For example handwritten manuscript, a painting by an artist are human manual records. An ECG (Electro-cardiograph) is a record made by a machine on the working of the heart by an individual.

Documents which are the outcome of recording of information either manually or by the use machines are of different forms.

5.4.2 Taxonomy of Documents

Documents can be broadly classified as Textual or Non-textual documents. In textual documents information is presented exclusively in the form of written text to be read. Information in non-textual documents may have some text but mostly the information is meant to be seen, heard or manipulated.

The following taxonomy of documents can give you some idea of the different forms of information records. (15)

i) **Ionic Documents**: information in the form of images, maps, plans, graphs, diagrams, posters, paintings, photographs, slides.

ii) **Sound Documents**: information in the form of recorded sounds like gramophone record, audio cassettes, etc.

iii) **Audio-Visual Documents**: combination of images and sounds. For example films, videotapes and discs.

iv) **Materials as Documents**: materials like monuments, models, samples, objects, artistic works, braille books, and nature games.

v) **Magnetic Documents**: documents prepared for computer processing of information.

vi) **Mixed Documents**: documents that bring together various textual and non-textual documents on the same subjects such as books and records, educational kits.

Rapid changes are taking place in recent times in the recording and use of information due to the breathtaking advances in the field of communication and information technology.

5.5 INFORMATION EXPLOSION

Information is self-generated multifaceted, dynamic and continuous. Basically it exists in human mind. But humans can not but share their experience of information with others.

Communication is nothing but an attempt to share our information with others. Once humans began recording information it became spreading far and wide and also it gave scope for the generation of more and more information. Mankind began inventing new means of recording and disseminating information.

Information generates information. Information is now appearing in huge number of documents - basically in journals and secondary publishing sources. With the onset of electronic publishing information is also available now in databases and on CD-ROMs.

According to some conservative estimates the production of books is 60 million per year in all languages around the world. According to FAXON database there are 2,00,000 journals. The average annual increase of new serials production is again estimated at 20,000.

The Director, Indian National Scientific Documentation Centre (INSDOC), T.Viswanathan (1994)16 says that 'Information generates information' cycle is operating and there is a boom of publication of documents throughout the world. According to him "over 10 million journal articles are published every year in about a lakh of periodicals, besides news, editorials and articles appearing in the popular print media. In India alone about 80,000 papers are published in about 3,500 Indian periodicals. With about half-a-million patents, an equal number of science and technology reports and theses and lots of grey literature, this huge knowledge base is increasing at 10 percent a year". He further says that even the number of electronic databases has increased fifteen-fold in 15 years and the number of entries added per year has gone up 22 times.

The vast and continuous outburst of information in multiplicity of documents in numerous languages throughout the world is appropriately described as 'Information Explosion'. It is also called 'Information Revolution'.

5.5.1 Libraries and Information Centres

In your BLISc programme you have learnt about the way information used to be recorded, preserved, processed and disseminated in ancient and medieval times. You have also seen in the modern times libraries and information centres are making their best efforts to collect information records and classifying and indexing them. Their efforts are towards disseminating right information to the right user at the right time. For this purpose they are developing techniques of processing, retrieving and repacking information from a wide variety of documents.

5.6 LET US SUM UP

Information is needed for any action. It has become a part of human life. For every human individual it is indispensable. Information generates information. It is a continuous multifaceted and dynamic cycle which generates information, uses it and again generates new information. Observation, intuition, research and innovation are some of the modes through which information is generated.

Information again may be recorded and unrecorded. Information available in a recorded form is called a document. The generation of information records in large numbers in various forms of documents in different languages is described as 'Information Explosion' or 'Information Revolution'.

Libraries and Information centres try to help mankind by creating, processing, retrieving and repackaging information available in abundance.

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5.8 ASSIGNMENT

1) Write an essay on the various forms of information.

2) Define creativity and describe the various aspects of scientific creativity.

5.9 RECOMMENDED BOOKS

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5.10 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) What is information and how it is approached for use?

2) Communicated information is of various forms - Explain.

3) Information generation is a cyclic process - how? Compare it with spiral of Development of New subjects.

II. SHORT NOTES

a) 'Every day approach' for information.

b) Stimulatory information

c) Information generation process

d) 'Chance' in scientific creativity

UNIT - 6 : INFORMATION FLOW THEORIES

Structure

6.0 AIMS AND OBJECTIVES

The present unit introduces you to Shannon's Mathematical Theory of Information, popularly known as Information Theory. It also touches upon the contribution of later Communication theorists in expanding the Information Theory.

After studying the unit, you should be in a position to

- describe the Shannon-Weaver's Information theory
- discuss the application of Information theory to various communication processes
- explain various concepts involved in Information Theory
- describe the contribution of Ackoff, Yoyits, Cherry, Osgood and Wiener in expanding the Information Theory.

6.1 INTRODUCTION

Claude Shannon (1916-) developed the mathematical theory of communication while he was a research mathematician at the Bell Telephone Laboratories and a professor of science at the MIT (USA). Though the theory was developed for engineering field it has important and far-ranging applications in many fields, including social sciences and communications theory. Warren Weaver (1894-1978), then a consultant for scientific projects at the Sloan Foundation, summarized the main concept of Shannon's mathematical theory and contributed extensively on the application of the theory to the problem of communications in society.

Shannon and Weaver's Mathematical theory of communication is widely accepted as one of the fundamental studies from which several communication studies have evolved. The main concern of the theory was to work out a way in which the channels of communication could be used most effectively. For them, the main channels were the telephone cable and the radio waye. The theory also enabled them to approach the problem of how to send a maximum amount of information along a given channel and how to measure the capacity of any one channel to carry information.

In Unit-3 of this Course, we have discussed about communication models. The present unit examines communication scientifically. Scientific approach leads to an understanding of the way things work. Scientific theory is made up of things that have been tested and verified and which have some generality and predictive power. Isn other words, a set of systematically related generalizations suggesting new observations for empirical testing may be called a scientific theory. Before studying the nature of information flow and the information theories it would be helpful to know the differences between a model and theory.

6.2 MODELS AND THEORY

'A theoretical and simplified representation of the real world' is called a Model. It is an isomorphic construction of reality or anticipated reality. A model, by itself, is not an

explanatory device, but it does play an important and directly suggestive role in the formulation of theory. By its very nature it suggests relationships. The jump from a model to a theory is often made so quickly that the model is in fact believed to be a theory. A model is disguised as a theory more often than any other concept".. (J.A. Bill and R.L. Hardgrave, Jr. 1973; p.28).

From the above definition - we can derive that

i) often models are confused with theories because relationship between them is so close.

ii) a model is not an explanatory device by itself, but it helps to directly formulate a theory.

Models help us try to systematically think about, visualize or discuss any structure or process. A structure of symbols and operating rules are used to match a set of relevant points. Thus a model implies judgments of relevance and this, in turn, implies a theory about the thing to be modeled.

Communication scientists are interested in modeling the structures and processes that are related to humans communication. How a newspaper, television network, radio, advertising agency or information bureau is structured and functions? How does information flow in a society ? The use of the models help them in formulating a theory. Further the use of these theoretical models unites the natural and social sciences. As librarians dealing with public we are also interested in the flow of information among users. The dynamic process of information flow has been viewed as a stochastic process and supported the mathematical theory of information.

6.3 INFORMATION FLOW

The study of the process of information flow is an important aspect in the systems study. A system, natural or social system, is made up of several interacting parts. Coherence in the system can be through inflowing information. Suppose there are two parts in a system and they interact coherently. The dynamic properties of interaction are studied by physicists and engineers. Communication or Information flow in the system also represents transient phenomena and cannot be described as steady state. The behaviour of components of a system analyzed and studied with statistical and dynamic laws. The interplay of dynamic and steady state are often referred to as a stochastic process. It has an element of probability or chance. The process of communication/ information flow in a system is viewed as a stochastic process. A stochastic equation or focal plane equation is derived by applying mathematics to study the probability of the distribution of parameters under study with time. Monte Carlo method can also be applied to study the stochastic process.

Information theory is a statistical tool used for tracing information flows in a complex system. Shannon's mathematical theory of communication was a milestone for understanding communication quantitatively.

6.4 MATHEMATICAL THEORY OF INFORMATION

Mathematical theory of information encompasses a body of concepts, assumptions and propositions about communication process. It is essential to understand the basic concepts and

essential functions of a general communication system before attempting to study the mathematical theorem of Shannon's work.

6.4.1 General Communication System Model

In the Shannon-Weaver model of communication we found that source, transmitter, signal, channel, and receiver are the main components. These components can be shown in a schematic diagram of general communication system.

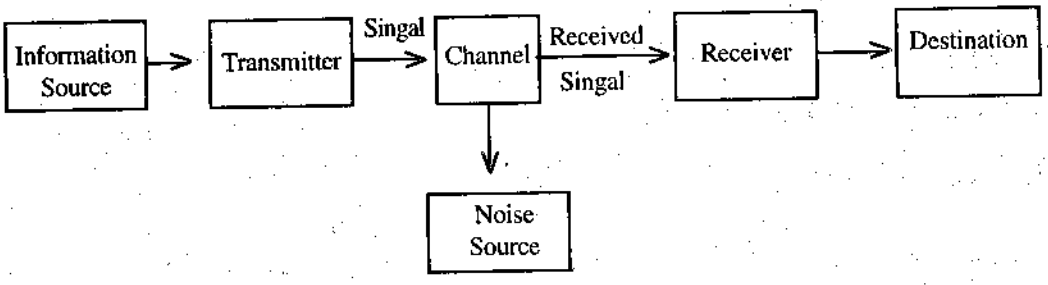

Fig. - 1 : *Schematic Diagram of General Communication System*

The source is seen as a decision-maker. The source decides which message to send, rather selects one out of a set of possible messages. The selected message is then changed by the transmitter into a signal which is sent through the channel to the receiver. For a telephonic message, the channel is telephone wire, the signal is an electric current in it, and the transmitter and the receiver are the telephone handsets. In oral speech the source is the brain, the transmitter is the human voice mechanism, the channel is air and the receiver coverts the sound waves into neural impulses for the brain.

6.4.2 Shannon's Theory

Shannon, Claude Elwood first published his Mathematical Theory of Communication in 1948 as a Bell System Monograph and a year later, after insightful review by *Scientific American* as a book with commentary by Warren Weaver, was still in print nearly fifty years later. No single book in communication theory has so far surpassed its publication record. The Theory became a milestone in communication research and marked the transition from an industrial to an information society.

Now the mathematical theory of communication is known as **Information Theory**. In fact, Shannon avoided the term information theory in his own work, suggesting that communication across time and space was always his primary concern.

Shannon's theory can be summarized as follows:

1) Communication is the fundamental problem of 'reproducing at one point exactly or approximately a message selected at another point'.

2) Coding to be central to any communication - a message must be encoded into a medium suitable for transmission and the received signal decoded by applying the inverse of the encoding transmission.

3) Need for a statistical characterization of message sources and channels, including transmission errors or noise.

4) One of the Theory's crucial innovations was its linking of communication to the freedom of choice a sender has in selecting a message, and the constraints this imposes on the receiver.

What is a message or what it contains ? Why is it selected or how it is encoded ? have become secondary.

5) Shannon decided to regard sending and receiving as a stochastic process, that is, as a process of selecting among sets of alternatives whose probabilities are somewhat dependent and knowable, at least in the long run.

6) He had misgivings about assigning uncommon meanings to the 'information'. He took John Von Neumann's' suggestion that this function be called 'entropy' because its mathematical form resembled one known by that name in Quantum Physics and interpreted in that field as lack of information. The mathematical properties of this function proved to be unique and enabled Shannon to develop the theory into a full-fledged calculus for information quantities.

7) The most consequential invention was the now famous logarithmic measuring function:

$$H = - \sum P_i \log P_i$$

for quantifying the freedom of choices available, uncertainty about, consumed or channeled information of a system. (H=Entropy; P=Probable alternatives).

Criticism of Shannon's Theory:

Shannon's theory was criticized for its engineering bias, especially in the diagram where Shannon used to depict communication process paradigmatically. He was concerned with the technical transmission problems of communication systems rather with the language (semantic).

6.4.3 Weaver's Contribution

Warren Weaver (1894-1978) is a mathematician from USA. The well-known collaboration between Weaver and Shannon began in 1948, when Chester Bernard (President, Rockfeller Foundation) invited Weaver to translate Shannon's mathematical theory of communication into less formidable language. Weaver's exposition of the theory was subsequently published together with Shannon's original article in *The Mathematical Theory of Communication* (1949).

Weaver identified three levels of problems implicit in the communication process:

1) **Technical problems**: How accurately can symbols be transmitted from sender to receiver?

2) **Semantic problems**: How precisely do the transmitted symbols convey the desired meaning?

3) **Effectiveness problems**: How effectively does the meaning affect conduct in the desired way ?

Shannon's theory applied only to the first level i.e., the technical problems associated with accurate transmission of signals from sender to receiver. Weaver was concerned with all three levels and shown the interdependence among these levels. Essentially, levels 2 and 3 make use only of those signal accuracies possible at the technical level of transmission.

Shannon and Weaver's Theory claims that the three levels are not water-tight, but are interrelated and interdependent. The study of communication process at each level helps us to understand how to improve the accuracy and efficiency of the process. Meaning is contained in the message and improving the encoding will increase the semantic accuracy. Meaning is dependent culture and the model does not specify about the role of cultural factors.

6.4.4 Components of Information Theory

Let us examine each of the components of the theory.

i) Source:

The communication process begins with a Source selecting a message out of all the messages to be communicated. The message can be in the form of spoken or written words, musical notes, pictures, mathematical notations, symbolic logic, body movements, facial expressions etc.

ii) Transmitter:

The transmitter transforms the message of spoken word into electrical current (electromagnetic waves) may be encoded signals. The signal takes different forms depending upon the communication system.

iii) Channel and Code:

Channel is the physical medium by which the signal is transmitted from the transmitter to the receiver. The channels may be electronic, mechanical or human. Light waves, sound waves, radio waves, telephone cables, the nervous system of organisms, etc are some of the channels through which signals are transmitted. The mathematical theory of information made it possible to define the capacity of a channel (C). All channels have an upper limit of capacity. A channel capacity is measured as the maximum number of bits it can hold. It is limited by the space or time available with the media. Utilization of channel capacity depends on efficiency of coding system. In a noiseless channel it is possible to transmit information at a rate of the maximum bits per second with efficient encoding system. In other words, the proportion of the channel capacity that is actually utilized is a measure of coding efficiency. That way each signal transmitted and received bears the maximum amount of information.

A **Code** is a system of meaning common to the members of a culture or subculture. It consists of signs. The signs may be physical signs which stand for something other than themselves. The signs are governed by certain rules and conventions that determine how these signs are used to form a message. Message is transmitted as codes via channels. The physical characteristics of channels determine the nature of the codes that they can transmit. The telephone is limited to verbal language. But certain channels accept a message re-encoded into secondary codes such as Morse, Braille, handwriting, printing, etc.

iv) Message:

Once the encoded message is received by the receiver he reconstructs the message from the signals. The receiver changes the transmitted signal back into a message and passes it on to a destination. The destination is the person or thing for whom the message is intended. A system to make corrections in the operation of communication called Feedback from the destination back to the source help the communicator correct subsequent output.

v) Information:

The most unique feature and most valuable contribution of the Shannon and Weaver's theory of Information to communication process is its approach to what constitutes information. Generally the term 'information' is often confused with meaning. But here the term is used in a very special way. Information, in terms of the Mathematical Theory of Communication, is a measure of our freedom of choice in selecting a message to transmit. It is similar to entropy in the physical sciences. It is a measure of the degree of randomness. Entropy is associated with the amount of freedom of choice one has in constructing a message.

The information value of a specific transmission or symbol is the reciprocal of its probability of occurrence. In other words, if more alternatives present the more information is involved in a choice among them. By introducing the base two logarithm (log2) into the equation, Shannon defined the unit of measurement of information (the bit) as the amount of information involved in a choice between two equally probable alternatives. That is, the value of information in the equation is unity (one) when exactly two alternatives are considered, each has the probability of 0.5 and the log2 is used. It is convenient that the simplest possible choice involves exactly one bit of information or uncertainty. (Donald R. Darnell, 1976;p.36).

For example, if I ask you "Are you a librarian ?" , your answer will be "yes" or "no". That means there are two equally probable alternatives each with a probability of 0.5 and the total value of information is one. In other words, the average information value of uncertainty in such two choice situations could be equal to or less than one bit per message.

vi) Redundancy:

Another concept in the Information Theory is Redundancy. It is that portion of the message which is predictable or conventional in a message. The opposite of redundancy is entropy. It is used to offset noise in a communication channel. Redundancy does not prevent noise but reduces it. To correct errors in a message, key or important items are used/repeated (i.e., redundancy) over a noisy channel to ensure their reception. Sometimes, whole message may be repeated where confirmation is required. Therefore, redundancy is considered as a measure of certainty or predictability as it increases the efficiency of a communication system. However, a more redundant message carries less information. In other words, a message with low predictability is to be entropic and of high information. Therefore, redundancy is useful and vital to communication systems.

Redundancy has two vital functions. It is viewed as

i) technical aid, and

ii social dimension.

According to Shannon and Weaver's theory, redundancy helps in improving the accuracy of decoding and enables us to identify errors. Speech needs to be more redundant than writing.

A major source of redundancy is convention which helps in easy decoding. It is one way of decreasing entropy and increasing redundancy. Imposing repeatable words as in rhythmic poetry and syntax decreases entropy and therefore increases redundancy.

The second vital function of redundancy is viewed from social dimension. For example if we say "Hello" on greeting some one in the street or office is also sending a message to maintain or strengthening social relationship. This kind of conventional behaviour cannot solve any communication problem. At the same time it cannot be regarded as a noise. Jakobson calls it as **Phatic Communication**. He refers the acts of communication that contain nothing new, no information, but the use of existing channels simply to keep them open and usable. This kind of phatic communication is highly redundant.

vii) Noise:

Another concept we have come across in the communication theory is Noise. Noise is any thing that is added to the signal between its transmission and reception that is not intended by the source. Noise can take many forms. In the present context of information theory, it can be distortion of sound in telephone communication, radio, television or film, errors in telegraphic message or fax, bugs in computer programmes and data, etc. Noise is spurious information. It increases uncertainty, as it makes the intended signal harder to decode accurately. To get useful information the destination must subtract the noise from the received message.

Shannon and Weaver identified noise as two kinds - semantic noise and engineering noise. Semantic noise is any distortion of meaning occurring in the communication process which affects the reception of message at its distinction. To overcome this the communicator must increase the level of redundancy by repeating the message. The noise can also be reduced to any desired level through improved coding of the message.

viii) Feedback:

Feedback is an another important concept in information theory. However, Shannon and Weaver did not use this concept in their theory. It was first introduced by Norbert Wiener of MIT in his book entitled *Cybernetics* (1948).

Feedback is the transmission of receivers reaction back to the sender. Feedback inserts a return loop from destination to the source in the model. It is a mechanism which allows a system to make corrections in its own operation. For example, feedback enables a speaker to adjust his performance to the needs and responses of his audience. In a classroom puzzled looks or signs of boredom or points that need clarifications or questions from listeners are the feedback which help the teacher/lecturer (i.e., communicator) to adjust his message. Thus,it makes the process of transmitting messages more efficient. It helps the receiver to feel involved in the communication.

ix) Medium:

The word 'Medium' was not used by Shannon and Weaver, however, other communication scientists have found it useful and added it later. The medium is basically the technical or

physical means of converting the message into a signal capable of being transmitted along the channel. Radio and television are medium which convert the signals into voice and or pictures. John Fiske (1981; p.18) divided media into three main categories. They are: i) presentational media, ii) representational media, and iii) mechanical media.

i) The **presentational media**: the voice, the face, the body. They use the 'natural' languages of spoken words, expressions, gestures and so on. They require the presence of the communicator, for he is the medium, they are restricted to the here and now, and produce acts of communication.

ii) The **representational media**: books, paintings, photographs, writing, architecture, interior decorating, gardening, etc. There are numerous media that use cultural and aesthetic conventions to create a 'text' of some sort. They are representational and creative. They make a text that can record the media of representational media and that can exist independently of the communicator. They produce works of communications.

iii The **mechanical media**: telephones, radio, television, telexes. They are transmitters of presentational and representational media. These are the channels created by engineering and are thus subject to greater technological constraints. These are also more affected by engineering noise that those representational media.

Katz, Gurevitch and Hans (1973) studied the similarities and differences among media and explained the relationships among five main media, namely, books, newspapers, radio, television and cinema and explained with a circular model shown below:

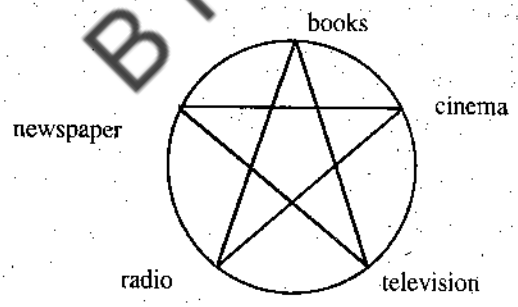

Fig-2: *Media relationships*

They found that people turn to a particular medium in preference to other for satisfying their needs. They also found that people feel that if one medium were not available, its functions would be best served by the ones on either side of it.

Mass media researchers have classified the needs of people into two main categories: A) Personal needs, and B) Social needs. The following table illustrates the media order of preference for satisfying people's needs:

Needs	Media order of preference for satisfying needs				
	1st	2nd	3rd	4th	5th
A) PERSONAL NEEDS:					
1) Understanding self	B	N	R	T	C
2) Enjoyment	C	T	B	R	N
3) Escapism	B	C	T	R	N
B) SOCIAL NEEDS:					
1) Knowledge about the world	N	R	T	B	C
2) Self confidence, stability, self-esteem	N	R	T	B	C
3) Strengthening connections with family	T	C	R	N	B
4) Strengthening connections with friends	C	T	N	R	B

B=Books; C=Cinema; N=Newspaper; R=Radio; T=Television

From the above table we can understand that people tend to use newspapers, radio and television to connect themselves to the society. The books (fiction) and films (cinema) help to escape from reality for a while. Further study helped to infer that the better educated tended to use print media; those with less education were inclined towards the electronic and visual media. Books help to improve one's understanding of self.

6.4.5 Application of Information Theory to LIS

The Information theory is general and it can be applied to any communication. Library, information systems and information centres follow the principles of communication. Interpreting the Shannon-Weaver's general communication system model, library and information centres are viewed as communication systems and we can derive a comparison among various components. The authors as information generators represent the source, while the publishers and other document producing organisations are to be taken as transmitters. The library or information centre is the connector, which brings the information users and information generators together. The equipment, procedures and the library staff which help in retrieving the information are the receivers in the communication system.

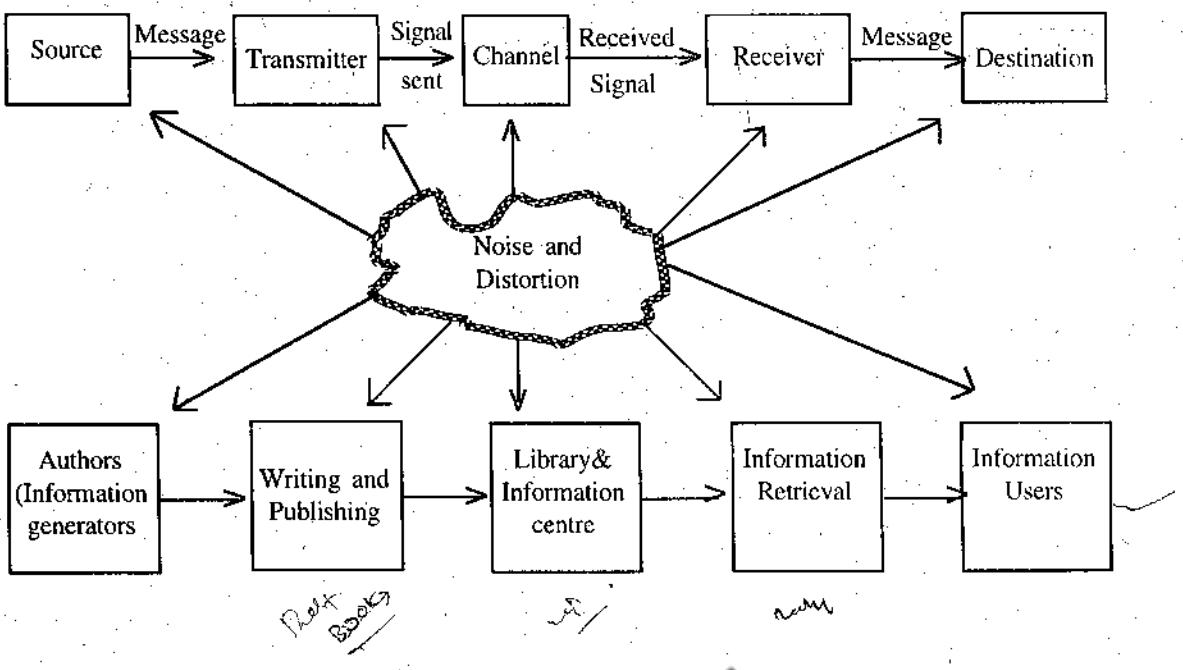

Fig – 3 : *Shannon – Weaver Model of Communication applied to Libraries and Information Centres*

6.5 VERSIONS OF INFORMATION THEORY

There are three versions of Information theory. They are :

i) Possibilistic and Semantic theory of information

ii) Probabilistic or Statistical theory of information

iii) Extension of information theory to a method for testing complex models of qualitative data.

6.5.1 Semantic Theory of Information

The Samantic theory quantifies information. If presupposes a distinction between two sets of elements, languages, or symbol repertores, connected by a code. One contains the set of messages, statements or meaningful actions exchaned and the other contains the set of meanings referents, things, people, ideas, concepts, or consequences the former refer to, indicate or are absent. In other words, information manifest in what the elements in one set imply about those in the other set.

The message is an element in one set and the receiver is in uncertainty as he or she wishes to know. The message reduces the receiver's uncertainty or quantities of information. A message whose content is already known does not alter the receiver's uncertainty and is **redundant**. A message that says something unrelated to what the receiver needs to know is **irrelevant**. A message that denies what previously appeared certain and thus increases the receiver's uncertainty conveys **negative** amounts of information.

The two states of uncertainty between the questioner and the receiver can be expressed as:

I (message/state of knowledge) = U (before receipt of message) - U (after receipt of message)

The unit of measurement in information theory equals the amount the answer to a yes-or-no question conveys and is called a **bit**. Since N alternatives can be exhaustively distinguished by log2N yes-or-no questions, the state of uncertainty becomes simply U = log2N bits. Thus, if U is an integer, U equals the number of times N alternatives can be divided in half until only one alternative remains.

$$I \text{ (message/state of knowledge)} = \log 2N \text{ before message} - \log 2N \text{ after message}$$

$$= -\log_2 \frac{N \text{ after message}}{N \text{ before message}}$$

$$= -\log_2 P \text{ after/before}$$

P is the logical probability and it may be interpreted as a measure of the difficulty of selecting among a set of alternatives by chance.

There are several properties of the semantic theory.

1) Quantities of information are not tied to physical entities. (For example, the length of silence between the signals of a Morse code is critical, as it may be informative).

2) Quantities of information are always expressed *relative to someone's cognitive system of distinctions* (For example, x-ray photograph may be more informative to a physician than by a measure of an instrument).

3) Quantities of information are always *contextual* measures. (The information is not attributable to a single message, but should be viewed in the context of all possible messages or conditions).

4) Contradictory messages turn out to convey quantities of information that are infinitive, indicating the logical inadequacy or powerlessness of a cognitive system to cope with such messages.

6.5.2 Statistical Theory of Communication

In the mathematical theory of communication the statistical analog of uncertainty is called 'entropy'.It is defined by the famous Shannon-Wiener formula:

$$H(A) = -\sum_{a \in A} P\,a \log 2\, P\,a$$

where the variable A consists of mutually exclusive categories, values or symbols a, and Pa is the probability with which a is observed in A. The entropy is a measure of variability or diversity. When all observations fall into one category the entropy is zero; otherwise it is positive quantity.

$$H = - K \sum_{i=1} Pi \log Pi$$

In this equation H is the average information content of n symbols whose probabilities of occurrence are p1, p2, ... Pn. The minus sign is used to achieve a positive value of H. Since probabilities range from zero to one.

The theory's most important contribution is the calculus it defines on top of such entropies.

6.5.3 Extensions of Information Theory:

Information theory could be extended to a variety of fields. Messages ranging from blue prints, computer programmes, political speeches, etc. Information could be conceived as a measure of the organizational work a message can do. Information can be processed, i.e., combined, transformed, or encoded in different media or information creates its own context of application. Information also becomes a part of any living organization, social or biological.

6.6 CONTRIBUTION OF OTHER INFORMATION THEORISTS

Many communication scientists have contributed extensively towards Information Theory after Shannon and Weaver. Some of the important contributions have been briefly summarized below:

6.6.1 *Colin Cherry* (1914-1979): Human Communication

A British telecommunications engineer and a leader in the development of the English School of Information Theory. He organized the first international symposia on information theory.

In his book **On Human Communication** (published in 1957; revised in 1966 and 1977), which was devoted to the mathematical theory of communication, he emphasized the difficulties that beset attempts at quantitative description of human communication.

Colin Cherry's early research was in electronics and circuit theory and later he directed his research to mathematical theories of information based on general statistical principles. His observation was "information conveyed by a sign, message or symbol in a set of events decreases as its frequency of occurrence increases in the set."

The later phase of Cherry's work was devoted to the sociology of telecommunication. In his book **World Communication: Threat or Promise** (1971) expressed his concern about the consequences of complex telecommunication networks for the stability of existing social orders. He cautioned that increased human communication per se does not guarantee increased agreement and that the centralization of power resulting from telecommunication networks may contribute to the decreased importance of the individual.

Cherry was awarded the 4th Marconi International Fellowship for his achievements in the fields of telecommunications in 1978.

6.6.2 *Charles Osgood* (1916-): Human Information Processing

A U.S. Psychologist, widely known as a pioneering psycholinguist. His contribution in the area of human communication is very famous, especially the modeling of an interpersonal communication process.

Osgood developed a multistage model of human information processing, following Shannon's information theory. Osgood proposed four basic stages in his model, each stage corresponding to a particular information processing stage in humans. They are: sensory recording (perceiving), decoding (interpreting), encoding (intending to act) and motor recording (responding). According to this model, meanings of signs are considered to be a psychological phenomenon that mediate decoding (input) and encoding (output) . Meanings of a particular sign are thus taken at once as an internal response at the destination of information to the brain and as an internal, mediated stimulus at the source of information from the brain. This model of human information processing has also proved useful for describing a decision-making process in groups as well as in individuals.

Osgood is also famous for his psychopolitical theory of communication, popularly known as GRIT (Graduated Reciprocation In Tension Reduction) developed in 1962. GRIT theory was originally intended to avoid a major nuclear war between the two superpowers, but now used for resolving conflicts/serious disputes in family, racial, labour and other interpersonal and intergroup relations.

6.6.3 *Norbert Wiener* (1894-1964): Cybernetics

A U.S. mathematician is known as the father and developer of the field of Cybernetics. Cybernetics is the study of control and communication in both animals and the machines. The term Cybernetics is derived from the Greek term 'Kybernetes', which means "steersman" or "Helmsman". If a helmsman wishes to steer his ship to the port, he watches to see how far the ship's bow will swing to post. His vision or feedback helps him to push the tiller to starboard accordingly.

In his book, "Cybernetics: Or, Control and Communication in the Animal and the Machine" (published in 1948) deals with human-human and human-machine interaction. Weiner noted that in both processes a message or an order goes out, and a return message or a signal of compliance comes back. A complete cycle involving feedback is necessary in both instances. He further stated that "this desire - or rather necessity - for communication is the guiding motive of their whole life". The ideas were expressed in "Cybernetics" in a rather technical form.

Wiener also wrote a less technical version entitled, "The Human use of human beings" (1950) and extended his ideas more to social issues. He argued that "society can only be understood through a study of the communication facilities which belong to it".

Wiener described information as the medium of relationships in a communication system, no matter what physical form the communication system might take. Thus he claimed the

centrality of information, rather than energy or matter, as the fundamental of any communication system. In fact, many communication system technologies, especially artificial intelligence, automata and prosthetic devices for impaired human functions, trace their modern developments to Wiener.

Wiener feared that the "Second Industrial Revolution" might do to the human brain what the first had done to the human muscle make it a slave to technology".

6.6.4 *R.L. Ackoff:* Psychological Approach to Message Transmission

In message transmission, information is generally considered as physical events and psychological aspects are disregarded. Ackoff's approach of message/information transmission is towards psychological aspects and the central issues are its meaningfulness and value of information. He has clearly explained the principal concepts - value, individual purposeful state, course of action, efficiency, and possible outcome of his proposition and assigned mathematical express. The value an individual puts on a purposeful state of message is a joint function of three multivariate functions.

Ackoff in his article *Towards a Behavioural Theory of Communication* (published in 1958 in Management Science 4;218) made an elegant mathematical statement:

$$V(S) = f(P_i, E_{ij}, V_j)$$

In the above expression, P_i, E_{ij} and V_j are different sets.

P_i indicates the Probability of choice. Each number in Pi set is a probability that the individual will choose a particular course of action. There are as many number of Pi as the number of courses of actions.

The E_{ij} set indicates the efficiency of various courses of action. In achieving some possible outcome, each of its numbers represent the efficiency of some course of action.

The V_j set indicates the value of possible outcome. Each element of which indicates the value the individual places on some possible outcome. The total number of values in Vj is the number of possible outcomes.

V(S) is only a descriptive element representing the purposeful state. It says nothing about the way to calculate the value of an element.

Any communication is expected to bring about a change in the purposeful state of a recipient. Since the purposeful state has a value, the change affects its value. The change in value of the purposeful state is necessarily accompanied by a change in one or more components as well. It is very difficult to quantify the amount of information and motivation communicated by a message since there is no way to assign meaningful measures to any of the variables. However, the messages are to be viewed as purposeful communications rather than as mere carriers of information. Though the communication may act as a dynamic force, the response from the recipient depends on the current state of several distinct personal process variables.

6.6.5 *Yovits and others:* Generalised Information System

The fundamental question that puzzles the communication scientists is 'What happens to information after it has been presented to the recipient ?'. Yovits and others identified four

essential functions occurring as an information cycle and proposed a model called the 'Generalised Information System'. They are

i) Information acquisition and dissemination function,

ii) Decision-making function,

iii Execution function, and

iv) Transformation function.

i) *Information acquisition and dissemination function:* We find three stages in this function - data input, processing and output of processed data/information. The data is gathered from the immediate environment, internally stored database or output from the preceding function of the system. The function in a latter stage may restructure, filter, weigh, select, reject, analyze, sequence, order, predict, display, or otherwise treat the data as required. The processed data (i.e., information, if used) is the output to be used in the next stage.

ii) *The Decision-making function:* It takes the output of the previous function as its input and uses it to make decisions. The decision-making is done by choosing an appropriate course of action from various choices available.

iii) *The Execution function*: The selected course of action, taken from the above function is transformed into an actual observable action. This is a physical event and the action may also be measured.

iv) *The Transformation function*: It takes the observable actions from the previous functions as input and turns them into data again. The data is provided to the first function, i.e., information acquisition and dissemination function, to begin another information cycle.

This type of information flow as described in the Generalised Information System model may be termed as **Closed-loop Systems**. The closed-loop systems need a human operator to manipulate the control devices. He makes corrections for the discrepancies between actual and desired outputs from the systems, like a vehicle driver regulates the speed of his vehicle on the road. This type of tracking systems also follow the functions of the generalised information systems.

6.7 HUMAN COMPONENT IN INFORMATION SYSTEM

There are certain problems in describing the human component in an information system. The people do not behave like machines. Human operator behaves to some degree of approximation like a linearly responding servomechanism. However, all such attempts to describe human tracking performance have failed due to human complexity. The mathematical equations to describe human performance across a variety of systems assume a trivial factor. It is difficult to explain how a person reacts to certain information. Even Shannon, Weaver, Ackoff, Yovits and many other theorists differ in their propositions. People cannot be treated as mathematical or symbolic abstractions. The practice is different from theory with regard to information systems.

Libraries, information systems and information centres are established to serve people, i.e., users and potential users. Their purpose lies in satisfying the user's needs. Information activities are designed to serve users, who may be real as well as potential or abstract consumers of information, however the practioner with experience gives priority to the real users.

6.7.1 Human Interference in an Information System

Human interference is an essential component in an information system. Groups of people playing distinct and important roles are seen in library and information centres.

Shannon model of communication includes a source, transmitter, channel, receiver and destination. In library as a communication system, the authors represent the source, publishers represent the transmitter, the library as the channel, and the receiver in a library consist of equipment, procedures and the trained staff, who take the message in a document to the destination. As we analyze this complex communication process, we find several people contributing to the total process. Information originates from the people and it is also consumed by the people. Several system functions are performed by people in channeling the information. System designers and developers also contribute indirectly in the creation of a system. The environment of a system is also made up of people around it. In fact, a social nexus of people connects the system inside and outside it.

6.7.2 Psychological Variables in Information Users Studies

An information system is designed and established to fulfil the information needs of the users. There are a good number of studies on user needs and user behaviour. However, most of them employ survey method to determine the user needs with an assumption that the behaviour of the scientists (i.e., users) is orderly. As the human behaviour is complex, the responses often tend to be not equivalent of their actual needs. This results in weak interpretation about the user behaviour. Generally, it is attributed to the borrowing of survey methods from the other disciplines and applying them inappropriately to information science.

Information science is a multidisciplinary field. It also embraces various aspects of psychology. Rees and Schulz suggested that the study of psychological variable might be of some help to information science in understanding the user behaviour. Wholesale adoption of the experimental methodology of psychology will help to study information needs, information seeking behaviour, information handling, etc.

6. 8 LET US SUM UP

Mathematical theory of communication, popularly known as Information Theory, studies the information flow. Shannon's model of communication includes five components - a source, a transmitter, a channel, a receiver and a destination. It is a simple model concerned with the information transmission process. The two main assets of the Theory are: i) it has nothing to do with meaning, and ii) it equates information with uncertainty. Warren Weaver expanded Shannon's theory to include transmission, meaning and effectiveness in the information transfer process. The later theorists like, Ackoff, Yovits, Cherry, Osgood, Wiener and many others have made elaborate research into the communication process.

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6.10 ASSIGNMENT

1) Apply Information Theory to various facets of a library, information systems and information centres and describe its advantages and limitations.

2) Observe the communication process between a user and a librarian. What type of noise do you find between them.

6.13 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Describe Shannon's Mathematical Theory of Communication. What are its limitations ?.

2) Briefly describe the contribution of later Information theorists after Shannon.

3) Briefly explain Yovits' model of a Generalised Information System.

II. SHORT NOTES

a) Entropy

b) Cybernetics

c) Feedback

d) Human interference in Communication

UNIT - 7 : INFORMATION DIFFUSION PROCESS

Structure

7.0 AIMS AND OBJECTIVES

The present unit aims at introducing you to the process of information diffusion and its applications to the information systems.

After studying this unit, you should be in a position to

- define what 'Information diffusion' is
- describe the patterns of diffusion process
- discuss various factors affecting information diffusion
- explain various models of diffusion process
- discuss the role of information systems in information diffusion.

7.1 INTRODUCTION

We often observe spreading of information from person to person in the society. The phenomenon of spread or dispersion through time and space is called 'Diffusion'. The ideas and innovations are dispersed from the producer to users. Innovations are the translation of ideas into new practices, processes or products. The diffusion of innovations is a prerequisite for social and economic change. In other words, the diffusion of ideas and innovations is a source of advancement for society as a whole. The process and influence of diffusion has been extensively researched by various social scientists.

Research on the diffusion of new ideas has begun primarily in the field of sociology with studies focussing on the adoption of new agricultural techniques by farmers in the United States. Later the attention was drawn to other types of innovations, such as medical products and new industrial processes. Though earlier studies focussed on desirable changes the present studies on diffusion deal with both harmful and beneficial effects of innovations. Development Communication has emerged as a specialised field dealing with factors affecting the diffusion of innovations and attitudes of populations, especially in developing countries. Research on diffusion research also focuses on role of social networks, information flow, demographics and psychological variables such as innovativeness and resistance to adoption.

7.2 DIFFUSION OF NEW IDEAS OR INNOVATIONS

Lawrence Brown developed a "Market and Infrastructure model" of innovation diffusion. This model focuses on supply-oriented rather than demand-oriented factors affecting diffusion. There are three stages in this proposition:

i) **First Stage**: Establishment of public or private agency through which an innovation is distributed or made available to the population at large. (This provides a Spatial Pattern of Diffusion).

ii) **Second Stage**: Conceive and implement strategies to promote adoption among the populations in their service or market areas. This leads to establishing infrastructure such as service and delivery systems and also design of information dissemination programmes.

iii) **Third Stage**: Create different levels of access to an innovation, depending on an individual's economic, locational and social characteristics. This ultimately influences the ecision of adoption or rejection.

Every year thousands of innovations/new products are introduced, however, a majority of them fail. Failure to gain acceptance may frustrate both private and public sectors. As public sectors use public funds on R & D, they are prone to criticism. The limited effectiveness of technological and social change programmes is attributed to the failure of public agencies to employ sophisticated marketing techniques and strategies.

7.3 PATTERN OF DIFFUSION PROCESS

The pattern of diffusion process is said to occur in the following two ways:

i) Temporal Pattern:

ii) Spatial Pattern:

7.3.1 Temporal Pattern of Diffusion

Often we come across certain questions, like

When does an idea or innovation first begin to spread within a country, region or organisation ?

How quickly does it spread once introduced ?

What types of people, organisations tend to be early adopters ?

What types of ideas and innovations spread most quickly ?

The Temporal Pattern of Diffusion generally follows Sigmoid Curve. The spread of ideas and innovations generally begins slowly, accelerates as the diffusion begins to unfold more fully, slows after some turning point is reached and levels off as saturation is approached. The rate of spread of information is shown as S-shaped curve.

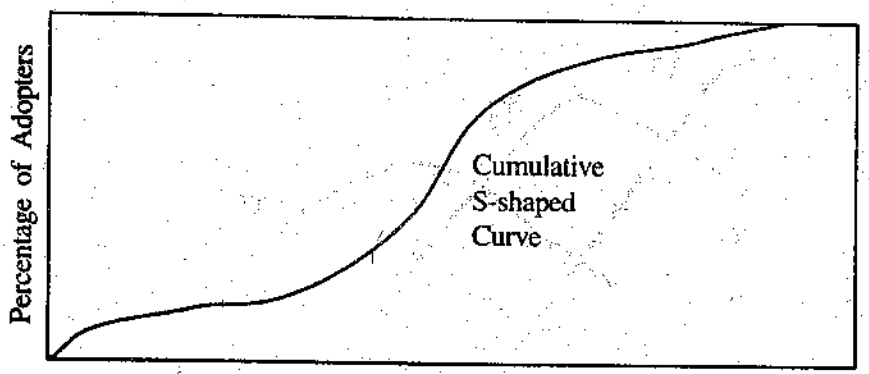


Figure-1: *S-Shaped Curve of Diffusion*
(Source: Rogers, Everett M. *Diffusion of Innovations,* 3rd ed. New York: Free Press, 1983).

The uppermost curve shows the rate of awareness of information, lower curve is the rate of adoption and the gap between shows the decision period.

The graph reflects the fact that an innovation/information can be accepted by a person only if he or she is aware of its existence. Further, the availability of information does not in itself guarantee acceptance. The behaviour of individuals towards innovation/information is related to the distribution of information. When only 5% of the individuals in a social system are aware of an information/innovation, there is little normative pressure to adopt. As the rate of awareness increases to 20 or 30 percent, peer pressure begins to grow, and it brings substantial influence to accept information/innovation. This is known as **Diffusion effect** or **Snowball effect**. Highly connected social systems tend to observe this phenomenon.

7.3.2 Spatial Pattern of Diffusion

In Spatial pattern of Diffusion, we find two distinct patterns, namely, Neighbourhood effect and Hierarchical effect.

i) **Neighbourhood Effect:**

Distance affects the rate of distribution. The time elapsing between introduction and adoption of an innovation tends to increase with distance from the nearest source of information or access. This is referred to as **neighbourhood effect**. The nearest source of adoption may be a neighbour or the distributor/propagator of information.

Diffusion through personal communication occur more frequently across shorter than longer distances.

Diffusion occurs in a wave-like fashion. The first diffusion/adoption is restricted to a small compact area. As the diffusion process continues, the circle of acceptance and use spreads. As distance and time lapse increase the innovation waves weaken gradually. (See Figure-2: Diffusion over Space and Time).

Another important observation was that the costs of adoption of innovation also generally increase with distance.

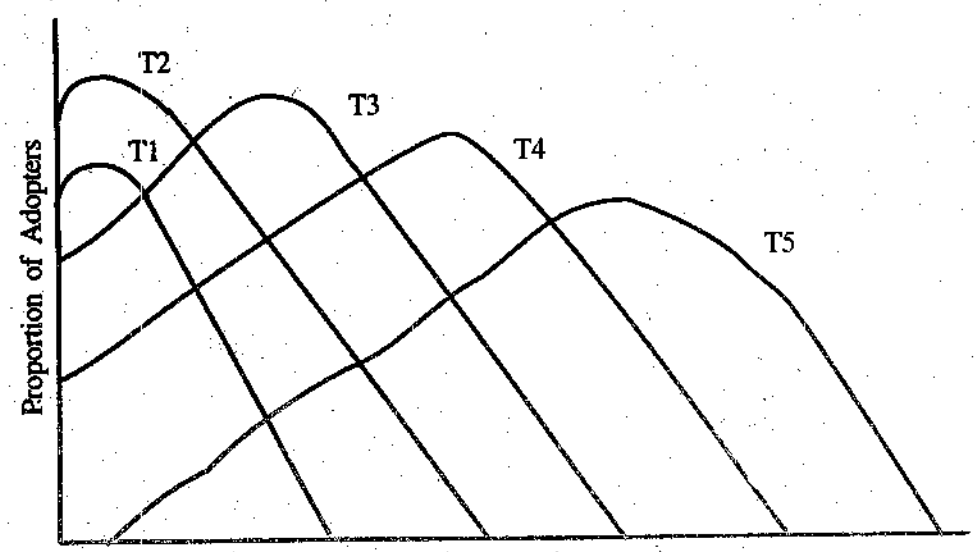


Figure-2: Diffusion over Space and Time

ii) Hierarchy Effect or Cascade Effect

The large metropolitan areas or the large urban places tend to adopt innovations before smaller urban places do so. The per capita rate of adoption is also greater as the larger cities have the capital to introduce innovations. Also, as the density of the population increases, so does the amount of information. This is known as 'Hierarchy Effect' or 'Cascade Effect'.

7.4 DIFFUSION OF NEW IDEAS AND INNOVATIONS

7.4.1 Factors Affecting Diffusion of Information

Different ideas and innovations diffuse at different speeds. There are several factors affecting the rate of information diffusion. Marilyn Brown listed the factors affecting diffusion of information, which can be summarised as follows:

i) **Relative Advantage**: If an innovation is perceived to be superior to the product already existing, it will replace existing one. Relative advantage is viewed in terms of cost-effectiveness, more security, more comfort, less of social conflict, etc.

ii) **Compatibility**: The new ideas and technology, which are compatible with the existing sociocultural values, behavioural patterns, procedures and equipment are more likely diffuse faster.

iii) **Impact on social relations**: Many new ideas/innovations may lead to alterations in social relationships. The new ideas may inhibit or promote adoption of innovations and thus help to further diffusion process. For example, the new agricultural technology accelerated urbanization in some developing countries and this urbanization in turn affected family and community relationships.

iv) **Complexity**: The use and understanding of an idea or an innovation depends on the degree of its complexity. An idea or innovation with complexity is difficult to understand and use. Greater complexity inhibits adoption.

v) **Communicability**: The more easily information about an innovation or an idea can be obtained by or communicated to the potential adopter, the more quickly it will be disseminated.

vi) **Observability**: If the use of an idea or innovation is observable, knowledge about its existence is diffused more easily to the uninformed.

vii) **Divisibility and reversibility**: If an innovation is divisible into smaller parts, then trials are possible and diffusion is promoted. The diffusion is more rapid, if it is possible to return to one's original condition or situation after its trial.

7.4.2 Classification of Adopters of New Ideas and Innovations

When the absolute number of adopters were plotted for a distinct time period, a bell-shaped approximately normal frequency curve was obtained.

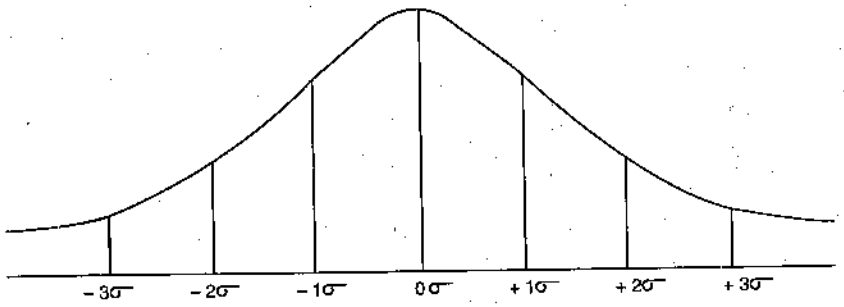


Fig. 3- : *Standard Normal Diffusion Curve*

In the above curve, the majority of adopters were found to occur near the mean. Using this bell or normal curve, the adopters of an idea or innovation can be classified into five categories on the basis of the two measures of the normal curve, the mean and the standard deviation(SD). The five categories of adopters are: i) Innovators, ii) Early adopters, iii) Early majority, iv) Late majority, and v) Later adopters(Laggards).

i) The **Innovators** or the individuals who were the earliest in adopting innovations constituted 2.5 per cent and lay at a distance of two units of SD to the left of the mean.

ii) The **Early adopters** constituted 13.5 per cent of adopters and lay between one and two SD from the mean on the left.

iii) The **Early majority** comprised 34 per cent of adopters and lay between the mean and one SD to the left

iv) The **Late majority** were located between the mean and one SD to the right.

v) The **Laggards** constituted 16 per cent of adopters and placed at a distance of one SD to the right of the mean.

The diffusion studies also revealed certain characteristics of adopter groups. The characteristics can be briefed as follows:

1) The relatively early adopters were usually younger and were equipped with a superior mental ability than that of later adopters.

2) The early adopters were generally better educated and have higher social status. These people were also more risk-taking and cosmopolitan in nature. They had also greater social participation and opinion leadership.

3) The early adopters used more impersonal communication channels and cosmopolitan information sources.

4) The later adopters tend to have traditional values and low social status, education and income. These people adopted innovations only when the pressures to adopt were strong or prices become cheaper.

7.4.3 Adoption Of New Ideas

The adoption of new ideas by organisations and individuals tend to reveal their characteristics.

The organisations which adopt innovations more readily reflect certain traits, i.e., openness to communication with its surrounding environment, functionally differential subunits, expertise of members, decentralised power, flexible rules and regulations, availability of resources, etc.

Rogers and Shoemaker developed a model called **A-I-E-T-A** model, which describes the changes through which an individual passes from first knowledge of an innovation to a decision to adopt or reject it. The individual's decision-making process can be divided into the following time periods:

a) **Awareness**: At this stage the individual learns of the existence of a new idea or innovation.

b) **Interest**: The individual recognises that he or she may have a need for this new idea or innovation and seeks more information about it.

c) **Evaluation**: The individual assesses the idea or innovation in terms of its benefits and costs. Then he decides whether or not to try it.

d) **Trial**: Trial is also an evaluation of an idea or innovation through small scale or limited use. The trial reduces the uncertainties associated with the innovation.

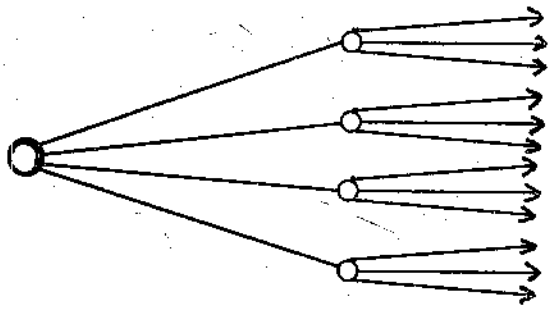
e) **Adoption**: Adoption is the use of new idea or innovation on continuous and full-scale basis.

The post-adoption steps include two stages, namely, reinforcement and routinization. **Reinforcement** is a confirmation of the adoption decision and when it becomes a standard procedure it is a **Routinization**. This model also reveal the role of different sources and channels of information. The information channels create an awareness and interest among people.

7.5 DIFFUSION OF TECHNOLOGICAL INFORMATION

There are several studies on the diffusion of technological information in the society. Models of information diffusion are constructed. The models help us to estimate the number of people with the information in question at any point in time. There are several different parameters in the study, which include the maximum number of information recipients (N_m) and the number of recipients to which a transmitter sends the information during a given time interval (n_i).

In the information diffusion process, we see in general an origin and one or several recipients. We can construct a simple model of information diffusion as shown below:



Time:	0	1	2
Informed:	1	4	16(4+12)

Fig. 4: *Diffusion of Information*
(Source: Losse, Robert M.,jr. 1990; p.251)

In this example, the origin of information is where only one person has the information and it is transmitted to four people (recipients). Each recipient, in turn, transmits information to three additional people. In other words, at time t=2, the person who originally had the information transmits it to three new people. (Information transmission is indicated by the right arrows in Figure-4).

At the end of a transmission cycle, the total number of people who have received the information will be the number of people who have received the information at the end of the previous transmission cycle plus three times this number (ie. 4+(4x3)=16).

The number of recipients, N(t), who have received the information at time 't' is calculated through the following equation:

$$N(t) = 4N(t\text{-}1)$$

In a comparatively large population, the total number of information recipients, N(t) grows at an exponential rate and this can be shown in a graph (See Figure-4: 'S' Shaped Diffusion Curve). If the population were infinite in size and infinitely dense, so that one never transmitted to some one who already had information, N(t) could be graphed as Curve-A.

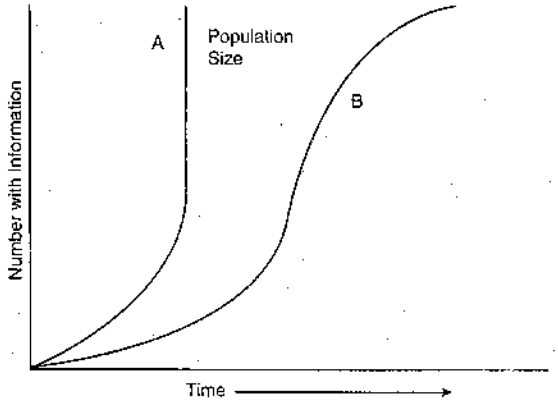


Fig. 5: 'S' *Shaped Diffusion Curve*
(Source: Losse, Robert M.,jr. 1990; p.252)

It is unlikely that neither of the above assumptions is ever fully met. As time progresses, more and more people will already have received the information and fewer additional people will be added to the list of recipients. This is shown in the above graph as Curve-B. The rate of diffusion (r) is worked out as follows:

$$r = f(t) \quad [Nm - N(t)]$$

The component [Nm - N(t)] will be large at t=0 and will approach 0 when the number of people with information approaches Nm.

The process of diffusion is controlled by internal factors as well as factors external to the diffusion environment.

If f(t) is ciN(t), it may be understood as a coefficient of internal influence on the diffusion process. As the information diffusion is seen as occurring only through interpersonal contacts, the N(t)[Nm - N(t)] may be interpreted as the product of the number of people with the information and the number of people without the information.

If f(t) is a constant ce (factor representing external coefficient of diffusion), the number of people already having the information not being a factor, the diffusion is controlled by external factors.

When control of the diffusion process is mixed between external and internal factors, the rate of diffusion may be modeled as

$$r = [ce + ci\ N(t)]\ [Nm - N(t)]$$

7.6 MODELS OF INFORMATION DIFFUSION PROCESS

There are considerable number of intra and interorganisational diffusion surveys focussing on the adoption and usage process of innovations. The time taken for the spread of diffusion of innovation is influenced by the institutional level characteristics. At the international level the characteristics of countries and organisations therein affect the adoption of innovations.

Anthropologists and sociologists were interested in the research on use of steel axes by the aboriginal tribes. Social scientists have been studying for a long time the spread of rumours, the use of new drugs, new teaching methods, etc. The researchers of innovation diffusion have compared the diffusion process with epidemics, economic theory, stock adjustment and vintage and brought out four models of analogy.

7.6.1 Epidemic Model

This model brings an analogy between the spread of infectious diseases and diffusion process of innovations. The mathematical theories of epidemics is often used by the Economists to study the use of new products. The basic hypothesis of this simple model of epidemics is "the number of individuals having contacted the disease in a fixed population in an elapse of time epochs is proportionate to the product of the number of uninfected". The same may be represented as a mathematical equation as follows:

$$m_{i+1} - m_i = B\ (n - m_i)\ m_i / n$$

In the above equation, n represents the number of individuals in a fixed population; m is the number of individuals contacted the disease; t and t+1 time epochs; B is epidemy indicator. The value of B depends on the number of factors such the infectiousness of the disease and the frequency of social intereraction.

7.6.2 Economy Theory Model

The adoption of any innovation by industrial or organisation firms depends on their profitable nature. Because of the availability of imperfect information about the innovations, the attitudes of various firms of the same industry differ in taking risks of adoption. An important reason attributed to inter-firm differences to adoption of innovations is the firm-size. This has led to an argument that the probability of adopting new innovations relates to the firm's size. An 'Industrial Engel Curve' was drawn by economists with the data collected from a sample of innovations. It indicated a positive relationship between the speed of adoption of innovations and the firm's size. Economists now focus on correlation studies to understand the nature of innovations vis-a-vis industrial growth.

7.6.3 Stock Adjustment Model

The stock adjustment model was used to study the stock levels of computers in the US and the Uk in the 1960s and '70s. The model helps to indicate the stock level, in particular, equilibrium stocks in any time period and in analysis of investment behaviour.

Though the stock adjustment model has limited applications, it helps to study interorganisational diffusion process of innovations.

7.6.4 Vintage Model

The Vintage model was postulated by Slater and others in 1960. It is also considered as an economic theory of diffusion and helps in decision making regarding replacement of old product/equipment with new ones. It is assumed that each vintage product embodies the best know-how of its date of production and is committed to nascent knowledge until the date of expiry. Therefore, decisions are affected on the assumptions of cost minimization, perfect information and indivisibility of plant. It suggests that 'old product is only replaced or scrapped when its operating costs exceed the returns it earns. Similarly, new equipment is only installed if its total costs are covered by the revenue it earns'.

7.6.5 Information Diffusion Theory

Elfredin Chatman studied the awareness, use and diffusion of innovation in a job environment among working poor and published her article entitled "Diffusion theory: a review and text conceptual model in information diffusion" (JASIS v.36; p.377-386). She identified three diffusion models, namely, Elements of diffusion model, Attributes of innovation model, and Stages of adoption model.

According to Chatman's Study there are four elements in information diffusion. They are the innovation, communication, social structure and time. The acceptance or rejection of an innovation depends on certain attributes, namely, relative advantage, compatibility, complexity

and trialability. In the information diffusion from person to person, the social structure that helps movement of various modes of communication and the impact of time variance of these modes are analysed and presented. She concludes that though the stages of adoption as shown in the diffusion of technological innovations (such as awareness, trial, and acceptability) are common in job environment, the usefulness of information is limited to the number of persons who can be hired for a position.

7.7 INFORMATION DIFFUSION vis-a-vis INFORMATION SYSTEMS

The term 'Information system' refers to the methods, materials and recipients involved in an organised way to effect information transfer within a specific field, activity or organisation. Information system has three basic functions, i.e. act as origin or source of informattion, agency for information transfer, and a facilitator for use of information.

In Information diffusion process systems act as an intermediary from the producers to users of information. Now let us understand the implications of information diffusion to information systems, services and professionals.

i) Generation of Innovative Process:

The generation of ideas or innovations in science and technological fields emerges from the perceptions of potential need of the market and technological feasibility. Technical information and documentation also helps in recognising these two requirements of the innovative process. On the other hand, the industrial firms have also to consider the economic feasibility and the social acceptance for the new products being designed. The innovative process is then supported by the flow of information from different sources.

ii) Information flow in R & D Establishments:

Information flow in innovation diffusion begins at the R & D stage. The R & D establishments play a major role in information flow by i) making a close contact with relevant advances in science and technology, ii) applying science and technology at the lowest cost in terms of time and effort, iii) maintaing a close liaison with users about its work, and assessing objectively the feasibility of an innovation. For this purpose, R & D establishments need a large input of information from external sources.

iii) Nature of Information in R & D Establishments:

As already stated the major source of information flow of innovations is R & D establishments. However, the nature of innovation diffusion and information orientation in corporate R&D establishments (of industrial firms) and national research institutes differ considerably. As the corporate R & D establishments are more oriented to industrial innovations and development of new products, the diffusion of information is innovation-oriented, cost conscious and user need oriented. They are also in possession of innovations with proprietary nature and community know-how. On the other hand the national research institutes are more infrastructure-oriented and tend to concentrate on process improvement. They provide scientific and technical

information and advice to industries. The information is more of an open nature, and acts as a resource to the other establishments.

iv) Information Sources & Services in R & D Establishments :

Information services in R & D establishments play an important role in making available the information required for its innovations. There is a spectrum of information services available from library and information centres. The basic activity in the spectrum begins with acquisition and storing of information for immediate as well as later use. Information services manifest in various forms. They may be documentation service, information analysis and synthesis, extension service, advisory service, etc. These services are, mostly based on the documentary sources, such as monographs, journals, indexing & abstracting services, technical reports, patents etc.

Information services for innovation diffusion of R & D establishments are shown in the following table.

Type of service	Nature	Users
1. **Alerting Services:**		
Current awareness latest R&D innovations	Broad categories of	Groups of firms
SDI	Highly specific nature	To individual scientists, engineers, technologists
2. **Literature Search Services:**		
Retrospective search documents/databases	in-depth searches of	to required
Reference queries	to answer quick reference queries	" "
3. **Document Delivery Service:**	Lending/supply of documents or copies	" "
4. **Repackaging Service**	Analysis & synthesis of information from documents/ databases	Specific user groups
5. **Extension and Service:**	Field liaison & advice	" "

v) Specialised Information Services:

Some of the large R & D establishments provide sophisticated information services to support their research activities in addition to usual services, namely, current awareness service, SDI, literature search service and document delivery service. These specialised services need

techniques of information handling and subject knowledge. The techniques involve information analysis/synthesis and interpreting the information in terms of user requirements. This is called "Repackaging of Information ".

The R & D establishments of industrial firms also pay attention to patent literature and trade literature.

vi) Establishment of Technical Information Centres:

Many small and large industrial firms are concentrating on the establishment of Technical Information Centres to provide in house information services to facilitate the use of external information sources. The industrial entrepreneurs need to design their own information units prior to establishing new units. These units not only function as traditional libraries with documentary resources and information services, but also act as agents for gatekeeping of technical information. The Information professionals of these centres have technical competence and act as an integrating force between an external network of information sources and an internal network of users to whom the information can be delivered.

The main functions of TICs are:

a) Acquiring monographs, scientific and technical journals, technical reports, patents, standards, technical manuals, trade literature, newspaper clippings,etc.

b) Monitoring in and outgoing correspondence of the Information System on technical subjects.

c) Providing information services such as current awareness, SDI, literature search,etc.

d) Providing/sharing facilities for scientific, technical and business databases and databanks.

e) Study and review of literature of state-of-the-art and new technology to trigger new ideas or innovations.

f) Business Intelligence System for decision support to managers.

g) Consultancy services to other firms in technical information.

It may not be possible for small industry firms to establish,comprehensive information units with all provisions detailed above. Several international and national organisations are providing advice and assitance to business/industrial firms in establishing their own technical library/information centres.

vii) Information Policy in support of Information diffusion:

Information flow is required for information diffusion of innovations, which ultimately support economic and social development of a country or a region. Government policies are often criticised for their bias to supporrt large industrial firms. Recent studies indicate that the small firms can also contribute extensively to innovations. However, most of the small industrial

firms of developing countries lack support for information and training facilities. The developed countries have well structured national information policies with provisions for scientific and technical information required for industries.

A Development Information Network (DIN) has been proposed by United Nations Development Programme (UNDP). It is expected to play a major role in development-oriented information transfer and promotion of technical cooperation among developing countries.

7.8 LET US SUM UP

To sum up, let us recaptulate the main points:

1) Information diffusion is a process of dispersion or spread of information in society. It is studied as tansfer of technical know how or innovations to farmers, engineers, doctors, etc.

2) The pattern of diffusion process occurs in two ways: Temporal and spatial patterns.

3) Several factors are affecting the information diffusion of innovations, such as relative advantage, compatability, complexity, communicability, observability and divisibility.

4) The process of information diffusion was studied through four models: Epidemic Model, Economic Theory Model, Stock Adjustment Model and Vintage Model.

5) Information diffusion in R & D establishments is facilitated through a technical library/ information ntre.

7.9 ASSIGNMENTS

1) Observe and report the information diffusion among your user community when a new service, say automated circulation or on-line search service, is introduced in your library.

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7.11 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) What is 'Information Diffusion' ? Explain the various patterns of diffusion process.

2) Briefly describe various factors affecting Information Diffusion.

3) How do models of diffusion help to study intra and inter organisational diffusion process?

4) Explain the role of information systems in information diffusion.

II. SHORT NOTES

a) A-I-E-T-A Model

b) Diffusion of job information

c) Technical information centres

d) Development Information Network (DIN)

UNIT - 8 : INFORMATION AND MASS MEDIA

Structure

8.0 AIMS AND OBJECTIVES

The unit aims to introduce you the relationship between information and mass media.

After reading this unit you will be able to

- list out the different kinds of communication practices
- describe the historic growth of Mass Media
- identify the types of Mass Media in vogue
- discuss the importance and impact of the Mass Media in society
- recognise the role of Mass Media in libraries as tools of information dissemination.

8.1 INTRODUCTION

Homo Sapiens are unique in many ways when compared with other beings. Rene Descartes, the French Philosopher, rightly summed up the importance of the human beings when he said: *Cogito ergo sum* (I think, therefore, I am). Due to biogenetic revolution the homo sapiens were enabled to think, remember and talk. Thinking is the root of all human knowledge. Human beings communicate their feelings and ideas through *dhvani* (sound), *sangna* (gesture), *pada* (words) and *dhrusya* (picture). Marshall McLuhan, therefore, said that medium is the message. All four modes are being used by people for communication. Language, however, has become the dominant mode of communication.

The communication process consists of four components. They are: 1) communicator, 2) Message, 3) Medium, and 4) Audience. Without any one of them the process is incomplete. Communication takes place between one to one, one to many, many to one and many to many. The verbal communication can be in any of the following forms. They are: 1) Oral communication, 2) Written Communication, 3) Print Media, and 4) Electronic Media. Let us see each of the four communication practices briefly.

8.1.1 Oral Communication

Oral communication was the oldest one which the humans adopted after they acquired speech and language. It is a communication by mouth. It has a limited reach. There are still many tribal communities like Koyas, Savaras etc. who use only oral communication. They do not have written languages. The oral communication gets distorted when it passes from one individual to the other. Oral communication is used for conversation, discourses, seminars, conferences meetings etc.,

8.1.2 Written Communication

Most of the world's languages do not have writing systems but many do. Documents of the pre-Gutenberg era were hand written. They were written on stones, skins, metals, papyrus

etc. In India talapatras and birch bark were used for writing. Paper became the common medium in the medieval times. Through writing, inscriptions and manuscripts were prepared. Such documents were collected in Manuscripts Libraries, Museums and Archival collections. This type of communication was a great improvement over the oral one.

8.1.3 Print Media

One of the most significant events in the human history was the invention of movable type in 1454 by Johann Gutenberg. This enabled man to produce any book in millions of copies. Printed books/documents began to be available to all in bulk. Modern libraries housing books and other documents came into existence. Printing made us to overcome the limitations of memory, space and time in dissemination of information.

8.1.4 Electronic Media

The Industrial Revolution and the subsequent innovations like the Morse code, Telephone, Radio, Cinema and Television revolutionised the communication process. Machine became the extension of Man. The developments in telecommunication has made the world a global village. Technological and industrial innovations created the Mass Media in this century. Mass Media have become effective instruments for information dissemination and societal development

8.2 DEFINITIONS

The definitions and the statements given below reveal the scope, purpose and the meaning of Mass Media.

a) *The Oxford English Dictionary*, 2nd ed. (1989) says " A medium of communication (such as radio, television, newspapers etc.,) that reaches a large number of people".

b) *The Random House Dictionary of the English Language,* 2nd.ed. (1983) defines: "Any of the means of communi cation such as television or newspapers that reach very large number of people".

c) *Longman Dictionary of Mass Media & Communication* edited by T.D. Connors, New York, Longman (1982) states. "print or broadcast outlet through which material is communicated in the public at large, usually means newspapers, television, radio etc.";

d) *A dictionary of Media Terms* edited by Edmund Penny, New York, G.P. Putnam's sons (1984) puts it: " The particular communication form used in presenting the written material, radio, T V, cable. cassette, film, live per formance, holography, audio recording or whatever medium or media are chosen."

8.3 MASS MEDIA : NATURE AND SCOPE

The word 'Mass Media' is used collectively in reference to radio, television, cinema and the high-circulation news papers. The singular 'medium' means any agency which diffuses

information to the public. The word 'media' is frequently used as a singular noun, and occasionally 'medias' as plural.

The earliest use of the term 'mass medium', as recorded in the *Oxford English Dictionary* (OED) 2nd. edn., was by S. M. Fechheimer in N.T. Prigg's Advertising and Selling (1923), at which time the one medium popularly known to the masses was the printed word, though radio broadcasting had just developed in the USA in 1922. The OED quotes J.S. Huxley in 1946: 'The media of mass communication - the some what cumbrous title (commonly abbreviated to Mass Media) proposed for agencies, such as the radio, the cinema and the popular press, which are capable of the mass dissemination of word or image". The quotation further says, 'The use of mass media to foster education, science and culture... Regarded from this angle, the mass media fall into the same general category as the libraries and museums.... That of serving agencies for man's higher activities.'

Mass media is a new social institution concerned with the production and distribution of information/knowledge in the widest sense of the word. It has a number of salient characteristics including:

1) The use of relatively advanced technology for the mass production and dissemination of information,

2) The systematic organisation and social regulation of this work and

3) The direction of information at large audiences who are unknown to the sender.

The importance of mass media is that it is a communication from one to many. Mass media increases the space the linguistic act can cover and decreases time that it takes to transmit. The medias have brought speed, ubiquity and pervasiveness to the traditional role of communication.

8.4 STRUCTURE OF MASS MEDIA

The structure of mass media comprises four elements viz.,
1) communicator, 2) Medium, 3) Message, and 4) Audience. Wilbur Schramm has shown the structure of mass media by a diagram.

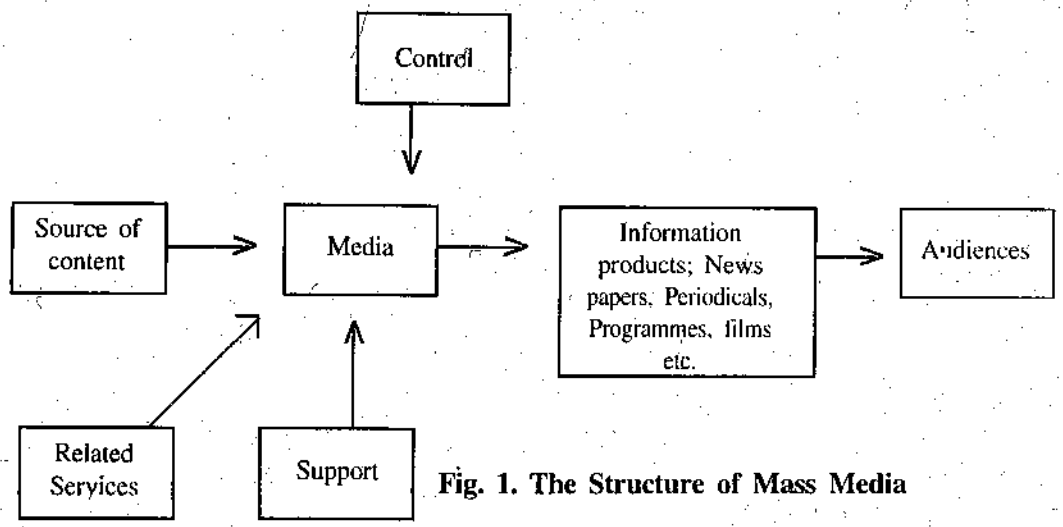

Fig. 1. The Structure of Mass Media

[Source: Wilbur Schramm: *Men, Messages and Media : A Look at Human communication.* New York: Harper & Row, 1973. p.144]

8.5 TYPES OF MASS MEDIA

Mass Media is a blend of traditional print media on the one hand and modern audio-visual media including satellite communication on the other. The following forms of communication comprise the Mass Media at present.

- Newspapers
- Radio
- Cinema
- Television and
- Video.

8.5.1 Newspapers

Newspaper, a medium of mass communication usually published daily or weekly by which nascent information on current affairs, opinion and entertaining features are circulated among the people. It differs from other mass media such as radio, cinema and television since it presents its message as reading matter on paper.

Newspapers of large circulation only come under mass media but not all. They should attempt to publish a complete and balanced presentation of local, regional, national and international news. In the modern age when the medium is said to be the message a newspaper must attempt to present its news as effectively and as attractively as possible. Page layouts, photographs, charts, type graphics etc. must help the reader to the important news. A newspaper should cover in its news both government and non-government agencies. It should have objectivity and accuracy in its reporting and audience satisfaction and profitability. Newspaper is the oldest of the mass media. News papers of some sort were there from the times of the Roman Empire. The invention of the movable type by Johann Gutenberg in Germany gave tremendous boost to this medium of communication. It is also linked to the emergence to power of the bourgeois class in Europe. It served their cultural political and commercial activities.

Germans were the early pioneers in the production of newspapers. In the half century following the introduction of printing in A.D. 1454 a few irregular news sheets started appearing in Nurunberg, Augswengol, Cologne. The earliest one was *Newe Zeytung* dated 1502. In 1588, the *Cologne Gallo Belgicus* appeared and in 1597, *Historische Relatio* was printed. The first daily newspaper was started in Leipzig in 1660 followed by the *Jenaische Zeitung* in 1674. During the period 1500-1800 a large number of newspapers appeared throughout Europe.

The earliest newspaper in the English language printed in England is, *Cornate*, or news from Italy, Germany, Hungarie, Spaine, and France in the year 1621. This was followed by the *Oxford Gazette* in 1665 which later moved to London and became the *London Gazette*. The first English daily, the *Daily Courant* appeared on March 11, 1702. There are many

newspapers in English language which have large circulation. To name a few: *Daily Mirror, Daily Express, Times, Daily Mail, Herald, Tribune, New York Times,* etc. It is estimated that there are around 50,000 newspapers of all types in the world.

The story of newspapers in India is altogether a different one. Printing presses were first brought into India in the 16th century by the Jesuit fathers for publishing evangelical literature. They were started in Goa, Madras and Calcutta. The first printed newspaper, the weekly *Bengal Gazette or Calcutta General Advertiser* was started on 29th January 1780 by James Augustus Hicky. This was also popularly known as Hicky's journal. *Dig-Darshan, Samachar Darpan and Friend of India* appeared subsequently. The first daily newspaper published in India was *The Bengal Hurkaru* from 30th June 1836 under the editorship of James Sutherland.

Indian Press includes 41 centenarians. The Gujarat daily, *Bombay Samachar* is the oldest existing newspaper which was started in 1822. At the end of 1993, the total number of newspapers was 33,612 out of which 3740 were dailies, 275 tri/bi weeklies, 11,136 weeklies and 18,461 other periodicals.

Total circulation of newspapers at the end of December 1993 was 67,611,000 copies. According to the circulation statistics, 153 are big newspapers having circulation of more than 75,000 copies, 421 are medium category with circulation 25,000 and 75,000 copies. *Ananda Bazar Patrika, Times of India and Hindustan Times* are in the first, second and third positions circulation wise.

Newspaper is a powerful medium in India from the days of freedom struggle. In the following table the number of newspapers as in 1993 according to their language and periodicity can be seen. (see Table-1 in Appendix).

8.5.2 Radio

Radio communication is one of the electronic media. In the case of newspaper, people have to be literate to use it, whereas in the case of Radio communication people even without literacy can use it and its great advantage is that too many people could listen to it. The production of radio sets is cheap and their operation easy. Through radio, people can have access to information from all countries in the world. Radio enables the broadcast of all languages, dialects and accounts. Shortwave broadcasting added to the range of radio stations and to their political potential. Radio communication has become an important means of disseminating news and propaganda and also of education and entertainment.

The beginnings and the spread of radio communication in the west and India are interesting to know. Theoretically, radio was invented in the 1860s by James Maxwell, a Scottish physicist, who worked out the formulas of the existence of electro magnetic waves. However the first to create what we now call radio waves was the German physicist Heinrich Hertz. Subsequently there were many early experimental audio transmissions before the regular commercial radio broadcasting came into vogue.

Radio developed differently in Europe and North America. In the USA the radio broadcasting was first used with the Harding - COX presidential election returns on November 2, 1920. The BBC (The British Broadcasting Corporation) began in 1922. It was created as

a public service with appreciable independence from government. Political leaders began to use the radio broadcasting increasingly in the 1930s and 1940s. The development of tape recording in the 1950s brought new techniques and flexibility to radio. After the 1950s radio began to be found in the west in every house, in cars and in work places. People began to use a wide range of radio stations for listening programmes of their interest. The BBC and the Voice of America (VOA) are the best examples of radio broadcasting to day bringing the latest information to every home.

Radio broadcasting started in India in 1927 by private companies in Bombay and Calcutta. The Government took over the transmitters in 1930 and started operating them under the name of Indian Broadcasting Service. It was changed to All India Radio (AIR) in 1937 and it came to be known as *Akashavani* since 1957.

AIR's network comprises 179 broadcasting centres consisting of 172 full-fledged stations, three relay centres, one auxiliary centre and three exclusive *Vividh Bharati* commercial centres. There are 146 MW transmitters 50 short-wave transmission and 89 FM transmitters. The present national coverage is 89.7 per cent by area and 97.1 per cent by population. AIR is servicing as an effective medium to inform and educate people besides providing wholesome entertainment.

8.5.3 Cinema

Cinema in its communication combines sound, speech and vision. It is one of the powerful genres of the electronic media. Its influence on the mass is phenomenal. It is a great entertainer.

The origins of the cinema might be traced back to 1896 when Thomas Alva Edison's vita scope was the novelty of New York and Paul's theatreograph was drawing the crowds to the London music halls. From the 1920s onwards the cinema used music incorporated in the sound track. Prior to this it was the era of silent film. The Jazz singer of 1928 was the first cinema with dialogue sequence. The 'talkies' became popular within no time. After the 1930s the silent cinema became obsolete. The cinema became an agency of mass communication with influence in politics, attitudes, fashion, the arts, music and language. There are cinemas of different kinds. There are cinemas for children, horrors, tragedies, comedies etc. They bring different culture, languages etc., to the notice of others.

Cinema was produced in India for the first time in 1912. R.G. Torney along with N.G. Chitre made the first film entitled, *Pundalik* in 1912. D.G. Phalke (1870-1944) produced *Raja Harichandra* in 1931. The era of silent movies was overtaken by the talkies in 1931 when Ardeshir Irani (1886-1969) produced *Alam Ara*, the first talkie cinema.

India tops the world in film production. Huge capital to the tune of around 500 crore is invested. The cinema industry is mainly concentrated in Bombay, Calcutta and Madras. Nearly two lakhs people are employed in the cinema industry. The country has more than 6,000 permanent and around 4,000 touring cinema houses. The total seating capacity in these cinema houses is a little over 50 lakh. The average daily attendance of people going to cinema houses is around one crore. Indian films are exported to nearly 100 countries in the world.

Government of India had set up different organisations such as Central Board of Certification, Films Division, National Film Development Corporation, Directorate of Film Festivals and National Film Archives for the development of the cinema industry.

The Indian cinema has tremendous impact on society and politics. Cinema writers and stars have been entering into active politics.

8.5.4 Television

Television is the most effective means of mass media known to mankind. After about 80 years of development, television made it possible for millions of people to share a single experience. With teletext, teleconferences on television, the world has become too small for communication purposes. Television is a tremendous force for political persuasion, for education and enculturation and for commercial advertisement. As on today almost all the nations in the world have privately, publicly or governmentally owned television. Television is used both by the educated and illiterates since it is a audio-visual medium.

In the 1920s and 1930s the potential of television was not widely appreciated; radio and cinema were at that time fast developing and popular means of mass communication and entertainment. Charles Frances Jenkins and John Logie Baird made experimental demonstrations of television in 1920 and 1926 respectively. However, J.G. Baird had broadcast in 1928 television pictures in colour, outdoor scenes and stereoscopic scenes.

The first regular public television system in the world began in Berlin in March 1935, its object being 'to imprint the image of FÜhrer in the hearts of the German people'. In 1936 the Olympic Games were televised. Television was converted into an electronic system in 1938. The first regular television service was inaugurated at Alexandra Palace by the British Broadcasting Corporation in November 1936. Radar and Satellite technologies contributed greatly to the development of television communication. Television has become a world-wide phenomenon today.

Doordarshan, the Indian National Television Network, is one of the largest broadcasting organisations in the world. An experimental television service was introduced in India with the starting of Delhi Kendra with the UNESCO grant on September 15, 1959. It was extended to Bombay city in 1972. Till 1975 only seven cities were covered by television. Now more than 85 per cent of the 900 million population of India can receive Doordarshan programmes through a network of more than 700 terrestrial transmitters.

In the year 1982 a regular satellite link was established between Delhi and other transmitters. Doordarshan also introduced colour transmission. Doordarshan has a three-tier primary programme service - the national, the regional and the local. There is the SITE project of the Doordarshan covering 2400 backward villages in the states of Andhra Pradesh, Karnataka, Orissa, Madhya Pradesh and Rajasthan. Doordarshan broadcasts educational and informational programmes besides entertainment and sports programmes. In 1984 a second channel was added in Delhi which was extended later to Bombay, Calcutta and Madras. This service known as DD2 Metro Entertainment channel has been extended to many more cities and now over 75 million people can receive programmes on this channel. Doordarshan has also entered into an agreement with the Cable News Network (CNN) and a 24-hour News and current affairs show is also available for viewers in the country. The Star TV, SITI cable, ETV etc., are also available for the viewers on different channels.

8.5.5 Video

Video communication is the latest audio-visual electronic media. By the late 1970s video tapes, video recording and playing apparatus were vigorously marketed. The portable

video cameras have changed the making, the cost, the production, the speed and the presentation of programmes. The distinction between video recording, television and cinema of late had become blurred. Video provides freedom to the viewer to select his programmes as per his needs. These programmes could be music, poetry, songs, lessons or any other privately recorded materials. Video parlors have become a common sight in every country. CD-ROM and multimedia is the development of video technology.

8.6 FUNCTIONS OF MASS MEDIA

Experts assessing the influence of mass media emphasise what people learn from the media has cognitive effects in the widest sense. People may learn from the media what is normal or approved, what is right or wrong, what to expect as an individual, group or class and how they should view other groups or other nations. Aside from the nature and magnitude of mass media effects on people, it is impossible to doubt the enormous dependence of individuals, institutions and society as a whole on mass media for a wide range of information and cultural services.

It is widely believed that mass media has an important role to play in achieving national goals. The Mc Bride Report of the UNESCO lists out the following eight functions of mass media. They are:

- dissemination of information
- socialization
- motivation
- promoting debates and discussions on public issues
- education
- cultural promotion
- entertainment
- integration

8.6.1 Dissemination of Information

Mass media made the world a global village. Through them it has become easy to know what is happening anywhere in the world. By the growth of mass media in this century, millions of people have come to know new ideas, philosophies, approaches and attitudes to life. It has brought a new dimension in man's horizon. Mass media is disseminating facts, transmitting knowledge of many things and providing the speediest and the most effective means where by leaders can approach the people in times of crises and strains. The information which is brought by the mass media is the nascent and up to date and current micro information. The press, the radio and the television through their own agencies bring the information speedily to the doorstep of the people.

The newspapers in India publish information on Government policies, programmes and activities. They obtain information from Press Information Bureau, National Press Centre. PTI, UNI and Non-Aligned News Agencies Pool. Doordarshan and Akashavani bring out many news bulletins on political news, government programmes, weather etc.

8.6.2 Socialization

The process of socialisation is closely linked up with the growth of mass media. The newspapers and other electronic media are powerful tools of social change. They undermine traditional values and social controls. They work for the furtherance of dominant social order at the cost of local and regional systems and cultures. The media brings people together to discuss and debate various social problems which are effecting the different sections of people in the society. By such discussions social movements get strengthened and people are persuaded to change their deviant or unconventional behaviour. Media has played a great role in creating awareness among people about untouchability, superstitions, women problems etc. The constant flow of messages from the mass media cultivates a 'mainstream' set of outlooks, assumptions and beliefs about society. People also look towards the media for ideas, information and impressions. The attitudes of people, their habits and customs gradually undergo changes because of constant and consistent messages of the mass media about social morality and social responsibilities. Cinema and television have extraordinary effect on man-woman relations, marriages, size of families and life style of people.

8.6.3 Motivation

Modern societies are media dependent. Their growth and development is closely related with the mass media. They make use of media for achieving a great many goals that were handled differently in traditional society. Mass media as disseminators of information in different sectors motivate people to seek latest information or skills, needed for development Newspapers and electronic media bring the latest developments in science, technology, agriculture, medicine etc. to the notice of people even in the remotest areas and motivate them to use the fruits of the latest innovations for the personal and social benefit. The radio and T.V.programmes on agriculture showing the use of improved variety of seeds, use of fertilisers to protect the crops can easily motivate farmers to use them. The various literary programmes can stimulate people to go to libraries and read further. The educational programmes on radio and T.V. are a boon to the student community to become motivated and learn. The audio-visual element of the programmes have greater effect on the people than the print media.

8.6.4 Promoting Debates and Discussions on Public Issues

Mass media is a vehicle for effective politics and politics is mainly dependent on mass media. The Newspapers, Radio, T.V. and Video have terrific effect on public issues. There are no societal matters which are not covered in media. The Newspapers and the Electronic media bring all the latest developments in global and national politics to the notice of people. Public matters are hotly discussed and debated on T.V., Radio and Newspapers. Mass media is extensively used for elections. Literary debates, discussions on social issues like prohibition, prostitution, corruption, pollution have become the focus of the media. The media serve as watchdog over our society and Journalists believe they have a special responsibility to critically examine the performance of the government and its organs.

The media are often criticized, however, for bias and lack of credibility. Differential exposure to media results in differential levels of knowledge, leading to structured inequalities in the distribution of information in society. Those sectors of population which are relatively less exposed to mass media become functionally more ignorant. In democracies, this is thought

to lead either to dangerous populism or to low levels of participation and to elite domination. Mass media is also misused by political control.

8.6.5 Education

Mass Media bring knowledge to masses. It has a captive influence on audience. It can help to equalise educational chances, especially by reaching those denied chances of adequate childhood participation in education. The traditional forms of education which are associated with book work have become unexciting and dull to young people due to development of video games, film cassettes etc. Educational institutions, therefore, are now utilising film, radio, television and video as part of the instructive process. According to McLuhan, this will eventually produce hybridised cultural forms that are both entertaining and educational.

Mass media directly and indirectly help the educational process. National Policy of Education (NPE) 1986 emphasised the role of media and educational technology in the promotion of education. It stressed that media should facilitate reaching out to the most distant areas and most deprived sections of student community. AIR has a long legacy of allocation of time for educational broadcasting - both formal as well as non-formal types. THe Educational Television programmes were started in 1960 on experimental basis but they became regular from 1961 onwards. The Satellite Instructional Television Experiment (SITE) is a land mark in educational television in India. The countrywide programme of the ETV is a remarkable example of the use of media for education. Since 1984, Indian television has broadcast 11.5 hours of programmes every week for higher education. Fourteen Educational Media Research Centres and Audio Visual Research Centres have been set up by the UGC in the country for programme production.

8.6.6 Cultural Promotion

Mass media in every country largely remained national in character. Since the media has to cater to the tastes and values of the people, the cultural forms of the country are largely reflected in the programmes of the media. The literature, poetry, drama, music, folk art, classical art, dances implode through the mass media to reach to the audience. Every one loves the part of his country. Events of history, monuments, great people of the country, form part of the programmes of the mass media.

Mass media are the cultural ambassadors of a country. When we see programmes on BBC we understand, their language, their habits, their dress and life style. The Indian epics, Ramayan and Mahabarat when they were telecast on the Doordarshan, they depict the cultural heritage of India and make people from other cultures to understand the Indian culture. Young children can easily absorb the cultural past of a country, if the media both print and electronic ones, design programmes depicting the cultural values of the country instead of crude programmes of violence and crime. Great cinemas through their story, song, music and dances stimulate people to absorb and retain cultural values as assets of the people and their civilisation.

8.6.7 Entertainment

Mass media provide both information and entertainment. Their programmes are designed to serve the entertainment function. It reflects largely the mass tastes and mass values. When a mass medium ceases to do this, it ceases to be a mass medium.

Television is the number one entertainment medium but cinema and radio are not far behind. Some of the movies were and are great hits as entertainers. T.V., Radio and Videos are common sight these days even among the middle class families. Colour is an added attraction in T.V. and cinemas. Music, songs, dances are amply used in T.V. cinemas and Radio programmes.

Even newspapers and magazines succeed or fail largely in terms of their entertainment content and quality. They intermix their information content with a dose of fun and games. However the least entertaining of the mass media is undoubtedly the newspaper. Mere entertainment is considered by many as a waste and a degradation of media potential. Many a time it is difficult to distinguish between a good entertainment and a bad entertainment. The media however, cater to the public tastes but they also help to mould public tastes and values.

Entertainment is by far the largest service of the mass media. This is especially true from the viewpoint of the audience. Television is the number one entertainment medium but cinema and radio are not far behind. Some of the movies were great hits as entertainers.

8.6.8 Integration

The idea of nation-building through the mass media has been evolving through decades. The creation of national consciousness is a major problem in a country as diverse as India with its many languages, sub-cultural traditions and ethnic groups. One of the ways of achieving national integration is by presenting through the mass media the literature, drama and music of each region to all other regions. This helps the different sections of people of the country to understand the cultures, habits, customs, festivals and life styles of each other.

The vast power of mass media has implications to democracy. The media moulds the people to things of one nation and one people under the democratic set up. Through their programmes they impress the people to get united against external threats and internal disturbances. Newspapers through their columns project the common problems which the country is facing and thus make peoples to discuss and debate the common problems of the country in a national perspective instead of regional Jingoism. Through mass media, we find, the literature, poetry, stories etc are translated to the benefit of the people of other regions.

8.7 LIBRARIES AND MASS MEDIA

Libraries are social institutions. They are established by mandate for providing access to information to all sections of people irrespective of their class, colour, race, caste and sex. They have to provide information free to all without collecting any fee. Libraries have been in existence from ancient times. They have started growing enormously after the invention of printing. They have become indispensable source for the furtherance of education. Libraries, through dissemination information, have caused the emergence of democratic ideas of freedom and equality. Different kinds of libraries like public libraries, academic libraries, special libraries, industrial libraries, private libraries are in vogue. Libraries have become catalysts of social change and development.

Mass media is a recent phenomenon when compared with libraries. Cinema, Radio and T.V. have come to pubic use only in the first quarter of this century. Though Newspapers were in existence for the last 150 years. Their circulation earlier were limited. Newspapers

with large circulation is a phenomenon of this century only. Mass media provide both information and entertainment. They provide the latest, up to date and pinpointed information to the public. The information provided by the mass media is uniform, fast and reach even the remotest areas where libraries are not available.

Today the concept of library comprises many media besides books. An enlightened policy on library must take into account the possibilities of all media. Educational concerns must be extended to the whole of the media. If tapes are better than books for learning languages or any subject, look after them.

Libraries and mass media are two different channels of information and their similarities and dissimilarities are detailed below:

1) Libraries are generally used by people who are literate. Illiterates who cannot read and write normally keep away from libraries. Whereas the mass media with the exception of newspapers are listened and viewed by all.

2) The actual users of libraries are few of the total population whereas films, radio, T.Vs are used by more people.

3) The readers have to go to the libraries to use their collection by the people whereas the mass media is available at home. People can use them easily according to the convenience of their leisure.

4) The library facilities can be used singly by individuals, whereas mass media can be used simultaneously by the entire family.

5) The purpose of the libraries is to provide information and knowledge whereas the purpose of mass media is largely entertainment. Films, radios, T.V. and even newspapers contain information mainly designed to fill the leisure time but not for serious purpose.

6) Access to public libraries is free. Anybody without any restrictions of class, caste, race, sex , rich and poor can have free access to the libraries whereas for mass media one has to spend money. People have to subscribe to newspapers and purchase the radio and TV to hear and view them. They are expensive and poorer people can least afford.

7) Libraries provide reference service, information service and borrowing facilities, where as the mass media programmes can be viewed and listened at the slotted time schedules only., except in the case of the use of a video.

8) Libraries are essential for education. Mass media are also used for educational purposes. Radio and T.V. are used for broadcasting educational programmes for students in schools and colleges. ETV is largely utilised by the open universities where the education is imparted by the distance mode.

9) Variety of programmes and news are brought to the people instantly by the mass media. Whereas it is not possible for the libraries to be instantaneous in bringing the global news and information to the people like the mass media.

10) Libraries are cultural institutions which preserve the culture of the people in the documents and transmit them to the posterity. Whereas the programmes of the mass media are time bound.

11) Mass media are largely part of the libraries these days. They cannot replace the libraries. They are at best supplements and complements to the libraries. News papers, radio, T.V. and video films are largely used in the libraries. Video books and films are common sight in the libraries of the advanced countries. They can be borrowed like other documents from the libraries.

12) There is general criticism that mass media because of their attraction may mislead people to populism, voilence, crime etc., Libraries are centres of peace and harmony.

8.8 LET US SUM UP

Both libraries and mass media provide information to their readers, listeners and viewers. The information available in the libraries is in the form of books, periodicals and other documents. This is mostly print media at present. This information could be utilised only by the literates, whereas the information through Radio, T.V. and cinema even illiterates can obtain by listening and viewing them. Information provision through audio-visual media is direct, fast and reaches all people uniformly.

Libraries and Mass Media are essential for social development. Mass Media reaches to the places where libraries have not developed or available. Newspapers, Radio, T.V. and Cinema bring out latest information though their different types of programmes. Their information is topical and pinpointed. Their influence on people is phenomenal. Though there is criticism regarding the ill effects of T.V. and cinema, on children and students, still these media could be used effectively to develop interest and motivation for developmental activities.

Mass media can create interest and quest in people for further information. Libraries are the ultimate sources of information. Potential readers can be turned into regular readers by libraries reaching out to the people through their services. Hence mass media can supplement and complement the libraries but cannot replace them. Library materials are available on regular basis to borrow, whereas the Radio scripts, and T.V. programmes are not easily available after their slotted time for use.

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SARKAR, R.C.S. *The press in India.* New Delhi: S.Chand & Co, 1980.

SCHRAMM, Wilber (ed) *Mass Communications : A Book of selected Readings.* 2nd. ed. Urbana : University of Illinois Press, 1975.

SCHRAMM, Wilber. *Men, Messages and Media: A Look at Human Communication.* New York : Harper & Row, 1973.

8.10 ASSIGNMENTS

a) Compile a bibliography of books or articles published on Mass Media in English in India during 1990-1995.

b) Write an essay about cinema and its impact on society?

c) Describe the role of Radio Programmes in Rural Development?

8.11 RECOMMENDED BOOKS

1) AHUJA, B.N. *Theory and Practice of Journals* in 2nd. edn. Delhi: Surjeet Publications, 1984.

2) ARYA, Sunanda. *Mass Media and Public Opinion in India.* Jaipur : Printwell Publishers, 1989.

3) CHATTERJEE, R K. *Mass Communication.* New Delhi: National Book Trust, 1973.

4) LE MAHIEU, D L., *A Culture for Democracy : Mass communication and the cultivated Mind in Britain between the Wars.* Oxford: Clarendon press, 1988.

5) Mac SHANE, Denis. *Using the Media: How to deal with the press, television and radio.* London: Pluto press, 1979.

6) MEHTA, D.S. *Mass Communication and Journalism in India.* New Delhi: Allied Publishers Pvt Ltd. , 1979.

7) RAGHVAN, G.N.S. *The press in India: A New History.* New Delhi: Gyan Publishing House, 1994.

8) RENNING, Helge & LUNDBY, Knut (eds). *Media and communication: Readings in methodology, history and culture.* Norwegian University Press, 1991.

9) RIVERS, William L. *The Mass Media: Reporting, Writing and Editing.* Delhi: Universal Book Stall, 1967 (Indian reprint).

10) SCHRAMM, Wilbur. *Mass Media and National Development.* California: Stanford University Press, 1964.

11) SINGHAL, Arvind & ROGERS, Everett M. *India's Information Revolution.* New Delhi: Sage Publications, 1989.

12) SINGHA, Arvind K. *Mass Media and Rural Development.* New Delhi: Concept Publishing Company, 1985.

13) SNOW, Robert P. *Creating Media Culture.* Beverly Hills, Sage Publications, 1983.

14) SWINGEWOOD, Alan. *The Myth of Mass Culture.* London: The Macmillan Press, 1977.

15) WHALE, John. *The Politics of the Media.* Glasgow: Fontana, 1977.

8.12 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) What are different types of Mass Media and explain their growth in the twentieth century ?

2) Discuss the impact of Mass Media on the modern society ?

3) Explain the importance of Mass Media in Libraries as instruments of Information Dissemination ?

II. SHORT NOTES

a) What are the components of communication?

b) How are the Mass Media useful for rural development?

c) Briefly describe the Electronic Media?

d) State the development of Cinema in India as one of the Mass Media?

Appendix

Table : 1. *Number of Newspapers in 1993 According to Language & Periodicals*

Language	Dailies	Tri/bi weeklies	Weeklies	Fortnightlies	Monthlies	Quarterlies	Bi-monthlies Half-yearlies	Annuals	Total
English	256	18	637	496	216	1025	590	133	5316
Hindi	1674	107	6050	2012	2230	381	120	22	12596
Assamese	10	3	51	29	41	10	9	1	154
Bengali	80	11	503	376	582	360	116	8	2036
Gujarati	78	7	289	120	387	47	36	10	974
Kannada	203	5	289	173	395	34	15	2	1116
Kashmiri	0	0	1	0	0	0	0	0	1
Konkani	0	0	2	1	1	0	0	0	4
Malayalam	184	2	154	137	585	42	17	8	1129
Manipuri	10	0	3	5	3	3	2	0	26
Marathi	225	17	579	140	397	87	34	82	1561
Nepali	1	2	12	5	7	16	5	0	48
Oriya	46	2	84	57	224	73	18	4	508
Punjabi	79	15	296	63	204	25	17	1	700
Sanskrit	3	0	6	2	13	13	4	0	41
Sindhi	8	0	31	9	32	6	2	0	88
Tamil	297	34	324	193	578	23	9	2	1460
Telugu	87	2	206	138	336	20	6	1	796
Urdu	389	18	1022	297	437	44	14	3	2224
Bilingual	47	17	445	255	930	277	106	27	2104
Multilinguals	13	4	77	41	190	59	25	7	416
Others	50	11	75	22	104	44	8	0	314
	3,740	275	11,136	4,571	9,837	2,589	1,153		3 1 1
33,612									

(Source: *India 1995 A reference Annual.* New Delhi, Publication Division 1996. p278)

BLOCK-III : INFORMATION TRANSFER - MEDIA AND PROCESS

In Block-II you have learnt how information is generated and diffused. Information gets utilised when it passes through some media and reaches wider public or an individual or group of individuals.

In the present Block there are four units dealing with the different aspects of information transfer media and the process of such a transfer.

Traditionally information had been transferred through oral communication or through documents like books and journals. With advances in scientific research and technological changes more and more varieties of documents are being used for recording information. They are broadly classified as conventional documents and non-conventional documents.

In Unit-9 you will study about the conventional documents through print media which are further grouped as Primary, Secondary and Tertiary information Sources.

In Unit-10 the non-conventional media like microfiche, Audio-Visual materials, magnetic and optical media for information storage and transfer are discussed.

Unit-11 explains to you the agencies for information transfer like Authors, Publishers, LIbraries, Documentation and Information centers etc. However, there are certain other categories also such as Information Brokers/consultants, Invisible Colleges, Technological Gate keepers, media personnel etc. who actively engage themselves as information transfer agents.

In modern times communication technology is making such rapid strides that accurate information can be transferred with great speed across the geographical boundaries. Known as IT (Information Technology) the new technology is becoming a part and parcel of our lives. For librarians information scientists, scientific and technological researchers business and industry IT is becoming an indispensable tool for growth and development. In the last unit of this Block (Unit-12) you will gain an exposure to the basics of information technology and communication technology.

UNIT - 9 : INFORMATION TRANSFER MEDIA - CONVENTIONAL

Structure

9.0 AIMS AND OBJECTIVES

The aim of this unit is to introduce you to various conventional communication media like books, periodicals, abstracting and indexing periodicals, Government Publications, reports etc. It is true that you have studied about these sources of information in your B.L.I.Sc course.

The objective here is to explain their role as media through which information is transferred.

After studying this unit you should be able

- to describe the growth and development of information transfer media
- to recognise the role of primary communication media in scientific information transfer
- to know the importance of secondary communication media in information transfer process
- to recognise the importance of tertiary communication media in transmitting reference information

9.1 INTRODUCTION

In Block 1 of this course you have studied the way in which human being organizes the world of experience by transmitting the data gathered into signs and symbols, that is knowledge. These signs and symbols, according to agreed rules, have been communicated to one another. The human culture has played a major role in the communication process in the earliest times. The oral tradition was the mode of storage and transmission of information, for eg: The vedas, myths and legends etc. However the amount of information that can be transmitted in this method was limited and a need was felt to record human thought in a systematic way to ensure that information was made available permanently to any one who may need it.

During medieval period, there was a shift in modes of thought from memory to the written record. For long time documents for religious, secular and administrative purposes, legal reforms etc. were interpreted as records of storage, rather than for communication; while the spoken word of messengers sufficed for the ordinary business of the day. Later, the industrial revolution has provided the base for the growth of physical communication systems, that is, roads and railways. Due to these socio-economic changes, there was a change in the texture of thought and they laid the foundation for more recorded information, their storage and communications. This was the start of recorded/ non-verbal/formal communication.

In Unit 3 of this course, you have studied about verbal/non-verbal communication, communication process, theories and models of communication. Again in Unit 7, you have learnt about the role of communication, formal and informal communication, its nature and modes of communication etc. Thus you have gained sufficient knowledge on communication, its nature and modes. Now, you will learn about media of communication.

9.2 COMMUNICATION MEDIA

You have learnt earlier that the various channels of communications are called media. Recorded knowledge may be available in any one or more of the following physical media.

a) Print Media - Books, Journals and other printed documents.

b) Near Print Media - Computer Printouts, Mimeographed Multilithed or typed documents;

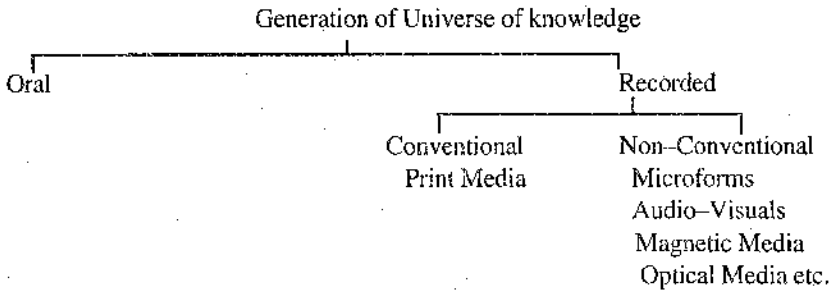
c) Graphic Media - Photographs, charts, drawings etc.

d) Microforms - Microfilm strips, reels or cartridges, microfiche, microcards, microprints of various sizes and reduction ratios.

e) Machine - readable media - magnetic tapes, discs, optical discs etc.

f) Teleprint - Telex, Fax, Satellite communication in print form etc.

The print media is called the conventional communication media. While the other non print types are called non-conventional media. In this unit, you will learn about conventional communication media. You will know more about non-conventional media in Unit 10 of this course.



The accumulation of graphic records created a social agency to preserve and arrange them for use. In other words, individuals cannot store the large quantities of information that is being generated and a corporate store is required i.e the library. The result is the 'golden chain of libraries' from Nineveh to the 'computerised libraries' of today. So, the libraries are the centres of recorded knowledge and memories accumulated by generations. Hence, as a library professional you ought to know about the types of recorded knowledge and the channels of their transmission.

9.3 CONVENTIONAL COMMUNICATION

Our civilization is an epitome of knowledge accumulated by the successive generations. To partake of it, we must need to get in touch with their thought. The only way to do this is to record the experiences, observations or generated knowledge on some physical media that can be transferable. Mankind, from the earlier times, have tried to preserve their thoughts, by recording them for the sake of future generations. For the purpose of recording, man has used a number of physical carriers or media. Scholars distinguished several stages in this process. According to Mac Garry1, the following stages are landmarks in the development of recorded communication media.

1) Cuneiform writings, 2) Hieroglyphics, 3) Development of alphabet, 4) Art of development of paper and 5) Gutenberg phase.

Thus, man has used a number of physical carriers like stone, clay, papyrus, parchment and vellum, palm leaves and birch bark, silk etc., to store and transmit knowledge. Each media has its own limitations and hence was replaced by another media. After the invention of paper in China in A.D.105, by Ts'ai Lun, it became a better communication media. Although the art of paper making was spread to all countries, the production of book was felt difficult until A.D. 1440, when Gutenburg invented printing from movable type. Consequent to the arrival of paper and printing, the publishing of documents, the recorded sources of human knowledge, increased.

9.3.1 Document

A document in print media is a record of work covering any one of the aspects of universe of knowledge that can be transported across space, and preserved through time. As early as in 1908, the International Institute of Bibliographers defined a document as "All that represents or expresses by means of graphic signs (writings, pictures, diagrams, charts, figures, symbols) and object, and idea or an impression. Printed texts (books, magazines, newspapers) today constitute the most numerous category of them".

9.3.2 Characteristics of Conventional Communication Media

Michael Buckland has 2 identified the following characteristcs of print/conventional media.

a) No special equipment is needed to read them

b) They are strictly localised. the reader must read a printed book, journal, pamphlet or map where the item is; the reader must go to the book or the book must be physically transported to the reader.

c) Information on paper does not lend itself to simultaneous viewing by two or more people; either another copy must be found or users must take turns.

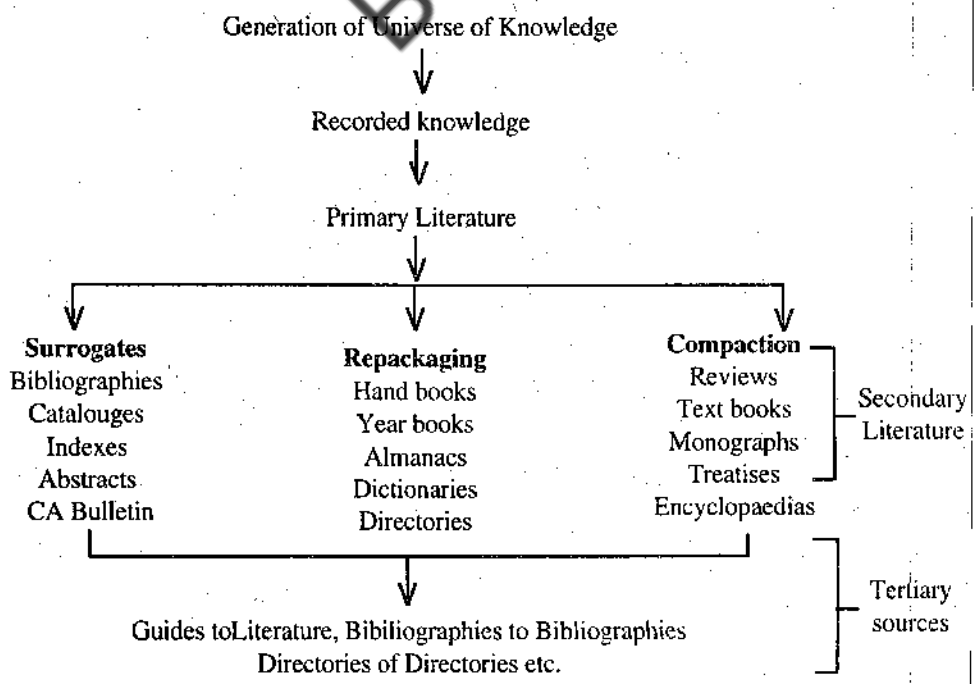
d) The conventional media on paper are bought and made available without charge. They are bought at a one-time cost as an investment, the cost is not passed on to the reader.

9.4 TYPES OF CONVENTIONAL MEDIA

As you know, the documents are available on various forms such as books, journals, government publications, reports, patents, standards, maps, atlases etc. The documents have been classified by Dr. S.R.Ranganathan as conventional, Neo-conventional, Non-conventional and meta documents. Harison and Grogan classified them as three main categories - Primary, Secondary and Tertiary. *The Encyclopedia of Library and Information Science* has illustrated the structure of communication media as follows:

I. Illustration:

Aids to formal communication: The formal aids to communication, thus, can be categorized as Primary, Secondary and Tertiary media.



9.4.1 Primary Communication Media

The scientific innovations can be communicated by two means a) in the initial stages informal means and b) at the advanced or completed stage through formal means. The research activities and findings can be recorded and communicated in a variety of formal communication channels, such as journals, conference papers, dissertations, technical reports etc. The preliminary communication forms the earliest contribution to the existing body of knowledge and disseminates nascent thoughts on on-going research to the community at large. New concepts are recorded and communicated through this media.

Harrod's *Librarian's Glossory* defines a primary source as "Original manuscripts, contemporary records, or documents which are used by an author in writing a book or other literary compilations" and a primary publication as "a publication which contains mainly original (new) matter, eg. papers describing the results of original research"

According to Subrahmanyam4 the following list represents the wide range of formats available for communicating primary scientific information.

a) Lab note books, diaries, notes, medical records

b) Personal correspondence

c) Videotapes of experiments and surgical operations

d) Graphs, charts and tables, usually machine generated during experiments

e) Transcripts, and audio-visual tapes of lectures and discussions

f) Internal research reports, memoranda, company files

g) Patent specifications

h) Computer programs

i) Letters to the editor or short communications in journals

j) Preliminary communication in 'letters' journals

k) Pre-prints or reprints of conference papers

l) Conference proceedings

m) Technical reports

n) Theses and dissertations

o) Journal articles, pre-prints and reprints

p) News letters

q) House organs

r) Standards, specifications, codes of practice

s) Trade literature

You have studied about these media in detail as primary information sources in your BLISc Course. Here, few more important primary sources as communication media will be described.

i) Periodicals and Serials

The ISO standard 3297 defines a serial as " a publication, in printed form or not, issued in successive parts, usually having numerical or chronological designations and intended to be continued indefinitely". Thus the term serial encompasses an extremely wide range of 'material including journals, news letters, news papers, technical and research reports, annuals, national and international government publications.

Harrod's Librarian's Glossary defines a periodical as" a publication with a distinctive title which appears at stated or regular intervals without prior decision as to when the last issue shall appear. It contains articles, stories, or other writings by several contributors".

Periodicals transmit current information and keep the users abreast of the latest technical developments and fundamental research. Some of the periodicals are highly specialised in nature and are the only sources to provide access to such literature and keep their knowledge update.

For eg. IEEE SPECTRUM Published by the Institute of Electrical and Electronics Engineers, Inc., USA.

There are also general periodicals suitable to the age and intelligence of the readers. Eg. Scientific American, Computers Today, Competition Success Review.

The value of periodicals lies in its currency. They convey the results of laboratory research immediately. They provide access to ideas brought out after laboratory testing and have productive applications. The major features of periodicals can be summarised as:

a) It is an official public record of science disseminating what has been achieved and what is in progress

b) The nature of periodicals stimulates its use; its subject range helps the reader to scan, browse or read

c) It sets priorities in discovery and records the achievements

d) It acts as a reviewing medium annexing the new publications in a particular field.

Eg. British Medical Journal Annals of Library Science and Documentation.

ii) Conference Proceedings

Conferences are forums for the communication of scientific information. The scientist/ author presents a paper at a conference. Such presentation will be brought out as conference proceedings which constitute another important type of communication media to communicate current scientific innovations. The media used to communicate the proceedings may be in any of the following formats:

a) Part of a Journal

b) Proceedings with a distinct title in the form of a monograph

c) Proceedings in the form of report series

Further, as medium of communication, conferences have an advantage for informal communication through discussions, comments and criticism by participants.

Eg: 37th A.P.Library Conference on Contemporary Issues in the field of Library and Information Science 19-21 May, 1995, Anantapur.

iii) Patent Specifications

The patents are one of the formal recorded media through which the scientists and researchers communicate the preliminary findings of their research endeavours and secure the proprietary interests of their discoveries. Generally, the kind of primary literature is published by patent office and is a detailed description of the invention written or drawn by the inventor himself. The basic characteristics of patents can be summarised as:

a) It is in the only primary communication media that contains technological information.

b) They disclose information on practical application of the discoveries.

c) They include information on technological terms.

iv) Standards

Standards are technical specifications containing a set of conditions to be fulfilled. They may be issued by companies, associations or groups, government departments, national, regional and international standards bodies. A standard communicates the consolidated results of science, technology and experience aimed at the promotion of optimum community benefits.

According to American Standards Association, Standard is a " concise statement of the requirements for a material, process, method, procedure by which it can be determined that the conditions are met within the tolerance specified on the statement; a specification does not have to cover specifically recurring subjects or defects of wide use or even existing defects".

The characteristics of standards may be summarised as follows:

a) Due to rapid progress in technology, a standard may become obsolete very soon. Hence it has life for a limited period.

b) Standards are dynamic and not static and always communicate information about operation or testing materials.

Eg: Indian Standard Code of Practice for Library lighting. New Delhi: I.S.I, 1966.

v) Government Publications

In a democratic country, the people's active participation in the polity determines the development of the country. Hence the publications of government has a larger scope. Generally,

print media is the best for communicating information on activities of government to reach the concerned classes of society like farmers, industrialists, labourers, educationists and so on. These may be issued by local, state / provincial and national bodies as regular publications or technical reports.

Mohinder Singh 5 has stated that " the nature and contents of Government Publications correspond to the nature and functions of the issuing agencies. They may be broadly categorized as administrative reports; Statistical reports; Commission or Committee reports; research reports; bills, acts, Law codes etc.; Law reports; Digests, Records of proceedings; Rules and Regulations; Information publications; Propaganda Literature; Periodicals; Maps & charts; Lists of Bibliographies".

The Government publications possess the following characteristics:

a) They may be published or mimeographed.

b) Intended for public communication or may be 'classified' i.e., the degree of secrecy prevents their communication to general public.

c) They are the primary and authentic record of legislative judiciary and government itself.

Eg: *Education for National Development* (Chairman: D.S.Kothari). New Delhi: Manager of Publication, 1967.

vi) Reports Literature

The Harrod's Librarian's Glossary and reference Book defines Report as " A general term which includes reports of some kinds which give the results of research or development work, and which are associated with the name of the sponsor within the numbered sequence".

The publication may include technical notes and memoranda, preprints, research and development reports, and formal reports like institutional reports, committee reports, topical reports etc. However, research reports are much more important as primary communication media. Dissertations for academic degree and technical reports from private and public undertaking companies doing research constitute a sizable fraction of primary communication media. Usually unpublished, and sometimes 'classified', these reports communicate the results of research at universities, Research institutes and R & D wings of industries. United States Government is the world's largest producer of research reports.

The Reports Literature incorporates the following characteristics:

a) Rapid dissemination, as they are unpublished and communicated immediately for peer group review, for application and to avoid duplication of research.

b) They are not intended for circulation and sometimes they may be classified.

c) They may tend to be longer than periodical article with more details of research.

d) They are generally provided with a serial number.

Eg: *Online Access to International Databases; Feasibility Report* (May,1986). New Delhi: CMC Limited, 1986.

9.4.2 Secondary Communication Media

The primary sources of information has exponential growth and scattered in a diverse variety of sources published through out the world. The current developments of research in any field depends on existing knowledge base. As identification of the primary literature becomes complex, secondary sources emerged to facilitate the identification and selection of pertinent documents appropriate for a given purpose.

Harrod's Librarian's Glossary defines a Secondary Source as "Book or unpublished literary material in the compilation of which primary sources have been used" and a secondary publication as "A Document such as an abstract, digest, index to periodicals, current awareness journal, or popularization, which is prepared to disseminate more widely information which has already appeared in another form, particularly a primary publication".

Thus the secondary sources are derived from primary publications by the process of surrogates, repackaging and condensation.

I. Surrogate Type

i) Indexes and Abstracts:

The massive investment in 'big science' after the Second World war helped to encourage what many regarded as an inflation in the number of journals, firstly in science and technology and then in social and behavioural sciences. The more journals there are to scan and read, the greater the danger of missing vital information. Hence to provide a key to their contents, which will keep the researcher abreast of current information and save valuable reading time, indexing and abstracting periodicals have been published. These are two major document analysis tools and are corner-stones of secondary communication.

The value of indexes and abstracts is their ability to substitute or surrogate for the primary literature. They act as guides to original literature.

a) Indexes:

J.E.Rowley 6 defined indexes as " an organised series of access points which lead from information known to the user to additional previously unknown information ".

Periodical indexing was the brainchild of W.F.Poole who attempted a comprehensive index to the periodicals of 19th century. These communication media take a number of journals, usually within a subject, and group the published articles under broad subject headings.

The main characteristics of Indexes are:

a) They provide description of a document of information usually in accepted format or style.

b) They help the user to be able to retrieve the records of documents that have been stored and organised.

c) Index terms are used as access points.

d) Helps to overcome the barrier of ' Information Explosion' and facilitates easy communication. **Eg:** *Index Medicus* / National Library of Medicine. Bethesda: U.S.A.

b) Abstracts:

J.E.Rowley7 defined " An abstract is a concise and accurate representation of original document ". The approach is for the preparation of a document abridgement or surrogate. There are different approaches for the purpose like annotation, extract, summary, abridgement etc. In other words, the writings are condensed meaningfully, so that, a part may stand for the whole. The summaries are accompanied by adequate bibliographical description to enable the article to be traced and are frequently arranged in classified order.

As you are aware, there are several types of abstracts, among which information abstracts, summarize the core arguments, giving the main data and providing the reader with an abridged form of the original. There are now more than 1,500 abstracting journals, published in almost all subjects.

The main characteristics of Abstracts are:

a) They communicate the immense bulk of the world's literature in manageable form.

b) They lessen the economic problem, language problem, exercise specialization and save about 90% of the time required to read the original work.

c) Help the reader to keep uptodate in a much wider field.

Eg. *Chemical Abstracts.* American Chemical Society, *Library & Information Science Abstracts* / Library Association, London.

Thus the abstracting and indexing periodicals, communicate the information and provide access to the user to a much wider field of knowledge than he can get from his own library's restricted collection. They form an essential tool in the preliminary stages of any research.

ii) Bibliographies and Catalogues:

The retrospective as well as current bibliographies and catalogues have an immense role as communication media. Generally, current bibliographies are serial publications, published at specified periodical intervals.

When cumulated these will become retrospective bibliographies. These Bibliographies have a broad scope encompassing almost all disciplines in the universe of knowledge.

The characteristics of Bibliographies can be summarised as:

They helps one

a) to obtain information on the books and other materials available in a given subject,

b) to find out the basic and best books on a subject.

Catalogues reveal to the user the holdings of a library or in a particular region or at a national level on a particular subject. The catalogue serves as a tool to maintain a record of published literature and to provide access to the same.

Eg: *Indian National Bibliography* / Central Reference Library. Calcutta: National Library.

Library of Congress catalogues. Washington (DC): Library of Congress.

National Union Catalog. Washington(DC), Library of Congress, 1956.

II. Repackaging Type

i) Dictionaries:

As most commonly used reference books, dictionaries communicate the standard and specialised terminology of a language or subject, with varying scope and level. Some are exhaustive in their coverage while others simple. The special purpose dictionaries facilitate communication in specialized areas like signs and symbols, chemical synonyms, trade names etc.

Eg: *The Random House Dictionary of English Language*. New York: Random House Inc., 1987.

ii) Biographical Literature:

The biographical literature forms an important media to communicate information about the persons and their contributions. Especially in science, it facilitates personal communication among living scientists and propagates advancements of science. The information may range from the address, telephone number or biodata and publications of a person.

Eg: *Who is Who in the World,* 8th ed. Chicago: *Who's Who India.*, 1987.

iii) Directories:

As you know, directories are lists of companies, institutions, government organisations, products, services and individuals. They communicate factual information and are used as guides to primary information.

Eg: *Times of India - Directory and Yearbook.* Universities - Handbook - India. Delhi: Association of Indian Universities, 1992.

iv) Yearbooks and Almanacs:

These are the compendiums of useful data and statistics relating to countries, personalities, events, subjects and the like. They are the media that communicate important events in chronological order, summaries of political, social and cultural events of the year, major trends in scientific and technological fields, biographies and statistical data about different fields.

Eg: *India - A Reference Annual. Europa Year book.*

v) Handbooks and Manuals:

These are the compilations of information of various types in a compact and handy form. They communicate data, tables, graphs, illustrations, formulae, factual information etc. The data is useful for scientists, technologists or practitioners. **Eg:** *Engineering and Mathematics Hand Book.*

III. Compaction Type

i) Books

Books are the secondary sources of compaction type. Information is provided in it in a compact form in an orderly manner. For this information is gathered from various primary sources. The book is the most powerful medium which has played a pivotal role in the transmission of scientific, technological, social, cultural, economic, political, religious information. Born out of desire to record and share human experience, books are marvels of wisdom. It has been a convenient mode of preserving facts and ideas and conveying the same to millions of readers.

After a long history of changing patterns, starting from clay tablets to the present book on printed paper it has stayed for quite a long time with its tremendous growth rate. According to Verner Clapp " the world publication has been doubling every forty years during the last five centuries".8 This indicates the importance of a book as transmission media by reaching a large audience.

T.K.S.Iyengar[9] has described the following advantages of the book as information transfer media:

a) portable

b) will survive most environments, although life depends on quality of paper, binding etc.

c) can be read without intermediate equipment

d) can be read at convenience i.e in an arms chair, at a desk, in the bed, or wherever convenient.

e) can be used by several people, simultaneously, as a number of copies can be made available.

f) can be scanned to judge the coverage and to review the plan of the book.

g) diagrams and illustrations can be used to amplify and elucidate points.

h) can be a work of art, with both a tactile and visual appeal.

Thus, through ages, books have been established as the cheapest and easy way of storing and communicating knowledge. In general books are considered as secondary communication media. However, some of the reference sources like Bibliographies of Bibliographies, Directories of Directories, Union Catalogues etc. are categorised as tertiary sources.

ii) Reviews

"A review is actually a narrative account of the progress of a particular field of study prepared by an expert in the field. The essential information characteristics of a review is that it shifts, evaluates and puts each significant contribution into its proper perspective".10

With the increasing magnitude and specialisation of knowledge, it has become imperative to devise new techniques for retrieval of relevant information. Further because of voluminous

publications, the user cannot read all the articles and digest the contents. The reviews of progress are of immense value under such circumstances. They provide a pathway in the chaos caused by proliferated literature.

Many of the reviews of progress are published annually and bring out the significant contributions on a subject to the attention of the reader in an easily comprehensible manner. Thus they replace many primary articles and reader would need to study only one article in the place of many.

Eg: *Annual Review of Information Science and Technology. Advances in Astronautical Sciences,Progress in Astro nautics.*

iii) Encyclopaedias:

The encyclopaedias, no matter general or subject, transmit comprehensive survey articles; often with bibliographies, in various branches of knowledge. They provide brief informational data on persons, geographical locations, historical events also and with this scope are used as reference sources.

Eg: *Encyclopaedia Britannica McGraw Hill Encyclopaedia of Science and Technology.*

9.4.3 Tertiary Communication Media

The Tertiary media list the secondary sources. Their function is to help the researcher in retrieving the secondary sources and from there to get access to primary information. The guides to bibliographical sources, bibliographies of bibliographies, directories of directories etc. are included in this category. However, the tertiary media are more useful as reference and book selection tools than effective communication media, as they do not carry the original information and are of delayed publication.

9.5 LET US SUM UP

Man wanted to record information for the purpose of communication, on a permanent medium, to reach larger groups. Hence he started to record information in a form external to his memory i.e., on some physical formats as a means of communicating with others. As each new storage medium was developed, it eventually contributed to the multiplication of data and to the greater availability of recorded information.

As a means of communication the book has monopolised for centuries, followed by the periodical and other forms of communication media which make available more information for use. The more information there is available for use, the more new information is likely to be generated.

This increased communication through primary media has necessitated to adopt new media for gaining access. Thus, the secondary sources like abstracting and indexing periodicals have emerged to communicate secondary information. The increase in the publication of these secondary communication medium has led to a further need for tertiary communication media. These three types of media on conventional print format play a vital role in communicating generated information to the user, thus facilitating maximum utilization of information.

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9.7 ASSIGNMENT

1) Describe diagrammatically how the generated knowledge has been recorded on various media.

2) What are the characteristics of conventional communication media ? Describe the role of primary media in transmitting scientific and technological information.

9.8 RECOMMENDED BOOKS

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9.9 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Trace out the role of secondary periodicals in the communication of information.

2) Explain the concept 'Conventional communication media'. Elucidate various types of conventional media.

II. SHORT NOTES

a) Periodicals and Serials

b) Standards

c) Reports Literature

d) Reviews

e) Patent Specifications

UNIT - 10 : INFORMATION TRANSFER MEDIA - NON-CONVENTIONAL

Structure

10.0 AIMS AND OBJECTIVES

The aim of this unit is to introduce you to various non-conventional media, that facilitate communication at global level with great speed and accuracy that suits the present day information environment.

After studying this unit you should be able to

- describe the development of non-conventional media as supplement to conventional media
- explain the role of audio-visual media in information transfer process
- be aware of the micro media, their types and characteristics, as information transfer media
- know about the electronic media, their development and the emerging trends.
- differentiate non-conventional media from conventional media.

10.1 INTRODUCTION

In Unit 9 of this course, you have studied about the concept of conventional and non-conventional communication media. You have studied how one system of communication begins to influence another, in transmitting scholarly communication, which has led to the development of various printed formats of communication media.

You have also learnt, how in the traditional system of scholarly communication, print/ conventional media has played a significant role. In the present information society, how we live, work, prosper and relate to others is largely a function of information transfer. Hence, radical changes occurred in traditional mode. During the 1960s there was a tremendous change in the range and complexity of physical formats used to record and communicate information. The meaning of document was enlarged even further to embrace what are known as non-conventional/non-print/non-book materials.

In the present day information environment, we may have to expand the definition of a document defined under Sec 9.3.1 of Unit 9 of this course. Subsequent to technological development, a document may be defined, according to Mc Garry (1), as " any concrete or symbolic sign preserved or recorded for the purpose of proving or constructing an intellectual phenomenon. In the genuine sense it is material of any kind regardless of its form and characteristics and upon which information has been recorded".

From the 1960s onwards there has been a need to compress the space in which it is stored because of the enormous growth of information. Such compression must be accompanied by the ability to find relevant items of information quickly, so the accompanying need is to develop fast search and access systems. To meet this demand, the non-conventional formats paved their way as communication medium.

These media came in every kind of form and in all shapes and sizes. The adjective non-conventional is meant to embrace both equipment and non-equipment types of innovations embodying new subject matter. It emphasizes the broadness over the terms automated or mechanized. The use of these communication media makes it possible to transmit even greater amounts of information, and has the potential to revolutionize library service. None-the-less, the rate of change in the media of storage and retrieval directly affects librarians and

information workers. Librarians of the present times, like you, have to cope with a variety of non-conventional communication and storage media.

10..2 NON-CONVENTIONAL COMMUNICATION MEDIA (NCM)

Non-conventional documents are records in non-conventional size, shape or material. Audios, visuals, audio-visuals, microforms, databases etc. are included in this category. The term is used for those media which do not come under conventional print media and which require special handling.

10.2.1 Historical Development

The developments in non-conventional media is the result of inventions of the late 19th and 20th centuries. For eg. the true beginning of photography took place in 1841. In 1839 John Bejamin Dancer invented first micro-photography. The sound recordings were patented by Thomas Alva Edison in 1877, while the sound tape was first developed by Valdemar Poulsen using a wire magnetic recorder. The development of first electronic computer ENIAC (1945) and its further generation has led to the development of many new communication and storage media, like magnetic, optical and hypermedia, during the 1970s and the 80s. The optical storage systems have been invented first in 1972 by MCA and IBM DISCO vision. The 1990s have witnessed the sophistication in the format, equipment and use patterns of these media.

Thus the inclusion of non-conventional media in library's collection is a 20th century phenomenon. In USA, the public libraries were the first to include these media in their collections, as early as the 1940s. However in India, these media are often found in special libraries followed by academic libraries. Recent improvements in telecommunications made it possible for all the broadcasts, mail, transactions and publications to be conducted electronically.

10.2.2 Characteristics of Non-Conventional Media

The general characteristics of non-conventional media are as follows:

a) The media appeal to the sight and hearing of the user

b) Generally, the media require additional equipment for usage

c) The media may be unilateral insofar as the user is only a receiver or may be interactive as in the case of electronic data bases

d) The cost of acquisition and storing of the media is generally lower than the print media

e) The time required to produce and distribute them is lesser than print

f) As storage systems, they can accommodate more information in a smaller space

g) They require less shelving space for their organization in the libraries

h) They were not easily browsable and most important of all, they lack bibliographical control

i) They are not covered under the law of legal deposit

j) They have increased longevity, if properly secured and preserved

k) These are more localized communication media, as their use depend on equipment

10.2.3 Uses of Non-Conventional Media (NCM)

The NCM can be applied for communication of information in a variety of ways. According to Fothergil and Butchart2 the uses of NCM, can be summarised as :

a) The audio-visual expenses are close to the way in which people learn about their environments and interpersonal relationships. These are the channels through which information is expected for efficient mental processing and the development of understanding.

b) The microforms can carry information more concisely and directly than the printed words in a books.

c) Because there are generally fewer imaginative requirements in mental transaction, the information communicated is less ambiguous and the comprehension is quicker and more complete.

d) Computer programs are more interesting and memorable as they require participation and responses from their users; conveyed through the latest communication techno-logies, they provide access to global information online.

e) The appearance of CD-ROMs and other optical formats of video storage have introduced further possibilities of interaction with databases and images.

f) These media can be used either independently or collectively as kits.

10.2.4 Application of Non-Conventional Media

The application of NCM are wide-ranging. In the beginning they have been used to cover general information and entertainment programmes, for eg: movie films, audio cassettes, video cassettes for movies etc. However, now they are applied to record and communicate scholarly scientific information. The applications can be summarised as:

i) The NCM are frequently used as a means of recording information and events, both for immediate analysis and as historical archives. Hence are used for correct and retrospective reaches.

ii) News and events of all kinds are captured through such media to keep a record.

iii) The emergence of information technology and computer based systems have created major changes in storage and communication of information. Exchange and movement of information is increasingly being undertaken by cable, microwave, satellite; the outputs are electronic and sometimes paper print outs.

iv) The microforms are used to miniaturize the information store and thus secure space.

10.3 TYPES OF NON-CONVENTIONAL MEDIA

The NCM encompasses a variety of physical formats. They can be broadly grouped, based on the relevant characteristics, into three groups:

1) Audio-visual Media
2) Microform Media
3) Electronic Media

These three types are further divisible into specific types. In the following paragraphs you will be learning more about each type.

10.3.1 Audio-Visual Media

Audio-visual materials were originally used for recreational purposes and to supplement textbook teaching. Now, they are no longer considered extra or addition but form a significant part of all areas of learning. Now there are few libraries without audio-visual materials, in their collections. " There are audio-visual materials in all subjects fields. These are essential in art and music appreciation courses and in language courses; they will enhance the study of drama, literature and history; they are useful in all the social sciences and in the pure and applied sciences."3 Thus, the availability of so many science, historical and art packages makes them to have a significant place as communication media.

i) Characteristics of Audio-Visual Media:

a) Audio-Visual media require equipment for projection of information.

b) They are available in all subjects, especially as part of educational technology / teaching aids.

c) They need less storage space.

d) They require special preservation programmes.

e) Their use is preferred due to the low cost of storage and retrieval.

ii) Types of Audio-Visual Media:

The Audio-Visual media can be further divided into three types:

Audio : includes sound or audio recordings like phonograph discs, audio tapes, audio cassettes or cartridges.

Eg: Audio cassettes and sound recordings used for music

Visual: Includes still images like slides, film strips, transparencies, wall charts, charts, drawings etc. and moving images like silent movies etc.

Eg : Advertisement slides, micro films etc.

Audio-Visual: These are visual images with sound like video movies, sound films etc.

iii) Equipment:

There are revolutionary changes in audio-visual technology and equipment. The chief audio-visual equipments or 'hardware' used for the purpose are slide/film projectors, audio players/recorders, video players/recorders etc.

All of the equipment has been extensively used for a number of years and there have been few major changes in these traditional formats. The greatest area of development in A/v technology is video. This format has great potential as a tool for storage and retrieval of information for study for eg. you may be watching the UGC and IGNOU educational programmes on Doordarshan. These are used to illustrate, clarify and support oral lectures.

TABLE

MEDIA	EQUIPMENT
Slides	Slide projector
Transparencies	Over Head Projector
Film Strips	Film projector
Audio Cassettes	Audio record player
Sound Recordings	Audio record player
Video cassettes	Visual cassette recorder/player

10.3.2 Microforms

Microform is the name given to any micro photographically produced printed matter. The first major programmes of microfilming began with newspapers in the 1930s. Use of microforms increased greatly in the 1970s, as microfische were introduced to disseminate technical reports and other information. For eg. in 1970 books in English were produced on microfische. Microforms represent a significant departure from paper. These were a start in the process of miniaturization, by reducing the bulk of paper based media, obviating the problem of paper decay.

i) Characteristics of Microform Media:

The basic characteristics of microforms are as follows:

a) Special equipment is needed to store and read them, called microprinters and microform readers respectively.

b) These are more localized than paper as there is a need for the microform, and user and equipment should be at one place.

c) Low cost of acquiring and storing makes them a reasonable choice for some sorts of information.

d) They are easily transportable with less cost and time.

e) Copies are less convenient to make.

f) The microforms are not very comfortable for extensive reading, as they cause visual strains.

ii) Types of Microforms:

Microforms may have different configurations, but one is developed on polyester base material. The image is created in the layer of emulsion attached to the polyester-base by chemical response to light and is fixed there by processing with other chemicals. Some microforms are produced on non-photographic film, usually a diazofilm. However, the base is a polyester plastic film with the diazo dyes attached to it. In spite of similar processing techniques, the microforms can be categorized into different configurations based on their format structure, reduction ratio, equipment required etc. Forthergil and Butchwart4 described them as follows:

Microfilm : It is a photographic record, on a reduced scale, that carried printed material 35mm, 16mm roll film, an open reel in cassette or cartridge format, which you might have seen in cine-mode, are the general formats.

Aperture cards : are pieces of card with a window into which the microfilm is inserted, usually 187 x 82 mm. A microcard is a micrographic reproduction of printed material on standard size 3" x5" catalogue cards and contains upto 80 pages of print material.

Microfische : It is a 4" x 6" film card which contains rows of micro images of pages or other print material, arranged in a grid formation on a transparent film, 148 x 105 mm. The number of frames may be varied with the reduction ratio used, but the standards are 60 and 98 frame formats or pages using a reduction ratio of 24x from the original. COM fiche is 270 frame format with a reduction ratio of 48x.

Ultrafiche with reduction ratio of 150x are also used for particular business or unique purposes.

All microforms must be read with the aid of an optical device which will enlarge the micrographic image. Because of the reduction of the original to miniaturization, magnification is required using lens. Such an arrangement is called projection.

iii) Equipment :

The microform readers are very simple projections with few controls. Lamp brightness is usually fixed and movements in orientation of the image is possible using the control equipment. Most readers have the facility for changing lenses to give a variety of possible magnifications. The film may come in roll or a flat piece, the methods of enlarging and projecting it are essentially similar. There are separate readers for roll films and microfiche.

The film is either placed directly in the appropriate position between the lamp and lens or it is automatically threaded into the correct place. But a fiche is always inserted into the machine inside a carrier. Aperture cards can usually be read with equipment designed for microfiche, provided the carrier tray for the fiche is wide enough to accept the card.

MEDIA	EQUIPMENT
Microfilm/micro strips	Microfilm reader
Microfiche	Microfiche reader
Aperture Card	Microfiche reader with wide carrier tray.
COMfiche	Microfiche with 48 x lenses.
Ultrafiche	Microfiche with increase lense capacity.

The important point here is that the form is rigidly kept in position which may be done through a holding mechanism. Paper copies of individual frames of microforms can be obtained by using specially modified equipment called reader printers. The reader printer prints the image which is produced on the reading machine screen on a sheet of paper in a print that is easily read without the aid of any device.

Various methods of viewing film are direct viewing, direct viewing through magnifying lens, direct viewing by rear projection and indirect viewing. In essence, all film viewing and projecting systems operate in the same way i.e. placing the film between a lamp and a lens, within focal length, and viewing the images through magnifying glass. The size of the image is determined by the power of the lens.

10.3.3 Electronic Media

Libraries are evolved to provide access to information available either on paper or other formats. " The basic ideal behind the term 'accessibility' means to make information available, to remove any barriers to its dissemination and transfer; to provide the right information for the right user in the right way, at right time". To achieve this, a very powerful system of information coding and transfer is necessary. The one-to-many mode of communication has been enhanced by the development of printing; the audio-visual and microform also provide aural and visual one-to-many communication. The many-to-many mode of communication is helped by the electronic media.

The computers, communications, photography and other allied technologies have been blended to store maximum amount of information and to transfer it at a greater speed. Thus, electronic media entered the information transfer process with added advantages than a/v and microforms. The factors that necessitated the emergence and applicability of electronic media are:

a) It is virtually impossible for one library to contain all recorded data and information. Hence, resource sharing and networking, with the help of electronic media, are the need of the hour.

b) It became impossible to provide access to important material even in the most specialized fields, because of exponential growth of literature. The media that can store maximum amount of information is required.

c) As science grows, the level of specialization rises so high, leading to decreasing sub - specialisation or super-specialities. This results in intense communication difficulties. To avoid rediscovery in any subject, efficient retrieval system, using current technologies became a necessity.

d) The knowledge developed becomes obsolescent at a faster rate, unless it is communicated with great speed. Incidentally, the new scientific discoveries in the field of the satellite communication and other advanced technologies facilitate this.

Hence, the current technologies have been adopted to record and communicate information. In other words, the physical format to record and transmit information has become the electronic medium, a switch-over from print, a/v and microforms.

i) Characteristics of Electronic Media:

Mayer[6] has identified five characteristics of electronic media, that have a potential to bring about changes in information transfer. These are

a) They lead themselves to concentrated corporate ownership

b) They have global reach

c) They operate instantaneously

d) They are virtually unmonitorable

e) They are expensive

In addition to the above, there are general characteristics of electronic media which make their adoption more judicious.,

i) *Speed* : The computer works in nano and pico seconds, i.e.thousands of calculations can be performed within seconds using electronic media.

ii) *Storage* : The electronic media has vast storage capacity for the optical media has gigabyte storage capacity.

iii) *Resource Sharing* : The advent of electronic media helps in the implementation of resource sharing through networking.

iv) *Information transfer* : The convergence of computers and communication systems transmits data electronically to anywhere in the world and provides global access to information through online or CD-searches.

v) *Simultaneous operations* : The electronic media has made it possible to perform many functions simultaneously.

vi) *Equipment* : They require special equipment to read them. Computers and communication links form the basic equipment.

ii) Types of Electronic Media:

The electronic media, that helps in information storage and transmission in computerized environment can be further divided into three types.

1. Magnetic Media
2. Optical Media
3. Hyper Media

The following paragraphs give a brief presentation of these three types. However, you will be learning more about them as 'storage media' under Course O5.

10.3.4 Magnetic Media

The machine readable communication is generally through databases. The databases are records of information, may be a book, journal, abstract/index periodical, newspaper or an encyclopedia in the machine readable form on magnetic media. The databases, used in conjunction with computer allows storage, manipulation and retrieval of information. Secondly the equipment is used to gain access to databases for online search. In other words, the databases facilitate cooperative, shared provision for information in a timely and reliable manner. Generally, magnetic media is used as machine readable datafiles. These magnetic media can be of different types.

i) Characteristics of Magnetic Media:

a) Magnetic media are plastic polyester material coated with ferrous oxide.

b) They have high storage capacity. For eg: magnetic tape can store 40MB while magnetic disc can store 200 to 500 MB.

c) Magnetic tape offers sequential access to data while disc offers direct access.

d) It is a robust medium for transporting copies of files.

e) Unit costs of this medium are low.

ii) Types of Magnetic Media:

Magnetic tape : The tape is made of a polyester base with a layer of ferrous oxide and chromium. By magnetization and rearrangement of the magnetic fields, a message is recorded on the tape which can be read by a device. It is the same procedure as for our audio cassettes. The tape is wrapped around an open reel in a video cassette. The open reel is used widely for the preparation of master/originals in main frame computer. The reels are usually 3",5",7" or 10 1/2" in diameter.

Cassettes : are first patented by Philips in the 1960s as audio cassettes. You might be familiar with them. Later, they have been used to store digital information. The tape is

0.15" wide and magnetic coated surface is exposed. Tape for computers are generally shorter and the common lengths are c10, c12 and c15 i.e. their playing time. Digital audio tape cassettes are much smaller (7.2 x 5.4 x 1 cm) 2.8"x2.1"x0.4". They are available in 60, 90 and 120 minutes length.

Videotape : Almost all videotapes are made with chromium oxide as the magnetic coating. This coating is continuous from beginning to end. The video tape can also be used to record digital information for computer related equipment. But it is rarely done. Videotape is normally available as either open reel or in cassettes like the audio cassettes.

Magnetic Discs : These are used for recording digital data for computers. The discs are thin, circular plastic sheets, usually covered with ferric oxide, similar to tape. These are protected in card or plastic cover to secure the information as the density of information that is packed on to the recording surface is very high.

For eg. you might have seen a floppy disc that is used as auxiliary storage media in computer system.

Magnetic discs are used with computers as the backing store for recording information or data and programs. At present these are available in three sizes of 8", 5 1/4" and 3 1/2". The discs can be used with main, mini and micro computers. Usually a disc can store 300 MB of data. Another form of disc, about 2" in diameter, has been developed as a recording medium for still photographs. It can accommodate about 50 pictures per disc, playing being through a television set.

iii) Equipment:

The equipment for magnetic media are computers with tape or disc drives. Magnetic tapes are used in main frame computers while micro computers are needed for floppy discs. To store or retrieve information from the disc, the computer software packages are used.

10.3.5 Optical Media

In most library environments, the dual objectives are preserving library materials and providing frequent access to them. The conventional media creates problems to this contradictory functions. The Optic media best suitable to meet the objective. Theses are popularized as compact discs or CDs. The page images are preserved on digital optical discs. Both audio and visual images can be preserved on this media. The improvements in laser technology made them increasingly important. There are various configurations of optical media.

i) Characteristics of Optical Media:

The basic characteristics of Optical Media are:

a) They can carry substantial amounts of densely packed data. For eg: 600MB data can be stored.

b) They provide direct access to information.

c) They are considered practically indestructible.

d) The discs are accessed and stored by means of low-pow ered lasers.

e) The cost of storage on a digital optical disc is lower than that of storage on a magnetic disc.

f) New information cannot be added nor the stored information can be edited or erased from the master disc. This necessitates new discs to be issued to update the master disc, which becomes costly.

g) They are easily transportable, with less cost.

ii) Types of Optical media:

Forthergil and Butchwart7 categorize optical media as follows:

Laser Vision: These have been produced in two forms: Those carry a continuous moving picture of an hour's duration each side and without still picture facility; and those capable of carrying a continuous moving picture of 36 minutes duration each side, in which each frame is identifiable and capable of still picture control. Two audio channels, stereo and selected options are available in each. An extension of laser vision principle is known as Advanced Interactive Video (AIV).

CD-Audio : These are now very popular formats for distributing recordings of music. The discs are 12cm in diameter and 1.2mm thick and have a central hole of 15mm diameter. Recording is on one side and playing time is one hour. A smaller version of 8cm diameter is available and used for popular music.

CD-ROM : Compact Disk-Read Only Memory is similar in size and appearance to CD-audio. This disc is used to store information for retrieval through a computer and thus is entirely digital.

You might have heard about CD-ROMs or might have seen them also. These are plastic discs of 4.72" diameter on which 2,50,000 pages i.e 600 MB pages of text can be stored. The information on CD cannot be edited, erased or added; new discs are issued to update the master disc. The principal attraction of CD-ROM is that it is a relatively inexpensive method of storing, searching and retrieving large amounts of information, using a medium that is durable and highly transportable. The relatively long life time of CD-ROMs and the nature of digital storage has considerable advantages in comparison with magnetic media, for long-term archival storage purposes. WORM, (Write once Read Many times) and Erasable CD-ROMs are also available.

C D V : The 'v' stands for video. These discs are being prepared in a number of sizes, will carry audio in digital recording and video in analog. The sizes are 12cm carrying upto 6 minutes of video with sound and a further 20 minutes of audio. 20 cm carrying upto 20 minutes of audio and video on both sides and 30 cm carrying upto 60 minutes of audio & video on both sides are available.

Compact Disc Interactive (CDI) and Digital Video Interactive (DVI) are not yet available but research is on and expected.

iii) Equipment:

The equipment required for optical media are computers, CD-drives or CD-audio and Video players.

A CD-ROM is a self-contained system that consists of a computer, a special key board, a CD-ROM drive, a floppy disc and a printer. The laser technology enables to encode information on the disc as burnt pits on the disc's surface. This can be read by using a laser beam and the information is reproduced on computer screen.

Digital Video Disk (DVD)

Digital Video Disk (DVD) is a high density digital disk storing large quantities of digital video and audio data. It can store 4.7 gb of data enough for 133 minutes of high quality full-motion video, combined with multiple surround sound quality audio. The audio tracks allow consumers to choose audio track of their choice from several language tracks in which the movie dialogue is presented. The manufacturers also planning for second generation DVDs which can able to store upto 17 gb of data. As users can able to hook both the TV and PC systems upto a DVD player, it predicted that DVDs may wipe out videotape technology and replace current CD-ROMs and eventually hard disk drives in next few years.

10.3.6 Hyper Media and Hypertext

The terms hypertext, hyper documentation and hyper media are used synonymously though there are differences between these three. Ted Nelson in the 1960s had coined the word hypertext. Later the other modes emerged. Basically these are electronic databases or machine-readable full-text databases.

Hypertext is a non-sequential reading method for purely textual works.

Hypermedia are those that also include images and graphics.

According to Ted Nelson Hypertext is a non-linear, non-sequential text. A hypertext system allows users to link information such as words or sentences in one electronic document to related information in another document, thus creating trails through associated materials. It provides for the deposit, delivery and continuous revision of linked electronic documents, serving hundreds of millions of simultaneous users with hypertext, graphics, audio, movies and hypermedia.

Hypertext is a generic label for a cluster of technologies, for input, assembly, access, storage and retrieval. These technologies handle material, static or dynamic, in any medium, fixed or temporal. Its basic premise is freedom of movement inside and across texts. Hypertext database is the creation of a set of inter-nodal links that are intended to represent the relationship existing between objects.

The database includes :

a) a database structured in the form of network.

b) a retrieval mechanism that is navigational and browsing based.

Hypertext is proposed as an alternative medium to the publication and study of scholarly texts, which would provide a more helpful environment for the advanced study of imaginative literature.

i) Characteristics of Hypertext :

a) The medium depicts physical and logical networks of texts.

b) The structure of the document is flexible. Free movement into the text is possible.

c) It supports navigation through large databases.

d) It is useful in computer-aided learning.

ii) Equipment:

Computer is the basic equipment required for hypermedia. Hypermedia are the new technologies under way. Their success depends on consideration of physical and logical networks of cognitive issues in a full-text databases.

10.4 COMPARISON OF VARIOUS MEDIA OF COMMUNICATION

In Units 9 and 10 you have learnt about various conventional and non-conventional media of communication. The following table presents a comparative picture of these media.

Description	Print	A/V	Microforms	Electronic
1. Evolution	15th Century	19th Century	19th & 20th	20th Century
2. Storage Capacity	Optimum	Optimum	Optimum	Optimum
3. Space	More	Less	Less	Less
4. Cost	Expensive	In-expensive	In-expensive	Expensive
5. Access to Information	Direct	Sequential & Direct	Sequential & Direct	Sequential & Direct
6. Sharing of information	One at a time	One at a time	One at a time	Simultaneous
7. Global Access	Not instantaneous	Not instantaneous	Not instantaneous	Instantaneous
8. Time	Delayed	Delayed	Delayed	Real-time sharing
9. Equipment	Not required	Required	Required	Required

As indicated in the table, the relative advantages of one medium over the other leads to the switching over to the electronic media using current technologies.

10.5 LET US SUM UP

In this unit you have learnt about the non-conventional communication media. The essence of communication is to make available the generated information to the user. The conventional communication media are not able to cope with the contemporary information environment, characterized by exponential growth of literature, demand for speed and reliable information retrieval, demand for global access to information etc. Hence the non-conventional media have been developed. Whether it is audio-visual, microforms or electronic databases, the purpose is to provide access to potentially useful information.

The emerging information technologies provide opportunity to achieve this goal. New technologies will always be created. It is for the information professional to integrate them for information transfer and meet the needs of the users. For eg. The computer - mediated communication systems have brought in many advantages. They facilitate networking, online searching, CD-searches, E-Mail, Computer Conferencing, Teletex/Vediotext etc. and global access to information.

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10.7 ASSIGNMENTS

1) List out various audio-visual and microform media you have seen.

2) What are optical media. Describe various optical media.

10.8 RECOMMENDED BOOKS

FOTHERGILL and Butchart. *Non Book materials in libraries.* London: Clive-Bingley, 1990.

TEAGUE, S.J. *Microform, Video and electronic media librarian ship.* London: Bowher-Saun, 1985.

10.9 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Describe the advantages of electronic communication media over the other communications media.

2) Discuss how conventional media are distinguished from non-conventional. Which of the two media are more advantageous for the purpose of communication ?

II. SHORT NOTES

a) Microforms

b) Electronic media

c) CD-ROM

d) Optical media

e) Hypertext

UNIT-11 :AGENCIES OF INFORMATION TRANSFER

Structure

11.0 AIMS AND OBJECTIVES

The aim of this unit is to introduce you to various agencies involved in information transfer mechanism. The information that has been generated will be encoded in some medium-may be conventional or non-conventional - and transmitted to reach the use point. Various agencies are functioning in this transmit process.

After studying this unit you will be able to

- identify various agencies within the information transfer process
- explain the role of author as generator of information
- describe the role of publisher as primary distributor of information
- describe the role of secondary publishers as distributors of condensed or packaged information
- explain the role of libraries, information centres, documentation centres, data centres, information analysis centres in providing the user with access to information in any form on any format.

11.1 INTRODUCTION

According to Jessie and Shera (1) "Information both in the sense it is used by the biologists and in the sense we librarians use it is a fact. It is the stimulus we received through our senses. It may be an isolated fact or a whole cluster of facts; but it is still a unit; it is a unit of thought". The basic characteristics of information are:

i) *Information is Human:*

The information creation, communication and its use is by human.

ii) *Information is shareable:*

The information created by one can be shared by many.

iii) *Information is transferable:*

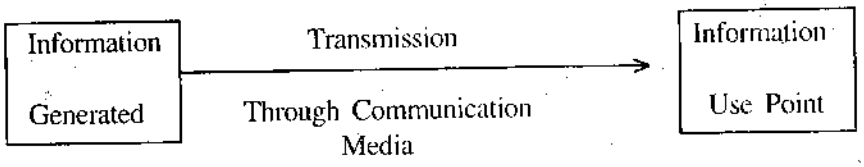
The intrinsic value of information lies in its transfer from generation point to use point.

We can further explain these characteristics as follows. Information activities do not occur in vacuum. They are organised into a structure of subjects, represented in a language, and elements of this structure are documentary recorded media, which are the vehicles of communication. The generated information will not attain its objective unless it reaches the use point and applied by the user for any task. For the purpose of the transfer, the information is being structured and represented in some communication medium.

Recall Units 9 and 10 where you have studied how human beings encode and structure the information through different media. In this unit, you will learn how the vehicles of information are being transmitted. Without transmission of information there is no science. Only when theory or discovery is either validated or invalidated by the scientific community, has the scientific development taken place and that is the process of information transfer.

11.2 INFORMATION TRANSFER

The process of transmission of information from generation point to the use point is called 'information transfer'. Simply, it can be represented as



Information Transfer can be defined as the process, in which the generated information, encoded in some form of communication medium is transmitted to the use point. Indeed, the value of information lies in its transfer. Unless it is successfully transferred from its generation point through its dissemination to destination, the value of information cannot he realized. Further, the value of information can be realized, if it is actively applied in decision making, research and developments, academic pursuits etc.

In the years following Word War II, society has become increasingly dependent on science and technology. Thus, we have witnessed their spectacular growth accompanied by significant increase in complexity and an equally significant fragmentation into disciplines and specialities. This has forced the recognition of the essential role of information transfer as a support and management function for science and technology.

11.2.1 Need for Information Transfer

Information, thus transferred, will contribute to -

- Strengthen the existing body of universe of knowledge.
- Bridges the lacunae that exist in the knowledge.
- Bridges the gap between generation and application.

The progress of the society depends as the growth of various fields like social, economic, political, cultural, education, science, technological, industrial etc. The transmission of information plays a vital role in the

- growth of knowledge and wisdom
- growth of research and innovations
- strengthening the science and technology
- education and training
- decision making

11.2.2 How to Achieve Information Transfer

After understanding about the concept and need for information transfer, you may find it interesting to know about the information transfer process. Information transfer can be achieved through various communication media, written or oral; formal or informal. The

society is moving from stone age through mechanical age to space age. In stone age, it was the oral communication; The print or hardcopy monopolised for long period. The spectacular technological progress, the rapid development of commercialization of electronics and tele communications has revolutionized the ways of transferring information and the technologies of data processing, storage and transmission on which the handling of information so heavily depends. This has facilitated the improvement of information process. Hence communication is an integral part of and essential link in information transfer. Nowadays, information transfer and information communication are used as synonyms. For eg. LISA uses both the terms as synonyms.

11.3 INFORMATION TRANSFER CYCLE

You have already learnt that communication means one mind effects another. The human mind has a quest for knowledge. He seeks information to satisfy this quest and after understanding he generates information to justify his thoughts and innovations. Hence the people, may be working, researching, teaching or managing etc. should be aware of the information generation and its flow. Access to generation is the 'ideal' for any discipline. There are different agencies that have a pivotal role in information transfer and thus provide access to information. It is a cyclic process that starts in humans as generators and culminates in the assimilation by them.

Guillion's report (2) *Into the information age: A perspective for Federal action on information* prepared for the consulting firm Arthur D Little Inc., USA, presents a historical perspective of information transfer pattern and institutional framework, and describes three basic modes of information transfer, each corresponding to a different value system. The three modes are :

i) Disciplinary information transfer - corresponding to the value system of pure science, academic and basic research, called Era I.

ii) Mission-oriented information transfer - corresponding to the value system of government sponsored missions called Era II.

iii) Problem oriented information transfer - corresponding to the value system of solving societal problem called Era III.

Keeping in view the contemporary changes, a fourth mode can also be added, that is,

iv) Individual - oriented customerised information services - corresponding to fee-based information services called Era IV Eg: DIALOG, BRS, SDC etc.

Further the report, while describing the development of information institutions in the USA, contends that the process of transfer of information consists of a chain of activities, the main links being generator, editor, publisher of primary publications, indexing and abstracting journal producers, libraries, documentation and information centres, online services, information companies and the end user.

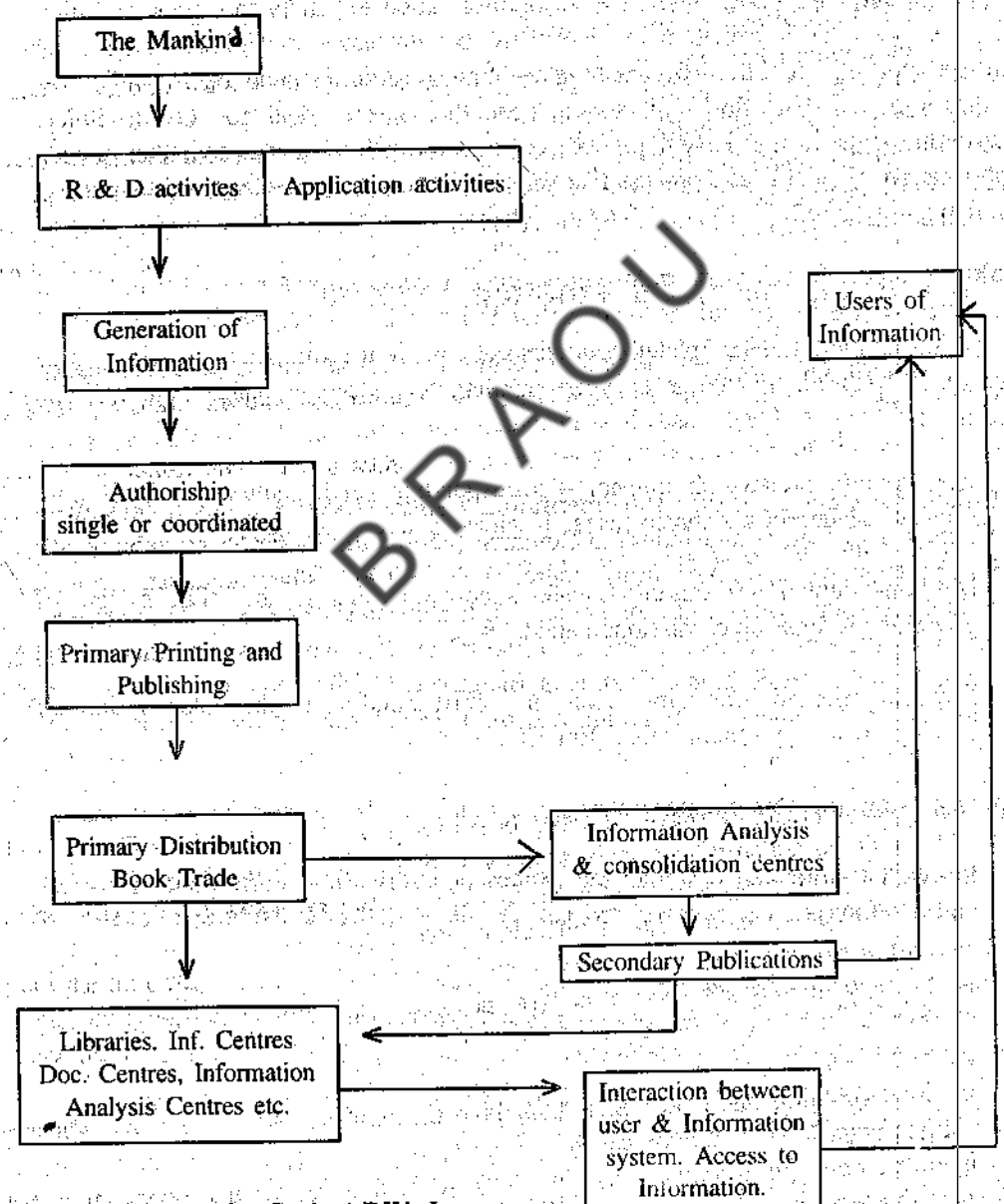
In other words, the institutions that are involved in information transfer process can be categorised as:

i) Knowledge generating institutions or individuals

ii) Knowledge publishers and distributors

iii) Institutions that collect, store, process and disseminate knowledge

Thus, the agencies of information transfer process can be diagrammatically represented as follows:



Source: Information Transfer Cycle / F.W. Lancaster)

The following components can be identified, from the above diagrams in an information transfer cycle.

i) Authorship

ii) Printing and Primary Publisher

iii) Primary Distributor

iv) Secondary Publisher and distributor

v) Libraries, Documentation centres, Information centres, Data Centres, Information Analysis Centres etc.

vi) Users of Information

Now we discuss each one of these components in detail in the following Section.

11.4 AGENTS OF INFORMATION TRANSFER

11.4.1 Authorship

In general, people want to communicate to share their ideas with the community; for eg. artist or writer share their creative works with the community. However, this activity is more significant in academic and research organisations. Scholars in all field document their work so that the unproved or proved hypotheses can be shared/used and improved upon by others. The documentation, thus, is an explicit expression of the principle of communication. All fields advance on similar basis.

An author is documenting his discovery, theory, interpretation, accumulation of facts etc. due to his motivation or drive for acceptance by the peer community. For it is through peer acceptance that the scientist or scholar achieves success and that knowledge advances. As it is commonly understood, peer review is the process, whereby authorities in a given field determine the validity and assess the relative significance of a particular contribution within that field. Hence, author tries to communicate in the formal process, either through printed or through informal channels. However, documentary media are more important as they reach wide audience trespassing geographical boundaries.

The authorship may be confined to a single scholar or group of scholars or specialists of the same field. Various types of learned societies are also producers of information principally through the expertise of their members, the professional societies, academic associations, and academics, technical associations, economic associations, humanitarian societies and industrial organisation generates information. Further, Government is an important segment of the national information infrastructure, that generates statistical, managerial, advertisement-routine, legislature, policy and decision papers, surveys, experts' reports etc., through its public service departments and undertakings.

Thus, as you have studied under the cataloguing course, the authorship may be single, collaborative or corporate, but the objective is to communicate the information generated at their point.

11.4.2 Primary Publication

Knowledge is the foundation on which society is built. The ability to disseminate knowledge, which is the primary task of a publisher, takes on a special significance. For cultural and ideological survival, every country has to depend on its publishing activities, as the publications are the mirrors of a nations's thought and culture. The concepts of universalisation of education and cultural renaissance have generated great thirst for knowledge and created an enormous demand for books. With the establishment of universities and research organisations, the demand for research level documents has also increased. As a consequence, a number of publishing houses have been established to meet the increasing demand for documents. The publishing field includes printing and publication activities.

i) Printing

The invention of printing press by Gutenberg heralded a major change in the life of man. It has paved the way for communication of knowledge, descending oral tradition and contributed to cultural renaissance. It has triggered off a literary explosion. Paperbacks have come a long way after their first launch by Allen Lane's reprint of quality writing and placed it between soft paper covers. This enterprise became 'Penguin Book'. Even today, a number of text books and scholarly works also appear in paperback editions. This has reduced the costs of production and increased the book buying market, thus facilitating more communication.

The printing technology has improved over means from the hot metal type casting machines for letter process. Further for the modernisation of printing industry, the frontline technologies have been adopted. Four colour offset machines, colour scanners, phototype setters etc. have been introduced. These technologies are being applied in the production of daily newspapers, weeklies and fortnightlies and other periodicals. For example, you might have seen that the Sunday magazine sections of newspapers are in colour. However the latest trend is for electronic publishing, that will be discussed in later sections of this unit. The latest developments in printing technology includes computer printing, electronic photography, specialist off-set lithoprinting etc. Thus, the printing technologies take up the first step in the massive information transfer process.

ii) Publishing

The citizen in a democracy has a right to read and it is society's obligation to ensure that every one has an opportunity to enjoy the benefits of sharing of information on all aspects of life. Further, man's knowledge has been revolutionized through passage of time. To keep abreast of the latest discoveries, on which the peoples lives and happiness depends upon, documents are the only sources, hence publishing of the documents plays a vital role in transfer of information. A publisher is someone whose business is to issue the written work of an author for sale to the public.

In the beginning the missionaries have started publishing educational and religious books in English and the national languages. After the advent of Engli[illegible]ducation, publishing in India was limited in its scope and was controlled by few multi-nation publishing houses through their representatives. Later "Indian Publishing has shown steep progress since the independence

of the country. India is among the eight largest book producing countries of the world and publishes books and journals in English and various Indian languages in a variety of subjects. It is credible on the part of Indian Book industry that it ranks 3rd after USA and UK in the production of English titles".(3)

Now, the Indian publishing is one of the top publishing industries in the world with its publications in 15 languages for educational and entertainment purpose. Like other industries of our country, publishing industry also has both public as well as private sector. Many departments of the Government of India and State governments have their own publishing units. We have the Publications Division within the Ministry of Information and Broadcasting. Then we have NCERT, NBT, Sahitya Academy, Grandh Academies in the states that have involved in publishing activity for the last four decades.

The university presses have started in 20th century. The private sector has also developed well and publishes books and magazines. For example., The Allied Publishers, UBS, IBH, Concept, Vikas, Sterling etc. have made a significant contribution in the transfer of generated information through their publications. "According to a rough estimate, there are over 11,000 book publishers in India, about 2,500 in Hindi language, about 1,700 in English and 1,400 in Bengali. The number of author-publishers is about 1,300 where as nearly 1,000 publishers are either government agencies or autonomous bodies"4 .

However, as far as university level documents are concerned, there is much dependence on the publishing industry abroad. India, being a developing country, depends much on developed nations like USA and UK for scientific and technological information and imports the same. There are efforts by Government and its agencies to encourage indigenous university level book publishing. For example, a number of programmes have been developed to encourage book publishing and thus facilitate transmission of information.

i) The NBT has started a 'scheme to subsidise university level books and reference books' since 1970.

ii) Ministry of Education, in cooperation with State governments launched in 1968 a massive programme to produce suitable standard books in Hindi and regional languages.

iii) Core Books Project in the Medical Sciences was envisaged by Government of India in 1970.

iv) UGC programme for preparation of university level books by Indian authors was initiated in 1970-71.

v) The Language Division of the Department of Education implements a scheme to provide financial assistance to voluntary Hindi organisations for promotion of Hindi. There are schemes for other languages also.

The Indian journals are generally publications of learned societies and associations of specific disciplines. At present there are several Indian journals published in public and private sectors. In addition to journals, the learned societies also publish monographs, treatises, research reports etc.

The emerging information technologies have an impact on publishing activities also, which has resulted in electronic publishing.

iii) Electronic Publishing

"Electronic publishing is the use of computers to facilitate production of printed products through photo composition and the use of computers and telecommunications system to distribute data to users electronically"(5). In other words, electronic publishing is the issuing of a written work by electronic means, particularly computers, either directly or over a communications network. Though the term ' electronic publishing' came into vogue in the 1980s, the roots of the electronic age in publishing can be traced back to the early 1960s, when computers were first used to drive photocomposition devices. This led to a period of transition in which computers were essentially used as devices to print indexing and abstracting publications, magazines and journals, certain types of reference books, catalogue cards etc.

The secondary publications were at the forefront of this development. Thus, the machine-readable database generated through this publishing operation were disseminated through off-line. A significant switch from off-line to online access occurred in the 1970s. This has increased the accessibility of databases and substantially decreased the cost of searching eg: MEDLINE. The period from 1960-80 can be regarded as one of transition from print-on-paper to electronic publishing. The period has witnessed the use of computers to print on paper; development of databases and their print equivalents; data bases only on machine readable formats.

During contemporary times, the connotation of electronic publishing is broader and includes electronic and optical publishing by computer-aided processes, by which information content is found, captured, shaped, stored in order to transmit it to chosen audience. The integrated process of electronic publishing includes the telegraph, photography, telephone, radio-telegraph, electronic digital computers, satellites and laser technology, hence, an efficient means of storing and transmitting of information. It offers the possibility of bringing the information content directly to the user whether at home or in a work place. However, since the dependence on a paper is still a habit, these have to be supplemented by hand copy production using computer printers and conventional printing processes for mans communication. Now, a number of primary and almost all secondary periodicals are electronic publications besides many reference books like *Encyclopaedia Britannica.*

iv) Desk Top Publishing (DTP)

The term DTP indicates that entire publishing is done on one's desk top which is quite possible at present. But generally this is used for the production of documents at the working place itself, using computers and publishing software such as Ventura, Page Maker etc. There are software packages developed in India for DTP. The author creates the documents on computer using word processing software, edits and makes pages, adds graphics, designs cover and pages, on a single desk and the document is produced on Laser Printer. The produced copy may be used as Camera-ready copy for printing large number of copies through conventional means. Thus the publishing field has adopted ways to produce printed material faster and more economically.

v) Book Trade

The information transfer cycle will be completed only when the book reaches the user and he reads it. The process of moving a book from the publisher to the reader is

referred to as distribution. The book distribution when taken up with commercial motive is called 'book trade'.

The earliest book trade can be identified during medieval times, when the craft guilds of printer-book sellers were organised by royal patent. Once the printing technology of Gutenberg spread to Europe and other countries, the nature of book trade has changed. As you know, the early printings of 15th century were called *incunabula*, which were thick, large volumes bound in blind-stamped calf over wooden boards lacking title pages but richly ornamented.

During 16th, 17th centuries, Europe became the centre of publishing and book trade. By 18th and 19th centuries, steam and electricity driven presses permitted economic publishing with multiple copies of book production. The 20th century has witnessed the significant developments in book trade. It has assured larger dimensions.

Creation of demand through promotion is a prerequisite for effective book distribution. Hence an important component of book trade is marketing which encompasses functions such as market research, sales, sales promotion, advertising, publicity and trafficking. The distribution channels are wholesalers, book sellers, mass market outlets, book clubs, mobile book shops etc.

The modes of promotion of awareness is through organising exhibitions, book fairs, cultural festivals and lectures by authors. However, common approach is to develop publicity material like brochures, trade catalogues, advertisement in newspapers, news letters, bulletins, reviews. 'Book in Print' brought out in different countries also acts as a promotional medium. Field promotion through representatives strengthens book distribution activities.

The contemporary book trade has been affected by the new technologies of information transfer. Photocomposition of books, computer print outs of bibliographic information, reprographic technologies has an impact on the book trade.

Thus, whether operating on a for-profit basis or for any other purpose, the printing, publishing and book industry has an important role as a primary publisher and distributor in the information transfer process.

The transfer of information, that is available in primary sources, may be either through direct purchase or indirectly through libraries or information centres etc. or through the secondary publications.

11.4.3 Secondary Publishers

Secondary publishers publish sources to original or primary information and thus perform the presentation and dissemination function in the information transfer cycle. You have already studied about secondary sources of information under Unit-9 of this Course. Abstracts, indexes, reviews, bibliographies, catalogues etc. are considered as secondary sources. The secondary publisher based his work on primary publications. The information is presented in a repackaged form, i.e. in the form of an abstracting periodical or digest or presented in a narrative form as in a review of progress or in the form of an encyclopaedia article. The main functions of secondary distribution are:

i) to keep the user abreast of the current literature of the subject i.e. the current use of information.

ii) to help find specific information in the literature of the subject, as and when need arises i.e. the retrospective search function. This is possible because the literature covered in a secondary source is being progressively cumulated into an organised store with keys provided in the form of index terms.

iii) to reduce language barrier to certain extent as the coverage age of literature is from different languages but presented only in English. For example, Chemical Abstracts covers literature in more than fifty languages but all abstracts are published in English.

Therefore, the secondary publishers have a vital role in the distribution of generated information in a repacked form and providing access to primary information.

11.4.4 Agents of Information Dissemination

The libraries, information centres, documentation centres, data centres, information analysis centre etc. represent the principal store where most of the formal and informal literature is collected, indexed, stored and made available for retrieval. Their role varies with the type of institution to which they are affiliated to, their nature of resources, services and users. For example, academic libraries, public libraries, special libraries, National libraries, National archives, documentation centres differ from one another, though their primary objective is to disseminate information. Hence, their role in information transfer has to be identified independently.

i) Libraries and Information Centres

Documentary information flow or transfer is indirect, multistage. The basic characteristics of documentary information transfer is that it is two-way. Information transfer takes place if information is both emitted and received. Hence the sources of information seek potential users and the users seek potential sources. Libraries and information centres are the agents to store and retrieve information, available in the documents, to maximum number of users. These are the centres of information activity as the generated information and the user of information meets here. Traditionally, the libraries have been considered as key parts of the information transfer. Their commitment has often been towards traditional texts.

The information centre is usually an office or a section of a bibliographic centre, research bureau which gives information about literature on a subject with which the parent organisation is concerned. It may include the functions of a special library and extend its activities to include collateral functions such as technical writing, library research for clients. The libraries and information centres select, acquire, analyse the documents, prepare surrogates of primary documents, store them, search them as per user request and retrieve them to the user. Thus these centres are always engaged in the information handling and transferring process.

However, the decades from 1980 to the present have been decades of remarkable change in these centres. The emergence of more and more machine-readable databases (both

primary and secondary) in the 1980s coincide with a period of wholesale conversion from card catalogue to online catalogues. Now, the electronic databases include entries not actually owned by the libraries or information centres, but virtually are universal in nature. Hence the libraries have diverted their activities as highly service oriented with the aid of online services. In India, the special libraries maintain more of the sophisticated services.

ii) Documentation Centres

According to *Harrod's Librarians Glossary* (5th ed. 1984) Documentation centre is " a place where publications are received, processed, preserved, summarised, abstracted and indexed; where bulletins relating to such material are prepared for distribution to those interested; where research is undertaken, bibliographies prepared and copies or translations made".

The traditional library system could not meet the information demands of scientific, technical and industrial organisations, developed after World War II, as their needs were too specific and specialized. As a response to this demand documentation centres have been established to cater to the information requirements relevant to their field. These centres have been established at national, regional and local level to serve specific subject fields Eg. INSDOC, NASSDOC, SENDOC etc.

These centres :

i) Select, acquire, store and retrieve specific documents in response to or in anticipation of requests.

ii) Analyse and consolidate of information and repackage it into bibliographies, indexes, abstracts, CA bulletins, reviews, state-of-the art, trend reports, digests, etc.

iii) Provide the information bearing documents and/or information in original or a reprograph or translation as per the needs of users.

iv) Get the feedback, evaluate and modify the system whenever needed.

The scope and coverage of documentation has been enhanced in recent years. It now aims at analysis of literature, search and location of documents with the aid of information technologies and developing networks at different levels.

iii) Data Centres

Unesco has defined a data centre as "an organisation handling quantitative numerical data. Such centres take primary function of collecting, organising and disseminating data mainly numerical and also provide a measurement service. They store data which are related to a narrow field of specialization"(6). To say simply, the information centres that handle only numerical data are called data centres.

The data centres are established to transmit data in specialised narrow areas like mineralogy, earth science, metallurgy, geochemistry, meteorology, oceanography, space services

etc. These are often concerned with large-scale data of raw or partially processed results. For example data of census, goods, materials etc.

Generally, these centres are established at national level, one centre for each subject. At the local level, the data centres may be attached to a university or research centre. In developing countries like India there is not much demand for these centres due to slackness in research. However, such centres are being designed in these countries, in the fields relating to industries, government projects etc.

The major functions of these centres include:

i) Data collection and codification

ii) Data evaluation and compilation

iii) Data organisation and development of database

iv) Data control

v) Data dissemination/retrieval service

These functions are being performed by data coordinator, data specialist, data analyst and programmer.

Eg: Office for scientific and Technical Information (OSTI).

The U.K. publishes the data activities in Britain giving brief summary of organisation, coverage, analytic activity and publications in different branches of knowledge.

iv) Information Analysis Centres (IAC)

One technique, by which science has attempted to cope with the information explosion is that of making a distinction between the creator or discoverer of the facts of science and the user who sift, absorb and correlate the facts. The technical information scientist, who perform the latter function constitutes IAC.

COSATI Panel (1968) described IAC as " A formally structured organizational unit specifically (but not necessarily exclusively) established for the purpose of acquiring, selecting, storing, retrieving, evaluating, analysing and synthesizing a body of information and/or data in a clearly defined specialized field or pertaining to a specific mission with the intent of compiling, digesting, repackaging or otherwise organizing and presenting pertinent information and/or data in a form most authoritative, timely and useful to a society of peers and management".

An IAC is an information system that can provide on call competent answers to specific questions. Most of the IACs are located in or associated with R & D laboratories. Analysis of information here means deriving from a document a set of words that serves as a condensed representation of it. This representation may be used to identify the document, to provide access points in literature search, to indicate its content as a substitute for the document. It may be in the form of an abstract, extract etc.

In a wider sense, analysis is a functional unit involved in the transfer of information from source to user. As we have already discussed, information is recorded and multiplied by publishing units. They distribute it to libraries and other storage units and analysis units, which may or may not be associated with a storage unit (library / information centre). The analysis units prepare guides to documents which helps in the subsequent identification of documents from the library units on demand. The functions of these centres are:

i) provides critically evaluated data to scientists and technologists.

ii) upgrades both quality and reporting of experimental measurements in the public literature.

iii) performs a catalytic and stimulant function in focusing on important problems and mobilizing resources to help solve them.

iv) evaluates systematically reports on results of research.

At this point, you might have observed that analysis of the same document is repeated over and again by different agencies. For example,

Publishers - for publishers' catalogue.

Secondary publishers - for indexing, abstracting etc.

Libraries/information centres/doc centres - for public access catalogue to represent the holdings of the library; and also for subject bibliographies, indexing and abstracting services, documentation lists etc.

Information Analysis Centres- for indexes, abstracts bibliographies and other guides to the literature.

Thus, the secondary publishers can also be considered as Information Analysis Centres. This indicates the importance of analysis in the transmission of information. However, there is a need to centralize these activities, so that repetitive works could be avoided.

11.5 DE-INSTITUTIONALIZED INFORMATION TRANSFER AGENCIES

In the preceding paragraphs, you have studied how a number of institutions, in public and private sector, are acting as agents in effective information transfer. Nevertheless, there are non-institutionalised information organisations that have a significant role in information transfer. Humans, as individuals or groups, also engage in the information transfer process. Indeed, in ancient days, when there was no recorded communication, human beings transmitted the knowledge through oral tradition. Hence human agents have a long record as communication channels than the documentary channels. In the present day information environment, the human agents can be identified as:

i) Information Brokers/Consultants

ii) Invisible colleges

iii) Technological Gatekeepers

iv) Media personnel

Let us discuss these aspects in detail.

11.5.1 Information Brokers

Information broker is an individual who provides information services on payment. Over the last few years, the concept of 'fee-based services' or 'marketing of information services' have gained momentum. Similar to a practising doctor, advocate, chartered accountant, practicing information professions have emerged in a number of countries, who charge from their clients for the services rendered to them. The client group may be from business, industry, government, academic or any other professional sector.

The information broker offers a combination of services to retrieve relevant and precise information, using the current information technologies. He searches the existing databases either on CD-ROM or online with national or international hook up and serves the current as well as retrospective information requirements of his clients.

i) Information Brokerage

The basic features of information brokerage include a) Resources, b) Services, and c) Marketing strategies.

a) *Resources* : Broker or consultant has to develop a comprehensive in-house collection of information sources, especially secondary sources. They are generally in the form of databases of reference works, company files etc. either on magnetic or optical media. Otherwise, maintaining a basic collection, he can make arrangements with international vendors like DIALOG, to have access to databases, through online.

Majority of information brokers have installed computer systems and maintain links with several databases through their vendors by paying subscription or minimum fees required by them.

b) *Services* : The services range from supply of bibliographic references to supply of documents on a topic of interest. The services generally include compilation of bibliographies, indexing, CAS, SDI, preparation of analytical reports, consultancy, online searching etc.

c) *Marketing Strategies* : The marketing strategies followed by the information brokers depends on the nature of clientele, their needs and capabilities for payment. Majority of the information brokers have made effective application of marketing techniques. The pricing strategies encompass cost-based, demand-oriented and competitor-oriented prices. There are various methods used as the basis for pricing and charging. The methods include marginal costs, overheads, cross subsidy, incremental costs, subsidizations and market demand. The pricing strategies for printed information and electronic information services vary as print is based on one-off charges, regardless of usage levels, while online costs are directly related to use.

According to Gilchrist(7) information consultancy involves traditional and additional purposes. These are:

Traditional purposes :

i) To provide requested information

ii) To provide solution to given problem

iii) Conduct diagnosis that may redefine problem

iv) To provide recommendations

v) To assist implementation

Additional purposes:

vi) Build consensus and commitment

vii) Facilitates client learning

viii) Improve organisational effectiveness.

In consultancy, technical and human components are closely linked i.e. the technical component of information work has to be supported by interpersonal skills in communication and the necessary ability to relate information and people.

The information brokers/consultancy is at present a very small business, as the number of professionals involved in the business are less compared to those involved in accounting and computing etc. However, in the West the demand for information consultancy is concentrated in those areas where the information is relatively hard and well understood and developed as information industry.

ii) Information Industry

"Those industries in all countries which manufacture or create for the market information services or information products, which can suppport individuals and organisations in doing the things with information that they need to do in order to achieve their work objectives(8)".

The changes brought in printing, publishing and electronic publishing; postal services, fax, e-mail, electronic data interchange; CD-ROMs and online databases have made the information industry more competetive and advantageous. Hence, the present information industry is capital intensive, and is in a constant state of turbulent changes with intensive competition and rapid changes. The information products generally maintained by the industry include descrete packages of information, developed prior to specific need for them, usually with the expectation of providing them to a number of users i.e. they have a more generic purpose Eg.CD-ROMs, Databases etc.

The operations include storing, accessing, processing or delivering information to meet the needs of specific users at the time they request service. The services comprise traditional and electronic information services. In USA, the information industry Association was formed in 1968 as a trade association to promote the development of private enterprise in the information field. Membership in the Association is limited to commercial firms engaged in the creation and marketing of information products, services and systems and their suppliers.

Indian Scenario

In India, information industry is still in its infancy, compared to western countries. However, a few firms are coming up, that are capable of searching and providing clients the documents or bibliographic information. Notable in this field are two firms viz., Constellate Consulants (P) Ltd., New Delhi and Informatics (India) Ltd., Bangalore. Both the firms are functioning for more than a decade with efficiency.

Gupta(9) has categorised the information industry of India into five kinds.

i) The first type is document procurement and distributing firms. Eg. Constellate Consultancy and Informatics (India) Ltd. These firms receive requests from users for any kind of information or document from individual or organisations in private or public sector. The Informatics (India) also takes up the books/journals vending. The constellate Consultants are specialists in procurement of reports especially NTIS (USA) reports and also distributors of *Engineering Index* in India. The firms search the national and international databases for information online / CD ROMs.

ii) The second category of firms are mainly concerned with commercial information and processing of data like Commerce Research Bureau (Bombay), Centre for Monitoring Indian Economy (Bombay), Operational Research Group (Baroda), Tata Economic Consultancy Service (Bombay) and Mafatlal Group of Industries (Bombay). These organisations collect the statistics made available by the government and other published sources of industry and transform into different categories and publish regularly.

iii) The third category of firms are mainly involved in the development of software and use of existing software packages in various library operations. Eg. Tata Consultancy Services, Hindustan Computers Ltd. etc.

iv) The fourth category of firms are involved in providing industrial information and meet a variety of information needs of industries like collection of information on a product or process to the preparation of trend or feasibility reports.

v) The last category is involved in the collection, processing and dissemination of highly specialised technical areas. Eg. Zinc and Lead Information Centre (Delhi), Copper Information Centre (Calcutta).

INTERNET

The emerging information technologies have brought in a rapid change, to communicate the generated information, not only through institutionalized channels or information industry but also through establishing personal contacts through computers. For example, a favourite pasture for the more adventurous scholar or technocrat is mining the INTERNET.

Internet is intended for scholars and researchers to share information by exploring the network connections. It is an international network of networks, has open up new avenues of communication between people, provided they have access to a computer. More libraries and information repositories are becoming available on the internet each day. This has made accessing remote libraries and services so popular. "Many people consider the Internet to be a living, growing, world brain like organism with a life of its own".(10)

11.5.2 Informal Human Information Networks

The information transfer by humans can be grouped into (i) the intellectuals (ii) the people (iii) the media personnel. In Unit 7 of this course, you have studied about the informal exchange groups / invisible colleges, information gate keepers etc. These agents are intellectuals or experts who play a vital role in the transmission of primary information.

i) Invisible Colleges

As you have already known, invisible colleges is the informal communication among knowledgeable sources. It is the information transfer process that exists between scientists and researchers far more personally and regularly using informal channels like letters, telephone, personal meetings, etc. Such informal communication patterns that exist between scientists has an important role in the transmission of information as it is crucial and at the forefront of research area. The groups in such communication comprise elites of that branch of knowledge.

De Solla Price has termed such groups of elite researchers as "invisible colleges". Hence, an invisible college comprises the most well-known and respected researchers, who know one another and communicate often. The external contacts or communication links which form the backbone of an invisible college can be made and reinforced by attending conferences and meetings, exchanging letters and telephone calls and joining professional societies.

ii) Technological Gatekeepers

"In the industries or companies some individuals hold key or star position in communication network because of the frequency with which others turn to them for technical advice or discussion. They have greater exposure to the published or unpublished literature of the outside world than their colleagues as they attend to more conferences, discussions, seminars etc. Such people are called as "technological gatekeepers" as these persons are usually consulted by their colleagues for information; this consultation takes place despite the fact that there are other avenues open to the enquirer"(11).

"Technological gatekeepers are different from invisible colleges. Invisible colleges are concerned with the flow of information among different countries and even using different languages at times. Whereas the concept of gatekeepers is by contrast concerned with the flow of information inside an organisation. The technological gatekeepers are also likely to be members of invisible colleges. In this way they form communications links both inside and outside the organisation. In Western countries, gatekeepers have already been working effectively as communication channels. In India too, there are people working as gatekeepers in scientific and research organisations but their services have not been recognised as there is no formal channel established".

People : Voluntary organisations for spiritual and bodily welfare, informal neighbourhood organisations and the family and interpersonal communication systems also contribute in the transmission of information.

Media Personnel : The mass media have a pivotal role in transfer of information as they can reach large numbers of people in different locations, more or less simultaneously, through an impersonal network with substantial volumes of information eg. T.V., Radio,

Newspaper etc. However, generally it is one way. Though they are meant mainly for entertainment purpose, they also disseminate academic and scientific advances. Eg. UGC Programmes. Hence, the media personnel, may be journalists or subject experts engaged in this field work, are identifying themselves as one of the agents of information transfer. They collect information through informal or formal channels, process it and present them formally, thus extending the entertaining, informative, instructional and research supportive communication.

11.6 INFORMATION USERS

The objective of information transfer process is to reach out to the user. Hence user is the last but most important stage in information transfer cycle. Lancaster has observed that the final stage in the cycle is assimilation, at which information is absorbed by the user community. He further makes a distinction between 'document transfer' and 'information transfer'. The latter occurs only when a document is studied by the user and its contents are assimilated to the point at which the reader is informed by it i.e., his state of knowledge on its subject matter is altered. Thus the information generated is being handled by different agents for the purpose of transmission and culminates at the user point with its use.

11.7 LET US SUM UP

The intrinsic value of information lies in its communication and utilization. To achieve this, transmission of information is necessary, by which the generated information, encoded in communication media, is transmitted to the use point. Information thus transferred will contribute to the progress of all facets of the society.

The information transfer is a cyclic process, starts with humans as authors and culminates in them as users. In this cycle, there are a number of agencies involved and they play a pivotal role in the distribution of information. These agencies, comprise authors, publishers, libraries, information centres etc. and the informal human agents. These agencies, in addition to traditional methods of transmission, reap the advantages of latest information technologies and make a significant contribution in the transmission of information and thus in the advancement of the society.

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11. RENU Arora. "Technological Gatekeepers". *Anuals of lib. sc. and Documentation.* 34(1) 1987. p.12-15.

11.9 ASSIGNMENT

1) Discuss the role of libraries, information centres, documentation centres and Information analysis centres in the transfer of information.

2) What are the human agents ? Discuss their role in information transfer process.

11.10 RECOMMENDED BOOKS

1) Lancaster, F.W. *Information retrieval systems.* 2nd ed. New York, John Wiley, 1979.

2) Kent, Allen et al.Eds. *Encyclopaedia of Library and Information science.* New York, Marcel Drecker Inc.

11.11 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Describe the information transfer process, explaining the role of various agencies involved.

2) Discuss the role of various information systems in the dissemination of information. Illustrate your answer with suitable example.

3) What is information industry? Trace out its development in India.

II. SHORT NOTES

a) Electronic Publishing b) Book Trade

c) Documentation Centres d) Information Brokers

e) Information Analysis Centres

UNIT-12: INFORMATION TECHNOLOGY AND COMMUNICATION TECHNOLOGY

Structure

12.0 AIMS AND OBJECTIVES

The aim of this unit is to make you understand the current developments in information transfer process. The emergence of latest information technologies have a direct impact on information transfer as these technologies facilitate communication with great speed and accuracy.

After studying the unit you should be able to

- explain the concept of Information Technology and its advantage in information transfer process
- describe the basics of Computer Technology
- give an account of the developments in communication technologies
- understand the impact of the above technologies in the contemporary communication process.

12.1 INTRODUCTION

After a study of the previous three units, you have gained adequate knowledge regarding the communication of generated information through conventional and non-conventional media and also various agents that have active role in the information transfer process. In other words, you have seen how the word of mouth got changed to print media and non-conventional media and then to electronic media and the information embodied in these media is being transmitted through various agents from author to the user. In this unit, you will acquire knowledge about the role of information technologies in the communication of information. The unit will be useful to you to understand computer, communication and other related technologies and how the emergence of these technologies facilitate communication of information at greater speed with much accuracy, trespassing the geographical boundaries.

12.2 INFORMATION TECHNOLOGY

2.2.1 Definition

There have been various definitions proposed for Information Technology (IT). From the Library and Information Science point of view, it can be defined as application of various technologies for the acquisition, processing, organising, structuring, transmitting, manipulating and messaging information, to derive various outputs. The term various technologies' include computer, telecommunications, reprography and audio-visual technologies etc.

Information Technology can be defined as " the systems and devices used for receiving, storing, analysing and communicating information in all its forms, and their application to all aspects of our lives, including the office, the factory and the home"(1) (Corter, Roger).

The UNESCO(2) definition of Information Technology also offers a broad view of this newly evolving discipline : " The scientific, technological and engineering disciplines and the managerial techniques used in information handling and processing their applications; computers

and their interaction with men and machines, and associated social, economic and cultural matters" (Enser, PGB).

12.2.2 Application

You might have observed the application of Information Technology in our banks, railway reservations, offices, business, science and technology activities etc. You might be wondering why, as librarians, you have to study about Information Technology. Primarily because, library is a nucleus of communication, where scholars congregate to seek knowledge from the achievements of humanity. As already mentioned, the Information Technology facilitates this communication process and link information and people all over the world. The other factors that necessitate adoption of Information Technology in libraries are:

a) Increase in the volume and richness of information;

b) Need for sharing of information and obtaining simultaneous access to information;

c) Change in publication from print media to electronic media;

d) Need for transfer of information for national and global activities in science, business etc.;

e) The cost-effectiveness of storage and dissemination of information on electronic media;

f) Availability of communication software, that provide time-shared access of exchange of files from international data bases.

Many activities can be carried out when you use your computer to telecommunicate. One common activity frequently engaged by business executives, government organisations, educational and research institutions is producing and reading *Electronic-mail*, generally called as E-Mail for short. It leaves the mail in a mail box file on a computer. Users may access the mail box file at any time to retrieve messages or send new messages. It is just like post mail to send and receive message from a person, but here the message is electronically recorded.

Another activity of the same kind is *Electronic Bulletin Board.* Information is posted in this kind of mail box for any subscriber to see and use.

As library and information professionals, we are interested in the use of computer, telecommunication technologies to search databases for information. *'Online'* access to hundreds of databases is made possible through national and international computer networks. Access to these databases provide full-text information, indexes to the articles, bibliographic references and abstracts, comprehensive coverage of journal articles in various disciplines.

12.3 COMPUTER TECHNOLOGY

As mentioned in the definition of I T, Computer technology is one of the important components of Information Technology. You have a detailed course on Computer technologies

under course 05. However, a brief presentation will be made here to have better understanding of this unit.

A computer is an electronic device with stored memory and facilitates processing and retrieval of information, with enhanced speed. Basically, a computer performs three main functions:

a) Input - gets the raw data from the operator.

b) Processing Processing unit of a computer is called CPU, which performs the calculations on the data received from the INPUT.

c) Output - Displays the final results of the calculations performed.

The special features of a computer are its:

(a) Speed
(b) Accuracy
(c) Endurance
(d) Objectivity
(e) Reliability

But remember, a computer is useless without programming by a human. One gets out of a computer what has been fed into it and nothing more. If intentionally unintentionally garbage has been fed only garbage will come out.i.e., GIGO (Garbage in, Garbage Out). Hence, a computer is 'an intelligent amplifier in alliance with the human brain'.

The computer has two basic components: hardware and software

12.3.1 Hardware

A computer hardware is the physical component and inner parts of a computer - CPU, VDU, Memory, Keyboard, Disc etc. In other words, the electronics of a computer are called Hardware. It is the hardware of a computer that ultimately determines its capacity for storing and processing of information:

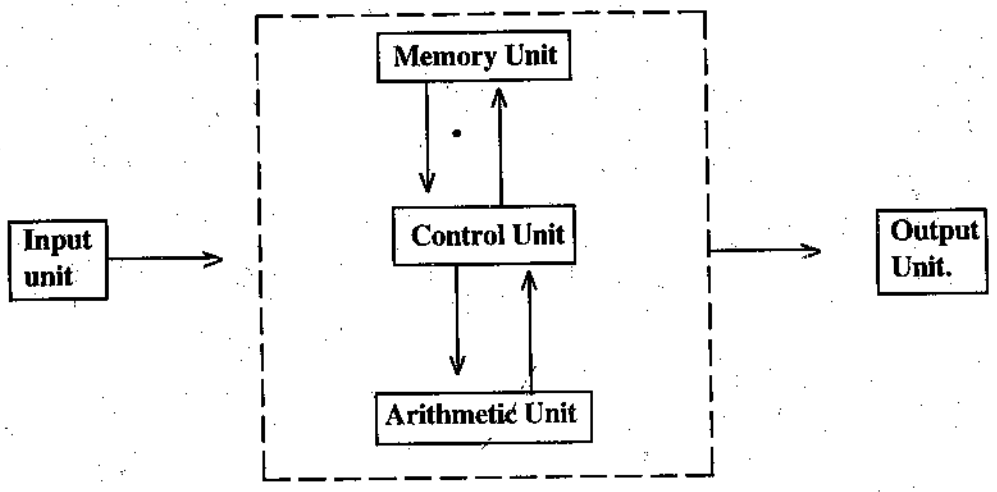
i) Architecture of Hardware:

A computer hardware resembles a human being in a way more than one.

	Human	Computer
a. Input	Through eyes & ears	Through electronic key Board.
b. Memory	Information is storedhere	Information Storage Area
c. Brain	Information is processed	Arithmetic, Logical operations perfomed by ALU
d. Output	Through mouth & hands	Results displayed on VDU
e. Coordinating unit	Automatic Nervous system	Control unit + ALU from a single tiny silicon chip called the microprocessor.

ii) Configuration of a Computer: The basic Configuration of a computer is shown schematically below:

Basic Components of a Computer



INPUT: The electronic keyboard which looks more or less like an ordinary typewriter with a few additional functional keys.

OUTPUT: Monitor or VDU and Printer.

These input/output (I/O) devices are also called as 'peripherals'. There are a number I/O devices and you will study them in detail under Course 05.

Central Processing Unit (CPU): The brain of the computer, that facilitates processing of data.

Memory: The Storage/memory unit is of two types. One, Internal memory or primary storage memory is a part of CPU. This is again of two types - ROM Permanent memory and RAM volatile in nature i.e., gets erased once the computer system is off. It has limited storage capacity. Second, External Memory - To expand the memory storage capacity, external memory devices like floppy discs, hard discs, tapes, cassettes etc., are used.

12.3.2 Software

Software is the general term used to describe the types of programs or lists of instructions which are needed to enable the computer system to carry out the necessary processing. Software may be defined as a set of programs for a computer. These programs instruct the computer how to process the input data and generate different outputs. The programs are the sets of instructions that a computer executes to accomplish an assigned/specific task. They direct the computer through a series of activities.

i) Types of Software

Primarily there are two types of software: *(a) System*

Software: Software developed by the manufacturers under the control of which one can run his own program is called system software. This is generally stored in ROM inside a computer or is available on floppy disc or cassette.

System software enables the computer to do difficult jobs in the proper order and at the required time. For eg. they keep track of the priority of different jobs and load the job into CPU in the correct sequence. They also bring in from the Secondary Storage the required application programs and data. Most of this work is done by the Operating System which is the most important component of the system software. System software is classified as operating system, file management system, memory management unit, job schedules, I/O traffic controls, command processors, utilities and service programs etc.

ii) Application Software

Software oriented towards developing an application. It is meant to solve specific problems. An application software is a set of instructions that are tailor-made to operate specific tasks such as inventory control, circulation control system, book order system etc. You might have seen the video game programmes and educational programmes. These are the application software. Application software can be developed by the use of various programming languages or through ready-made application packages.

iii) Programming Languages

A computer is an electronic machine. It must understand the instructions given clearly to act upon them. The computers understand several computer languages. The computer languages serve much the same purpose as human language. It is a means of communication. As in a natural human language, the computer languages also have grammar i.e., syntax etc. You will be learning more about it in course 05.

There are basically three kinds of programming languages.3 (Rowley, Jennifer).

a) *Machine Language:* Every computer has its own machine language. Instructions to the computer must be given in this language since this is the only language that a computer actually understands. However, this type of language varies from machine to machine and is a function of the hardware of the computer. The particular IC Chip used in a computer determines which machine language it follows. A machine code is an organised sequence of Os and 1s, otherwise known as binary code/binary numbers.

Eg.'Add 1 to' is represented as 010.

(You may recall that the binary digits are called BITs and eight bits constitute a BYTE equivalent to a character in our words).

b) *Assembly Language:* Assembly languages make some concessions to the programmes in that they use mnemonic literal sequence to designate machine code and to refer storage locations. Letter symbols replacing Numeric Machine Language Code.

Eg. DIV stands for Divide which is easier to remember than 11001 stands for DIVIDE.

'INC' represents an operation such as 'add 1 to'

However, programmes written in assembly code are essentially in the same format and hence are known as machine oriented languages. An 'assembler' translates the assembly language pro-gramme into the machine language.

c) *High-level Languages*: These languages allow the user to start working with the computer. This family of languages uses limited number of English words with strict set of rules covering their use. A program written in a high-level language is translated into the machine language by a compiler or 'Interpreter'. There are quite a number of programming languages, each having been designed for a specific application area.

You might have used or heard about the computer languages such as BASIC, FORTRAN, COBAL, PASCAL, C++ etc. All these are high level languages.

iv) Application Packages

While traditionally programming languages are used to create programs for specialised purposes, there are, today, a large number of ready-made application packages available which can be conveniently utilised in any organisation, for an increasing range of application such as Management Information Systems, Industrial Support System, Office Automation Systems, etc.

You might be aware of general application packages such as dBASE IV, LOTUS-1,2,3, Word processing etc. Library and information system is primarily concerned with software packages for text-retrieval or information retrieval. The application software for library and information science operations can be identified as:

a) Word Processing Software

b) Text-Retrieval Packages

c) Software associated with online packages

d) Library house-keeping Software

Some important packages for library operations are:

FUNCTION	SOFTWARE
a) Online Search Software:	HEAD LINE SCI-MATE SWIFT UNDER LINK CORTEXT etc.
b) Information Retrieval Software:	CDS/ISIS SUPERDOC EAGLE BRS/SEARCH MICRO CAIRS HOMER etc.

In addition, there are application software packages available for specific library operation such as circulation controls, serial control, online catalogue etc. In India, Software packages have been developed in the Private sector, like LYBSIS, LIBRARIAN V .03 etc. for various library operations.

12.4 COMMUNICATION TECHNOLOGY

The second important component in Information Technology is Communication Technology.

Communication is a basic human need. It is central to the human experience. You have studied in Units 9-10 of this block how the information is being communicated from sender to receiver through various media and how the agencies play a pivotal role in its transmission. Today, we are living in an information environment, wherein the information is considered as power.

The economy, industry, education, science and technology sectors in the world depend heavily on the rapid exchange of information. There is an immense need to communicate more quickly and efficiently. Hence we need technologies that could handle and communicate information at hitherto unknown speeds and to unknown distances. Today, we have enormous capability to communicate because of the advancements in technology. The developments in communication technologies permit to communicate information between people through machines instead of traditional channels.

12.4.1 Data Communication

Communication among people is a two-way process. One person talks and the other person listens. The same can be said of computers. It requires two machines to communicate. This general process is called data communication. When the computers are talking over telephone connections, as we do, the data communication process is termed as 'telecommunications'. Data communication refers to the means and methods whereby data are transferred between two processing locations. It is the link that permits a direct interactive bond between the people at one computer (the work station) and the data store (host computer) at a far away place.

For example, you might have observed that airlines and railway reservation systems have a number of terminals located away from their processors.

There is nothing new about data communications. The ancient Greek runner carrying the message of victory on the plains of Marathon inspired a present day athletic event. For thirty years telegraphs enjoyed a monopoly on the use of electronic impulses to transmit data between distant stations. The demonstrations of Alexander Graham Bell, that electric signals could be used to transmit voice messages along telephone lines paved way for the second data channel i.e., telecommunications. Now, it is the integrated computer and communications technologies that facilitate communication at great speed.

12.4.2 Hardware

Telecommunication technology refers to the transmission of data as represented by electronic signals and to the hardware, software and the procedures that makes it possible i.e. the linking up of computer and telecommunication technologies for information transfer.

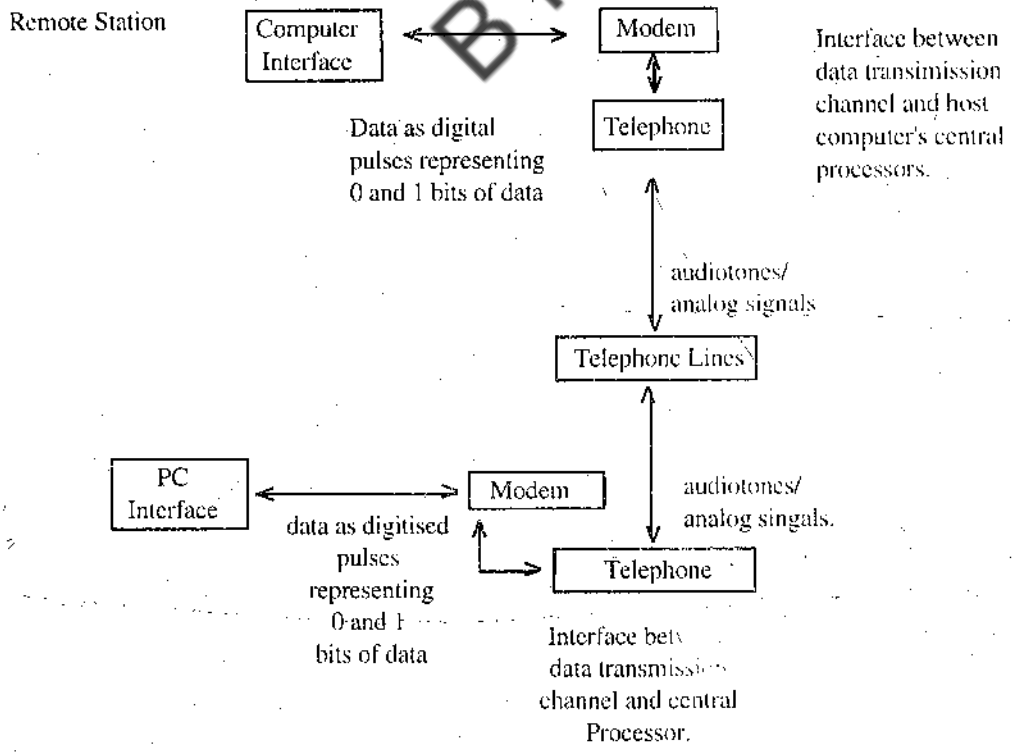
The first linkage of computing and communication devices occurred in 1940 when George Stibiz used telegraph lines to send data from Dartmouth college in New Hampshire to a Bell Laboratories Calculator in New York City. But it was not until late 1950s that the computing and communications linkage began in earnest.

An early large-scale business application was the Sabre passenger reservation systems developed in the late 1950s and early 1960s by American Air Lines. Hundreds of scattered terminals were linked to a central processing centre. Telecommunications usage has grown steadily since then. Today, computers, main, mini or micros, are an essential part of communication network. As more PCs are attached to communication devices and more of the equipment in an organisation is linked together by data communications, the distinction between computing and communications became even more blurred.

i) Basic Components

A simple data communication system typically links I/O devices at remote locations with one or more central processors. Some interface devices are used to bridge and control difficult data communication environments. In their system data to be transmitted are entered into a computer through a keyboard. One command from the operator, the data in digital form are sent in a serial (1 bit at a time) fashion to an interface device (MODEM). This interface converts the digital data into analog signals. The converted data are then transmitted over telephone lines to another interface device near the central processor or another computer. The modem at central processor converts the analog signals back to digital form. The data in digital form is stored in the main processor or routed for immediate processing. The same route is followed when output information is sent from central processor to remote location.

DATA COMMUNICATION NETWORK



In a data communication system, workstations and other remote locations are linked with one or more processors to capture input data and receive output information. This connecting equipment is called interface elements, useful to bridge different operating environments.

ii) Data Communication Equipment

There are mainly three types of data communication equipment. They are - Terminals, Modems and Multiplexers

a) *TERMINALS* : Terminals are devices for transmitting and/or receiving data over a communication channel. Terminals operate in a conversational or interactive mode. As such they incorporate facilities for both inputting data (usually a key board) and outputting of data (either a screen or printer). Terminals are then both input and output devices.

The earliest terminals were 'teletype terminals'. These are teleprinters or telex machines. However, they have been largely supplanted by the visual Display Unit (VDU). DUMB, SMART OR INTELLIGENT types of terminals are available now.

b) *MODEMS* : For one computer to telecommunicate with another, both machines must have a special piece of equipment called a 'MODEM'. Modem is derived from the words MOdulator/DEModulator. The sending Modem converts the digital pulses (data) of the computer into modulated sound signals that can be transmitted over telephone lines. The receiving modem demodulates the sounds and transmits them back into digital data that computer can use. This operation is necessary because digital pulses cannot effectively travel any distance over telephone lines that are designed for voice communication. Thus, a modem is needed to convert digital pulses into analog signals while transmitting data.

The modems are wired directly to the I/O equipment at the remote and central computer work stations. These devices have their own cabinets and are called external direct connect modems. Internal direct-connect modems are also available. These devices, on plug-in circuit boards, are installed inside PCs that are designed to accept them. But not all modems use direct wiring. Today, the sales persons, managers, engineers and others are using large number of portable terminals to communicate with distant computers. A special type of modem called an "acoustic coupler' is used in these situations to provide the necessary interface. The acoustic couplers perform a similar function, but differ from modems in that they are not permanently wired to the telecommunications network. Their main limitation is that the transmission speeds at which they operate are relatively slow.

There are four types of modems - Narrow band, Voice band, Wide band and Limited distance.

c) *MULTIPLEXERS* : Multiplexing is the use of a single telecommunications link to transmit a number of signals. Single multiplexing provides a transparent connection between remote terminals and the computer ports to which those terminals are attached. Multiplexers are normally required at both ends of 'shared' telephone line. There are two types of multiplexing - Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM). TDM is more popular than FDM.

Multiplexing was originally introduced to effect more efficient use of communication channels, but it has become an important component in Wide Area Networks and Data Transport System.

iii) Speed of Communication

However, just having two computers with modems is not all it takes to telecommunicate. The two computers must agree on how they intend to talk. The first issue to be settled is the speed with which the two machines communicate. This is called BAUD rate. In simple, the data transmission rates of modems are called BAUDs that is equal to CPS (characters per second). The baud rate is governed by the abilities of the modem. Most computers and modems are now able to communicate at 2400, 4800 and 9600 baud rate. You might have understood the advantage of fast baudrate. More information can be transmitted in the same amount of time, as the baud rate increases.

iv) Data Format

After the computers agree on how fast they will talk, they must agree on how each byte (character) that makes up the data or information will actually be transmitted. Recall that bytes are comprised of bits of binary digits. Depending on the nature of the computer and the data, a computer may communicate with an eight or seven bit data byte. In addition to the number of data bits making up the byte, there are 'stop bits' - that are the bits between successive bytes of data to allow the receiving computer to recognize the end of a byte. There are also 'parity bits' for the purpose of error checking.

v) Data Transmission Channels

Data transmission channels can be viewed as 'highways' that carry loads and men from one location to another. Similarly, the data transmission channels are used to carry data from one location to another. These are classed into narrow band, voice band and broad band categories. The wider the band width of a channel, the more data it can transmit in a given period of time. For eg: you might be knowing that in radio, the wider the band the more we will receive signals with clarity of sound, avoiding jamming, disturbance etc.

Narrow band - Eg: Telegraph lines.
Rate of transmission 5-30 cps.

Voice band - Eg: Standard telephone lines.
Rate of transmission over 1000 cps.

Broad band - Eg: Coaxial cables, microwave circuits,
communication satellites.
Rate of transmission over 100,000 cps possible.

(cps means character per second)

To transmit data, in many cases, the regular dial-up telephone switching network is used. However, for large volumes of data, it is often cheaper for an organization to acquire its own dedicated or leased line which can be used for both voice and data transmission.

vi) Transmission Circuits

Different types of telephone and telegraph transmission circuits can be selected to meet the needs of data communication. This refers to the way in which data is sent between computers. There are three types of circuits -

Simple – Permits data flow in only one direction.

Half-duplex – Permits transmission in an alternate sequence i.e. receiving and transmis sion operations will be repeated alternatively.

Full-duplex – Data transmission is simultaneous i.e. both receiving and transmitting operations at the same time.

Hence the speed of transmission is very high. Of the three circuits, full and half-duplex are more in use.

vii) Timing Modes

It is necessary for the data receiver to be able to split the team of bits that it receives into groups of bits of information, so that they can be transmitted into data. There are two means of achieving this, described as timing modes, : asynchronous and synchronous transmission.

In **asynchronous system** each character is surrounded by a start code and one or more stop codes which are represented as one bit of data each. **Synchronous timing mode** leads to faster data transmission but relies upon accurate counting and timing of bits that are transmitted. For eg., the first eight bits transmitted are recognised as the first character, the next eight bits as the second character.

viii) Network Switching

Messages/data can move from transmitter to receiver using either switched or non-switched techniques. There are three main switching techniques:

a) **Circuit Switching:** It is used in the traditional public service telephone networks (PSTNS). As you are aware in our Public Service Telephone System, both parties must be present and interaction is almost immediate. However, you might have an experience of 'engaged lines' while calling. This is because in circuit switching, other users cannot access if one is engaged. Further, as load increases, delay in call acceptance also increases. You might have also seen that some large organisations have their own telephone exchanges, referred to as PBX (Private Branch Exchange). These also have circuit switching. It is possible to have leased lines or dedicated lines on PSTN.

b) **Message Switching:** These systems overcome the problem of engaged lines by allowing messages to be sent and temporarily store them at the switching centre. The messages are then delivered by a call from the switching centre to the called party i.e., store and forward type. There is no connect time delay and improved circuit utilization is also possible. However, the disadvantage of message switching is that transmission time plus queue time is in minutes, which is not acceptable in most of the cases.

c) **Packet Switching:** It is a technique of data communication involving the switching and transmission of data in discrete quantities called packets i.e. the message is broken into a standard, fixed length packets. Each packet contains within itself both the data and the necessary information for its routing. This is designed for computer - computer communication. The speed can be 48 KBPS.

Examples of Packet Switching system are:

(1) Vides Sanchar Nigam Limited, India. 'Gateway to Package Switching Service' (GPSS).

(2) British Telecom's national packet switching network. 'Packet switch stream' (PSS).

ix) Data Transmission Media

The telecommunication networks that are used for data transmission may comprise one or more of the following transmission media.

a) *Twisted copper wires/wire pairs* : In this two insulated wires are arranged in regular spiral pattern. The twisted pairs transmit both analog and digital signals. Eg: Ordinary Telephone Cables.

b) *Coaxial cable* : Consists of many insulated wires in the same cable. It has greater capacity than twisted pair cable and may be used to carry data, voice and video. Eg: The telecommunication network in major cities like Hyderabad, Visakhapatnam etc.

c) *Optical fibres* : These are thin glass fibres and through these glass fibres light waves, representing electrical impulses are transmitted.

In addition to these cables, there are some software systems:

d) *Microwave Systems* : They use very high frequency signals to transmit data through space, with the help of roof top aerials. The data may be transmitted along a ground route by repeater stations. The data signals are received and amplified and transmitted by each station along a route. Eg: Radio Transmission

e) *Communications Satellites* : As you know, these are used for telephone and television channels. The satellites can support several thousand voice channels. The satellites facilitate broadcast, E-mail and distributed system. It acts as a reflector by accepting signals from one point on earth and returning the same signals to some other point on earth. Eg: INSAT - 1B.

f) *Wave guides* : Transmission of radio waves is through a tube, which is designed for a very high frequency. Used typically as a feeder between microwave antenna and the equipment on the ground.

g) *Cellular Radio* : It is the terrestrial voice telephone network. 'Cell' is a geographical area with low power transmitter. Cellular radio is a computer - controlled mobile communications service made possible by the change over to the digital communications. Using this, cellular radio sets or mobiles, normally installed in cars can communicate with each other and with ordinary phone users.

h) *Standard Electrical Mains* : wiring through which control signals can be sent by a computer to switch devices on or off (eg: light switches).

The transmission media, discussed above, vary in their physical form, speed, capacity of data transmission, fidelity of transmission and cost. However, to transmit large volumes of data at high speeds, broad band channels are required. Coaxial cables, microwave circuits and communication satellites are commonly used to provide these channels.

x) Communication Protocol

There is one final consideration when linking two computers together by phone - the communications 'protocol'. This is a set of rules that governs the overall data communication system, including how data is sent and received among the computers. Two common communication protocols are XON/XOFF and XMODEM.

12.4.2 Communication Software

In the previous sections of this Unit, you have learnt about telecommunication hardware. By now, you know that for two computers to telecommunicate, we need to have computer, to which a modem must be installed and a telephone line attached to the modem. With this equipment you can call on another computer, which is often called as host computer; as it is answering you computer's phone call.

Once you have your telecommunications hardware ready and you have a computer to call, you must install your computer software. This is an application program that is able to use the computer's modem to send and receive data. This type of software is visually capable of communicating in a variety of data formats, and it will support one or more communication protocols. So, in the following paragraphs, you will be knowing more about the communication software.

When utilized in an appropriate equipment configuration, communication software enables a personal computer to function as a terminal for the purposes of communication. Communication software supports the interactive transmission of data between two personal computers (PCs) or a Personal computer and another larger computer. The advantage of PC as a terminal is that it offers the standalone word and data processing capabilities which many users require.

In libraries, the communication software can be used to provide access to host data bases like DIALOG, BRS, WILSON-LINE, MEDLINE etc. for online search and retrieval of information. In such situations, communication software permits the offline preparation of search strategies, the downloading of retrieval citations, and other functions which cannot be performed by conventional terminals. Further, communication software provides access to Electronic Bulletin Boards, and similar message systems; and permit transfer of data files between two computers. Few communication software packages support communication between a PC and a TWX or telex terminal. Hence they can be used, with the support of the network facilities, in inter-library loan application for message transmission.

Asynchronous vs synchronous programs : You might have studied in your course 05 about the modes of communication. Generally, the communication software packages are designed for ASCII asynchronous communication. There are hundred of communication software packages in this popular group. Some examples are :

SMART COM I and SMART COM II	from Hayes Microcomputer Products.
CROSS TALK	from Microsoft.
ASCII PRO	from United Software.

However, some of the communication software packages employ the EBCDIC and synchronous. These are less significant for library operations than ASCII asynchronous programs.

i) Hardware Configuration

You might have understood, by now, that any software require specific hardware to operate. Likewise, communication software are also designed to operate in a specific hardware configuration. Usually, atleast one communication software package is available for every brand of computers i.e., IBM, APPLE etc.

Every communication software package requires a modem for the transmission and reception of data over telephone lines. Most of the modems designed for personal computer installations are characterized as SMART. These modems are controlled by integral microprocessor, which can respond to commands generated by communication program.

The communication software packages, generally operate in two modes: command mode and online mode.

ii) File Transfer

A computer equipped with communication software can exchange data and program files with remote devices, including main frames and PCs. If a computer transmits file to a remote terminal, the process is called 'uploading'; when it captures incoming information in a local disc file, the process is called 'downloading'. The most common library application of down loading occurs in an online search session.

12.5 AUDIO AND VIDEO TECHNOLOGY

So far you have studied the computing and communication aspects of Information Technology (I.T). As stated in the definition, audio-video technologies also have a distinct role in information communication, using I.T. for Eg: Pictures from a Video camera can be fed into a computer, processed in various ways, transmitted down the telephone line and printed as part of newspaper or other document. Now, computer systems are being developed, that will read data, audio and video pictures from compact discs (CD), so that documents like encyclopaedias recorded on CDs are available to sophisticated computer retrieval techniques as well as providing sound and pictures.

Under Unit 10 Section 10.3.1, You have already gained knowledge of audio, video media that carries information for the purpose of communication. This section deals with the audio and video components of Information Technology in data communication.

Any information system includes input, processing, storage and output elements. We might represent these stages as:

Input —> Processing —> Storage —> Output.

Unlike computers, the audio, video systems deal with information in analogue form.

12.5.1 Audio Systems

This section deals with the input, processing and output stages of an audio system.

Input : The Input stage of an audio system involves converting the sound waves in the air to electrical waves in a wire, using same form of microphone. The commonly used microphones are carbon, moving-coil, crystal, ribbon and electrostatic. In complex audio productions, a number of microphones will be used simultaneously and their outputs mixed.

Processing : Once the sound waves have been converted into electrical signals, they can be processed in a number of ways. For eq., in a musical recording, the amplitude of a certain range of frequencies may be increased, to emphasize the vocal element of the sound.

Storage : The result of the audio processing is recorded on a magnetic tape. Normally, the original recording will be made on a reel-to-reel master tape running at 75" per second.

Output : The output stage consists of an amplifier, to boost the electrical current generated by the playback head, and a loudspeaker. Loud speakers work rather like microphones in reverse. Some microphones can double up as simple loud speakers.

12.5.2 Video Systems

Video, like cine films, works by producing an apparently moving picture from a series of still frames. The human eye needs about 1/15 of a second to register a fresh image so frames which change faster than this appear to move. In cinematography, the frames are projected on to the screen at the rate of 24 per second, where as with video the frames are reproduced at the rate of 25 per second. In each case, the rates are appreciably faster than can be detected by the eye. However, to overcome a noticeable flicker as each frame flashes on or off, the flash rate is double by displaying each frame twice for 1/50 of a second.

Input: The input device for video is video camera. In a video camera, the light from a scene passes through the lens and is focussed on a 'target plate' inside the casing. This plate is coated with a chemical that units electrons when light strikes it. A bright part of the scene gives off many electrons while a dark part only a few.

To achieve a colour video picture, the camera has to have three tubes, each containing cathode ray gun to unit electrons, a target plate and a signal plate.

Processing: In processing, the signals from a number of video sources are mixed in a way that is analogous to the audio mixing. The audio components of the studio production have also to be mixed. Video production is quite complex and a whole day work may get half-an hour or less of finished video. The latest processing techniques is to have simultaneous record and display.

Storage: Video is also recorded on magnetic tape using a recording head. However, video picture contains very large amount of information and the bandwidth for video is 5.5 MHz compared with 20 KHz for audio.

Output: video tape recording mechanism is also used for playback. Here the heads on the rotating drum read the signal off the tape,unlike in audio. The resulting electrical currents are amplified and then fed into a TV set or monitor for display.

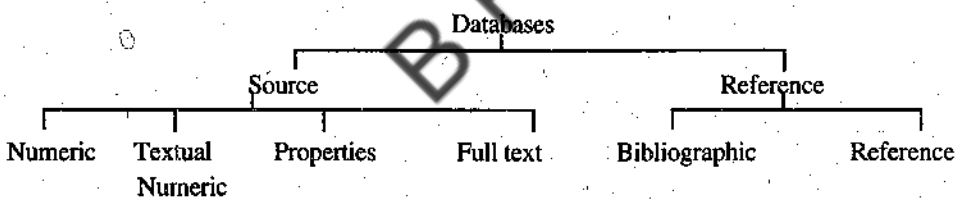
12.6 COMMUNICATION IN THE PRESENT DAY

As you have studied in Units 9 and 10 of this Block, traditionally, scientific information has been classified as primary, secondary and tertiary literature. Since the primary literature has been proliferated, it became difficult to scan the published literature. To alleviate this problem, secondary literature has been used to communicate the items of primary information. But, even the volume of secondary literature has become so high that tertiary literature like union catalogues, guides to literature etc. became necessary.

Further, the exponential growth of literature, interdisciplinary nature of research, international nature of information etc. have an impact on the process of information communication manually, as it cannot provide speedy and accurate access to information. Consequently, the recent trend is to store the scientific literature on a machine-readable form and use a computer for searching the desired information. Here, the information technologies, you have learnt in the preceding sections have been used to develop electronic data bases and search them, from anywhere in the world. Modern information and communication technologies are thus helping the user in not only getting accurate information from anywhere in the world but also at an un imaginable speed saving huge amounts of human time.

Databases: A database is a collection of related items of information or collections of records in machine-readable form that are made available for search using a computer terminal. The records in the databases are normally related to the subject context . Eg: Physics, Chemistry etc. or by the type of publication referred to eg. patents, newspapers etc.

Databases are classified into two groups (6) - source and reference. Reference databases include bibliographic and referal databases which help to identify on article, book etc. or name and address of person or institution respectively.



The bibliographic databases normally give additional subject information in the form of keywords and abstract which helps the user to select a document of his choice. The bibliographic databases may cover a wide subject area like science or a more specific area within that subject like chemical hazards. The general information provided in a bibliographic databases includes Accession Number; Title; Author; Source; Location; Index Terms; Abstract.

Majority of machine-readable databases are bibliographic Eg: Chemical Abstracts, BIOSIS, MEDLARS etc. Source or non-bibliographic or factual databases include numeric, textual numeric, properties and ful-text databases. Source databases are offered by a wider range of producers than bibliographic databases and are particularly important in the fields of business, economics, trade and commerce. The records in these databases do not refer the user to articles, books etc., but retrieve the full information immediately. The source data bases are again divided into four types.

a) *Numeric databases* : Consist of statistical data-presented in the form of tables

Eg. ADP Data Services, I.P.Sharp Associates Info. Ser.

b) *Textual-numeric databases :* Consist of a combination of statistical information and text. **Eg.** Many databases giving company information are of this type.

c) *Properties databases :* Certain information on physical, chemical and mechanical properties of substances and compounds.

Eg: Heilbron databases; The Martindate Extra Pharmacopeia

d) *Full-Text databases :* Provide access to the complete text of documents.

Eg. LEXIS by Mead Data Central contains the full texts of statistics and law reports.

The machine readable databases are used for online search. Besides, many databases are now appearing on CD-ROM format.

12.6.1 Communication with Electronic Databases

With the advent of computerised databases, searching and information retrieval may be done in the following modes, to establish commnication between source and recipient.

In house searching and online searching: In the first type, libraries may acquire their own electronic databases and perform searches in house. With the advent of CD-ROMs, this kind of searching became more popular. In case a library is unable to have its own computerised facilities, the service may be obtained either from database producers or from the other agencies authorised by producers, through online for direct search. The most important component in online access to databases is telecommunication facilities, about which you have already studied in the preceding sections.

12.6.2 Telecommunication Networks for Online Search

The developments in telecommunication technologies led to the possiblity of transmitting digital computer information over analog telecommunication networks. With the advent of this, telecommunication networks acorss the world have been started to transmit high volume of data.

A network is "Concerned with linking together various pieces of computer equipment and system(7)". The aim of networking is to provide end-to-end compatibility so that any terminal can be linked to any other.

Use of networks to transmit information is made possible with the advances in telecommunication technologies. The commhunication to online database can be done in two ways:

i) Using data network; and

ii) Using a telephone network.

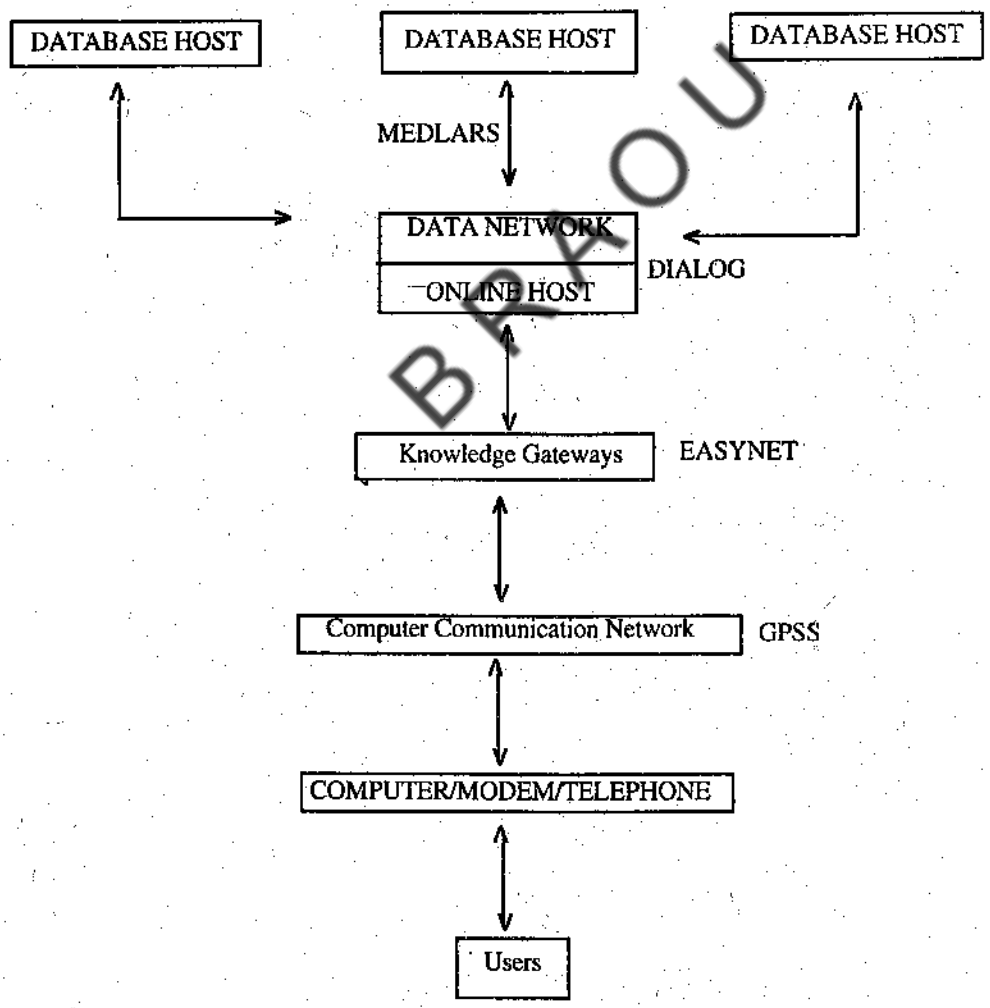
Data networks function in a store and forward manner while telephone networks provide circuit switching access. The store and forward switching can be either by message switching or packet switching. Telephone network is basically analog and the digital information is communicated with the use of modems. However, as access through local telephones is costly, packet

switching data networks have been established to provide cheaper and reliable means of communication. In our country, GPSS of VSNL, Bombay provides a computer-communication network and offers access to TELENET/TYMNET, the international telecommunication networks. These in turn, connect the user to a host of online systems. In order to facilitate access to different databases, some of the coordinating agencies have emerged.

Eg: DIALOG, SDC, DATASTAR, ESA-IRS etc.

Such agencies are called vendors, who have established a large online system, which has been connected to various databases. Such online systems are known as database hosts. Though the database host provides access to a large number of databases, the selection of right databases has to be done by the user himself, which is difficult for him. To resolve this problem, 'Knowledge Gateways' have been established, which plays the role of librarian or information officer. The ' Knowledge gateway' analyses the specific user request and selects the appropriate database and connects the user to the host. Eg: EASYNET.

The following diagram indicates how the user request passes through various levels to access a database online.



Thus the convergence of computers and communications has opened up many exciting possibilities in the field of information communication. However, a noteworthy point is that the

electronic access to information involves cost factor. The pricing component includes system cost, correct time cost, output cost, telecommunication cost.

In India, hundreds of databases have been developed by several institutions, either under NISSAT Sectoral centres like machine tools, leather, food, pharmaceuticals etc., or independently in the areas of their interest as developed by National Institute of Science and Technology and Development Studies (NISTADS) that has developed CLOSS (current literature on science of science); National Institute of Oceanography (NIO) generated a database called 'Oceanline'.

12.7 ADVANTAGES IN ADOPTION OF IT FOR INFORMATION COMMUNICATION

So far, you have learnt various technologies that are being used to transmit information. Now, let us assess what additional advantages have been accrued by adopting to the information technologies (I.T.) over the traditional manual communication systems. The quality of any communication system can be measured with the basic factors such as speed, time, accuracy, integration and economy. Let us elaborate these factor further:

i) Speed

The Library environment is currently undergoing a rapid and dynamic evolution. There are revolutionary changes in communication media (electronic IC, online text, hypertext etc.) as well as in communication methods with increasing demand for networking and resource sharing. The manual methods are so slow that long-delays elapsed between the receipt of the original data and communication of information to the needed points, and hence are less suitable to the present day information environment. The I.T. facilitates transborder information flow at great speed.

For eg: Online, E-mail, Fax etc. According to SS Murthy, in future we may have a single glass fibre of human hair diameter that will allow full text of 40,000 books transmitted over 1000 K.M in one hour. A single optical channel will transmit books @ 1 Billion/second. Further it has also been assumed that transport media in some applications may slight from hardwire to wireless. Then the user can acquire information with faster speeds. Moreover the amount of information processed in manual system is very slow when compared to the megabyte and gigabyte storage and processing capacities of modern communication media.

ii) Time

Time consumed to transmit information is an important factor to evaluate a communication system. The manual methods are time consuming, so that man has had to spend as much time and energy to communicate as has been spent on actual activities. In contrast, the latest technologies offer instantaneous access to information as they function in nano and pico seconds. For instance, if a user wants to have a list of references on his subject of interest, it can be produced manually as well as using I.T. If the list is to be prepared manually, it would involve the scanning of documents, catalogues etc. THe process would take days to months but still the list will not be comprehensive. If the same list is to be prepared using I.T., it can be prepared within no time by searching local, national, regional as well as international databases (which makes the list comprehensive) within few minutes.

iii) Accuracy

The depth of technical processing provides an almost error free information compared with manual methods. Now, more efficient ways of handling and transmission of data has been developed, based on the advances in I.T. Information retrieval by the use of manual techniques has greater chances of false drops because of multi-disciplinary nature of documents. The computer based systems would reduce the number of false-drops considerably and improve the quality of information because search querries can be formulated by using combination of terms, eg: Boolean search technique. Further, they also provide strict security procedures to prevent unauthorised access.

iv) Integration

The manual information transfer has its own geographical and other limitations. However, the application of I.T. helped for transmission of information, for national and global activities, trespassing all boundaries, with the help of networking. One of the effects of network revolution is access to library catalogues from local to international community. It is apparent that a country's ability to compete economically at international level is dependent on its ability to have access to information. With the emergence of networks at different levels, a wide array of activities are taking place across national borders all over the world to better the transmission of information.

v) Economy

Finance is crcial to the execution of an information system either manual or automated. It has been proved, over the years, that I.T. can create competetive advantage, meet the challenge of information explosion, enhance the utilisation of information through resource sharing and networking. The application of I.T. with low cost electronic media and ISDN services will help to have a more economically viable information transfer.

Hence, we can conclude that man needs no longer put up with the disadvantages of manual methods. The I.T. allows him to produce and communicate up to date and comprehensive information with great speed and accuracy.

vi) Storage

Fortunately, technological is keeping pace with the storage and retrieval needs not only at local but even at global level of information emanating from multiplicity of sources and the consequent proliferation of knowledge. Besides the computer, the basic machinery of I.T., these are more compendious packages like floppy discs, magnetic tapes, and compact discs. For eg. the 30 volume set of Encyclopaedia of Britannica is available on a single CD.

vii) Retrieval

Easy Retrieval of information is another important task of Library and Information Science profession with the help of IT information can be retrieved more and more easily. Computers have icons or other pointer-based aids that enable us to call readily to the screen a specific to a key board. Information can also be presented in all kinds of ways impress more readily upon a human mind in its demand for specific information for example the "Windows" in a computer can display several different pieces of information at the same time on a single screen. We have laser and image technics. The advantages of IT are summarised in a poem by Mr. Bill McKechnic:

"Rejoice! Rejoice! The word will be
Transformed by what they call" IT"
Your way of life will be revised,
Every thing will be digitised;and
all that moves and breaths and speaks
Be ruled by digital techniques".

viii) Copyright

This proliferation of technology for information transfer raises legal problems and moral ones - when related to the practices of a bygone age. These problems include copyright, consumer protection, privacy of data, subsidies and printing policies, standards etc. International standards and norms for information transfer and use should evolve in order to protect intellectual property rights.

12.8 LET US SUM UP

In this unit you have seen the innovations in computer technology and communication technology. These advances have brought in major changes in information communication. The data is being stored on electronic media in the form of database and the retrieval is made possible either through online or offline using computers and communication links. The Audio/Video technologies have supported the process and facilitated to achieve sophistication. These technologies have paved the way for electronic access to information and for the development of new information products and services like E-Mail, Electronic Bulletin Board, Video text/Teletext etc.

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12.10 ASSIGNMENT

1) Define Information Technology and describe the technologies you have seen so far.

2) Diagrammatically represent the process of data transmission from one computer to a remote terminal.

12.11 RECOMMENDED BOOKS

CARTER, Roger. *The information technology hand book.* Heinemann, 1990.

ROWLEY, Jennifer. *The basics of Information Technology.* London: Clive Bingley, 1988.

12.12 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Describe the latest developments in telecommunication hardware technologies.

2) Discuss the role played by electronic data bases in commu nication of information using information technologies.

II. SHORT NOTES

a) Data Communication

b) Communication Software

c) Copyright

BLOCK - IV : INFORMATION AND SOCIETY

Information and society are interrelated and mutually dependent. A group of individuals coming together sharing their information (ideas, views, expressions, etc) constitute a society. Communication is the means for such an interaction. Society in turn generates information to achieve common welfare and collective good.

This Block covers the areas of use of information by society to achieve development and progress. For better results in the use of information and consequential development of the society and the nation two things are essential;. One, each nation should have its information policy; and two. a section of the society will have to be trained to systematically gather, process and disseminate information to achieve optimum use of generated information by the society.

Unit-13 deals with the role of information in economic development and social change. It also describes the social implications of information like privacy, restrictions and transborder flow of information and the right to information. The upcoming information industry with marketing of information is also narrated.

Unit-14 studies the use of information by different sections of the society like scientists, industrialists, academics, technocrats, common people, etc. The needs of the users and their information seeking behaviour is described. The concept of Information Society is also explained.

Unit-15 speaks about international and national information policies in UK, USA, etc. and stresses the need for effective national information policy for India. International agencies like UN, UNESCO, FID, IFLA are playing prominent roles in working out international information systems.

Unit-16 narrates the evolution of information science from its early origins as the art of safe custody of recorded materials in a library. Societal use of information to optimum levels can be achieved through well planned training and updating of professionals who act as the mediators between information and its users. Professional ethics plays a paramount role in information dissemination.

UNIT - 13 : INFORMATION AND DEVELOPMENT

Structure

13.0 AIMS AND OBJECTIVES

This unit introduces you to the role of information in the development of a society. It also aims at acquainting you with the concepts of information industry and the marketing of information products and services.

After reading this unit you should be able to

- define the terms information and development
- discuss the role of information in development
- explain the upcoming field of information industry
- describe the various aspects of information industry and the services
- explain the need for marketing of services and products in libraries.

13.1 INTRODUCTION

Information is the concrete manifestation of knowledge. Knowledge being the key for all human progress, hardly any effort is needed on our part to appreciate that information has been is, and will continue to play the most dominant role in any meaningful progress or development of civilization.

Now we are living in a world that thrives on the access, distribution and use of information on which economic, political and social environment of any country depends.

13.2 DEFINITIONS AND SCOPE OF THE TERMS

13.2.1 Information

Information has been already defined in the previous units with its characteristics and implications.

13.2.2 Economic Resource

Assessment of direct benefits of information input in monetory terms is a somewhat difficult task. However, indirect impact of information helps in acquiring, storing and retrieving, conserving and investing other resources like money, materials and men more efficiently, economically and effectively. It also helps in disposing of those unneeded resources and wastage.

13.2.3 Development

Development means the process of bringing to a more advanced or more highly organised state; to evolve; the process of advancing through successive stages to a higher, more complex, or more fully grown state.

Development of the individual or group or society as such can be noticed through improvements in social, cultural, economic industrial, political conditions. In other words the crucial role that information plays can be gauged from the vast area of human activities in which it finds applications that include: growth of knowledge and wisdom, decision making and management, research and development, manufacture and industry, education and training and academic writing.

13.2.4 Social Change

Social change means alteration brought into the way of social living and behaviour of individuals and social groups in the society. There are numerous factors causing social change. Social, cultural and educational reforms, impact of westernisation, urbanisation and industrialisation, changing government policies, certain environmental conditions are some of them. They influence the individual and group behaviour in the society constantly.

13.2.5 Decision Making and Management

Decision Making is one of the major activities of management. The activity of decision making consists of three major phases: intelligence, design and choice. All the three phases are interrelated.

The first phase i.e. intelligence consists of searching the environment for conditions calling for decisions; it is synonymous with problem recognition.

The second phase i.e. design phase consists of inventing, developing and analyzing possible courses of action.

The third phase, i.e. choice consists of selecting the best course of action and implementing it.

Manager as a decision maker during the three stages should have information related to the set of alternatives to solve a problem and the consequences or outcome of each alternative; information related to method which allows him to make a preference ordering of the alternatives; finally he needs information to assess the impact of the choice made for later feedback and assessment.

Management requires correct and timely information to make effective and timely decisions for reducing the uncertainty and risk related to the problem solving activity.

13.3 INFORMATION - SOCIAL CHANGE

Social and cultural development and process of the individual and in turn the society is possible only because of the existence and awareness of knowledge created in the past. Knowledge passed on to us from past generations, cultures and societies reacting with the present minds creates new knowledge.

The basis of knowledge is information. Information which is the result of a meaningful response to a stimulus,when correlated, synthesized and stratified during the course of time

becomes knowledge. Knowledge applied and tested over a long period of time by a continuous stream of minds resulting in its acceptance as truth becomes wisdom.

Thus, wisdom is a part of human heritage. Of course, wisdom once accepted need not be valid at all times and to all societies; it could differ from culture to culture, and from age to age. By subjecting a body of information or knowledge over a long period of time to experience, testing and thinking, knowledge may get extended, modified, created or altogether discorded, thus affecting wisdom and society.

Culture is a term used by social scientists for learned ways of acting, feeling and thinking, rather than biologically determined ways. The term civilization is similar, but it refers mostly to scientifically more advanced ways of life.

Knowledge gained and accumulated through generations can be noticed through evolutionary development of different tools and things like development of tools, introduction of new methods of forming, growth of cities paving the way for cultural exchange, development of writing etc.

For example, if we examine the evolution of writing skills, it ranks as one of the most important steps in the growth of human culture. The first system of writing was developed about 3000 BC in what is now Iraq. Others developed in China at about the same time. Writing enabled people to record their thoughts and discoveries for later use and to communicate over long distances. They also began to record aspects of their culture and to hand it down in written form from generation to generation.

As mentioned above, information in the form of knowledge passed on through different generations reflects its power as developments made both in materialistic culture e.g. tools, buildings, technologies etc., and non-material culture e.g. social groups, language, personal skills etc. All these improvements and changes are nothing but the representations of impact of information on the sociocultural development of individuals as well as societies. Many authors and scholars expressed their views on information as a social resource not an article of merchandise. This ideology has been discussed in detail through the following discussion.

a) Information is a social right, a social function. Its aim is to make people more aware to give them full understanding of the economic and political dimensions of their problems on both the national and international planes and of their ability to participate in the decision making process.

b) If information is accepted as a social resource, it follows then that access to information should be the right of every human being. The right to information must embrace all kinds of information and not merely access to pedagogical or technical expertise. This applies to information produced within the country as well as without.

c) The Mac Bride Commission on New International Information Order (NIIO) visualised the social role of information in terms of three objectives:

i) **Socialization** : That is the provision of a common fund of knowledge which would enable people to function as effective members of the society in which they live

and which fosters social cohesion and awareness, thereby permitting active involvement in public life.

ii) **Motivation** : By promoting the immediate and ultimate aims of each society and the stimulation of personal desires and aspirations; the fostering of the individual or community activities geared to the pursuit of agreed aims; and

iii) **Integration** : Providing all persons, groups and nations access to the variety of messages which they need in order to know and understand and appreciate each other's living conditions, viewpoints and aspirations.

Information is power. Its distribution tends to divide the society - global or native - into the information-rich and the information-poor, and is the cause of other inequalities economic, political, social.

At the international level, a free flow of information between the information-rich and the information-poor can lead toward a New International Information Order (NIIO).

13.3.1 Information Role in Education and Training

The essence of education is the imparting of knowledge, which in a way is same as transfer of information, primarily through a teacher. Many changes are seen in recent years in the teaching and learning process. To encourage mass education distance education programmes have been introduced. In the place of teacher, different types of substitutes with the help of modern technologies and methods have been introduced. In this context, the importance of information is much more on newer media of communication and self study than on the teacher. Training on the other hand is concerned with equipping an individual to do a job, i.e. transfer of information/skill pertaining to the job through practice.

Academic Writing and Publications - Role of Information: Besides formal and informal education programmes, a person involved in academic profession, needs real effort in the form of personal publications and research for academic development. Writing, apart from its value to others, is a form of self expression, which provides immense psychological satisfaction to the writer. Unless one has access to information, academic writing suffers, thereby affecting the growth of theoretical knowledge and education.

13.3.2 Economic Development and Information

Information, no doubt is considered to be an important resource now-a-days. Not only that but it also helps to mobilise and to exploit other resources like money, men and materials.

Information is needed to keep track of funds, their inflow, their outflow, return on investment streams, the calculation of management and business ratios, raising funds, issuing stock and a myriad other functions. Information systems are needed for keeping track of general ledger accounts, payrolls, accounts receivable and payable, and so on. Information sources need to be tapped to monitor the stock, financial commodity and future markets, foreign banking and market activities, government fiscal and monetary activity, import and

export trading, and so on. Information services are needed to translate, analyze, compute, interpret, advise, photocopy, print, edit and deal with the endless financial information management tasks.

In the same way, information is required to keep track of human resources, "from birth to death" including selection, recruitment, promotion, training, reassigning professional and career enhancement, performance evaluation, and retirement. Information systems are needed to keep track of personnel classified by occupational skill category, salary, wages and benefits, entitlements, health benefits, safety records and so on.

Information sources need to be tapped to keep up with job applicants, prevailing personnel management practices, industry labour standards and guidelines, safety and security matters, government regulations, and so on. Information services are needed to advertise, for job placement, for interviewing, for record keeping etc. Finally, information is needed for property, plant and equipment *management. What is plant and equipment* but in idle, depreciating asset if we do not have information resources to support the tasks of production control, inventory control, property management, space planning, replacement scheduling, amortization schedule, mortgage lending and so forth.

Businessmen do not often think of information itself as a factor of production. But in brief information transforms the other resources by:

a) conserving those resources
b) acquiring those resources in the most efficient and effective way
c) storing and retrieving those resources economically
d) investing those resources prudently and
e) disposing of those unneeded resources when they have outlived their usefulness

In short, information must come to be seen as a factor of production, not just a factor of consumption.

13.3.3 Information for Research and Development

The research assumes an explanatory model of the process of innovation. Innovation proceeds from a conception / ideation stage through research and development to an engineering/production / marketing phase that terminates the process of innovation with the introduction into the market place of a product or service. At each stage of development of a product/ service input of information is a vital factor for different tasks to be completed.

Some of the basic features of scientific research are invariability, i.e. being verifiable; openness, i.e. available to all those who can make use of it; relatability i.e. an inter and intra-relationship of subjects; applicability for material development; growth i.e. capable of further extension of frontiers of knowledge. Communication is common to all these features and information constitutes a vital input.

Moreover a major impetus to scientific research comes from manufacturing industry which applies the results of research to production of goods and development of a new product. Innovation is the cornerstone around which an industrial enterprise survives today and can cope with competition. Innovation is possible through access to latest information and its transfer into physical products and processes.

With the advancement of science and technology and its impact on the weapons development, the defence research and development has become a major concern to all countries. Information resources form a vital component of the infrastructure needed to support,develop and exploit defence research and development. Supply of information for management decision making, patent and specification framing, technical coordination and liaison, technology transfer for civilian use, reporting to government and public is an essential factor in defence research and development.

13.3.4 Information as Political and Policy Instrument

Almost all the countries in the world have one or other kind of complex network of social and political relationships. Individuals have a range of entitlements, rights, responsibilities and duties. They need to be well-informed about these and about the communities in which they live. Without adequate access to information people cannot play their full role as citizens of a country, nor can they take advantage of the benefits which citizenship can offer. In other words, without information there cannot be effective participation in social and political life.

Furthermere, the long-stability of any democratic set up depends on the successful operation of social systems and political institutions. Governments are bodies which are involved in policy making regarding the welfare and developmental activities in the society. Policy refers to the course of action to be taken to meet a particular situation and methods to be adopted to achieve the expected goal. For making policies governments and different managements also need information related to the complex native of social, cultural, economic, educational and political requirements of the people they are governing; available resources; and methods of their proper utilization; rules and regulations governing the supply and use of the resources; external and internal factors exercising influence; the formulation and implementation of policy decisions etc. Even policy making bodies can not function effectively unless people are well informed about the issues that affect them; are capable of showing the difference between the fact and opinion; and are in a position to make value judgements based on an understanding of the issues.

i) Information as an aid in Planning

Planning is the most important functions to be performed by the management of any organisation. Basically planning is the process of determining the ends (objectives) to be accomplished and the means that will be used to achieve such ends. Steiner distinguished the information needs of management for two levels of planning viz strategic planning and tactical planning. The information required for strategic planning is related to and derived from the areas of knowledge outside the organisation. These include information about competitors, future technology, economic developments affecting market conditions and allied matters etc. On the other hand the information required for tactical planning is mostly derived from the internal data generated by different units and individuals of the organisation.

Information is also an important factor in planning industrial investment as pointed out by Mc Donald. Usually the company needs information related to markets, technological factors, financial factors, organisational factors, personnel policies and competition.

ii) Information in Decision Making and Management

All the voluntary actions are the results of decisions taken by an individual or a group. To be able to make a wise decision one should be aware of all the facts concerning

the situation or the problem pertaining to which decision is to be made. Experience, further analysis of the situation and judgment also help in decision making. Information both internal and external on all aspects of the problem under consideration, will minimise the risk involved in implementing a decision.

Jackson diagrammatically has shown the importance of information in decision making in Fig. 1.

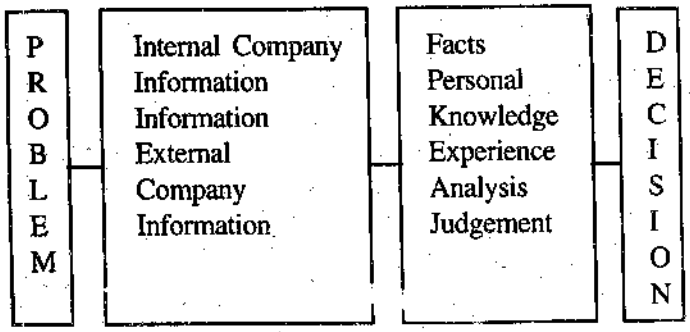

Fig. 1. Process of Decision Making

Information input for better decision making in all sectors and at all levels of responsibility, definitely a key factor in the allround development of a nation. In the words of a well-known economist, D. Lamberton " in a world... where the firm is obliged to make unique and crucial decisions to optimize and to innovate, the taking of such decisions puts a premium on information; its acquisition, storage and utilisation become a major business activity".

The contribution of information for policy decision making for national welfare cannot any longer be doubted. Strengthening national, regional and local information systems increases the flow of information available for development officials or policy makers. Developing countries have to recognise this as a priority task.

13.3.5 Social Role of Information

Socio-economic transformation is not just confined to a single country. In the current context of inter-dependent world the challenge transcends all geographical barriers. Rightly placed is the recent emphasis on the evolution of a new International Information Order. There is indeed need for a change that makes the world less unequal and more just and for a world, based less on power and status and more on justice and contact. New International Information Order is a natural compliment to the New International Economic Order, which emphasizes the need for international cooperative programmes aimed at restructuring the existing economic order. Nations, big and small, rich and poor realised that prejudiced, distorted and biased information transmitted by trans-national agencies was abridging their right to information and to be informed. Towards this end all nations together are working cooperatively to bring a new Information Order which shall and will lead to a decolonisation and democratised mode of communication of information.

Decolonisation and democratisation of information refers to the establishment of proper communication and information infrastructural facilities between inter and intra-nations to

facilitate the free, better, balanced and wider dissemination of information irrespective of the global size or wealth of the nations. In a healthy democracy people should not be merely passive receivers of information. They should also be active participants in the process of determining priorities, in the taking of decisions and their implementation. Different types of information centres and channels along with mass media are the important means by which people can be urged and enabled to participate in this process such participation is their right and 'Right to know' is part of this right .

i) Right to know/ Right to Information

The Right to know is as central to any rational being as the right to live. Freedom to differ is one of the fundamentals of democracy and honest and responsible difference of opinion is possible only if the right to receive and impart information is considered a fundamental right in every social system. In a democratic system wrongs can be corrected more easily and more peacefully than in any other system. Moreover, knowledge is effective only if it is easily understood by the common people. That is why the provision of information to the user in a suitable format, level and medium is a must for the proper use of the Right to Receive and Impart knowledge and information.

ii) Free Access to Information

The international information transfer can be defined as the process and systems that promote the flow of information from creating or generating nations or organisations to other nations or organisations. The two main issues involved in the international information transfer are trans-border data flow and the question of free access to information. Free access to information has two main components: information transfer and information policy.

You can have detailed account on information policy matters from Unit-15. A brief note on need for international information transfer, agencies that effect transfer of information and Trans-border Data Flow (TDF) is given in the sections followed.

iii) International Information Transfer

We have already pointed out (13.3.5) how different nations especially developing nations felt the need to have access to free, better and correct information without any inbalance and bias showing differences between nations poor and rich, big and small, developed and developing. In order to facilitate such access great efforts are being continued in dealing with the problems of information transfer by many international agencies inter governmental organisations and national governments.

Agencies involved in the International transfer of Information:

Over the last forty years the role played by inter-governmental organisations (IGO) in information transfer mechanism is remarkable.

Free information transfer should exist between the following agencies:

1. Government to government
2. Private to government or Government to private
3. Private to private

Both Central and State governments along with their legislative, executive and judicial branches have a great role in making policies governing national security control over

information. Such controls are more rigorously exercised over scientific and technological data, data of sensitive military nature or information critical for trade and business considerations.

Private sector organisations are usually more keen on maintaining secrecy over the proprietory information to compete with others in the market and for making more profits in the business.

The above said factors naturally create obstacles to free flow or access to information for developmental activities in the case of developing nations. As a result the world is experiencing a new problem i.e. "Global threats to information".

iv) Transborder Data Flow (TDF)

The information transfer across the national boundaries from one nation to another nation through an established system of international information transfer policy can be termed as the Transborder Data Flow (TDF). It is made possible now-a-days by the convergence of computer and telecommunication technologies which have facilitated the transfer of machine readable information across national boundaries with unprecedented speed and accuracy. Gassman has identified three overlapping stages in Transborder Data Flow:

1) Privacy and Data Protection leading to Data Protection/Privacy legislation.

2) Business communication and economic data emphasis on the technical financial and legal conditions, surrounding the use of TDF; and

3) Trade in information services influenced by the enormous growth of electronic information services.

To cope with the issues raised above, the national policy should be supported by a number of activities like national and transnational data network connections, trans-border data, data services especially processing and retrieval and registration agreements on information technology transfer. A number of appropriate international bodies like OECD, UN and UNESCO are showing concern over these issues. The OECD has produced a set of guidelines on the protection of privacy and the TDF of personal information. Inter governmental organisation's information systems working under UN have been very responsive to various problems of information transfer and trying to fill the gap between information-rich and information-poor nations.

13.3.6 Information Industry

Many times people respond to the introduction of the concept of the " information Industry" or "Information Economy" by saying "oh, you mean the computer industry". The significant influence of the computers in the information revolution makes this an understandable response.

Anthony Oelfinger developed a map of the information industry based on the relationship of various parts of the industry to computers. In his definition of the industry he placed the computer at the centre of the map and arranged the other elements around it moving from the left side of the map which he designated 'conduct', to the right side, which

he called 'content' and from the top, which he called the 'products', to the bottom, which he called 'services'.

Another version of information industry map was developed by Larry Day. His map is divided into eight segments, each arbitrarily of the same size (Fig.1) Reading in clockwise direction around the map and beginning at the one O' clock position, the map includes:

1) Content services
2) Content packages
3) Facilitation services
4) Information Technologies
5) Integrating Technologies
6) Communication Technologies
7) Communication channels
8) Broadcast channels

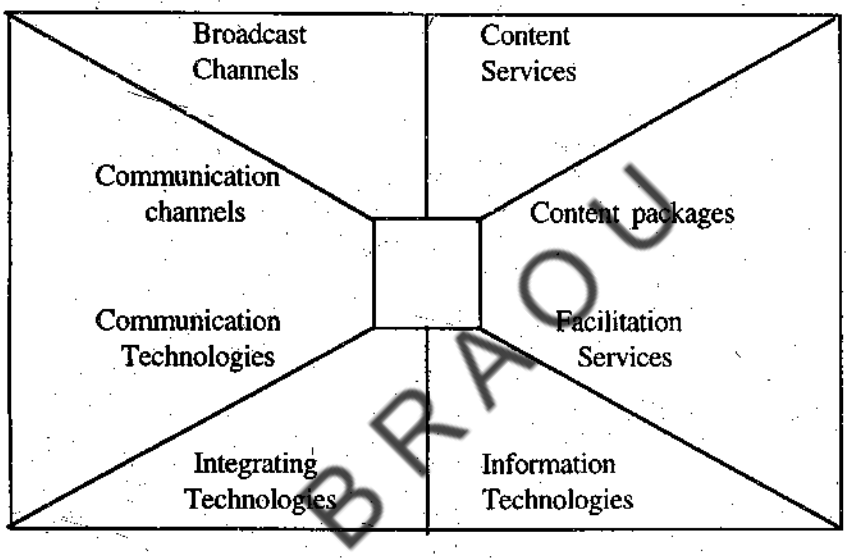

Fig.1 : Information Industry Map

13.3.7 Characteristics of Information Industry

Before examining different segments of information industry one must understand the characteristics of the information industry and business. Basically information industry deals with screening out of irrelevant information to current concerns for satisfying individual and organisational information needs. This in turn leads the information company to develop a number of distinctive characteristics or attributes. They are

1) Information companies create their own products

In contrast to traditional book sellers, information companies create their own products. Many information companies do rely on outside sources for their raw material, but in the process of adding value to these data they make them their own. Although copyright is generally considered on author's statuta, considered as an author's statutory right it is used by traditional publishers to create a proprietary position on which the publishing and marketing investment can safely be made. In contrast, it is the information company itself that has a

legitimate claim to a copyright for the author functions it performs in adding value to information.

2) Information Companies maintain close End-User Relations

Unlike publishing trade, the information company works closely with the people who actually use the information product or service being provided. This relationship creates a key role for the customer service people who are expected to translate user needs into product enhancements and new product ideas. This characteristic of information companies results in the implementation of criterion-3:customization of products and criterion-4: flexibility in delivery media.

3) Information products are customized

Maintenance of close user relations lead directly to a process of customizing the information service provided. The product is often delivered in "custom" packaging whether or not it has been customized in all aspects. In addition, customers will seldom find information products on a discount table. Producers and users of information alike know that out of date information is "disinformation" and cannot be discount priced.

4) Information Companies are Media independent

An information company must either media independent or use a multimedia approach. Once the information product is marketed, numerous applications for the content of the product will quickly become apparent. In order to compete in the market, information company follows alternate media forms of providing information to satisfy customers' needs. In other words in order to satisfy the need for information in required, suitable format, information industry may offer other media forms like magnetic tapes, floppy discs, compact discs etc. besides the printed format.

5) Information products are decision directed

While designing the information product or service, the information company mainly puts emphasis on the relevance and value of the product for the decision making process of the user. So information company products are decision oriented. Information companies recognise the principle that users need information, not for its intrinsic value, but because it assists them in making sound judgments.

6) Information companies price on the basis of benefits provided

Pricing of information is based more closely on what it would cost the end user to reproduce the product than on a prorata share of the cost of producing the information. This factor distinguishes the information company from the publisher since the publisher, when marketing its product, anticipates or forecasts a sales volume, packages and promotes the product to appeal to as wide a market as feasible, and calculates price on some multiple of each volume's "first-copy cost". The information company in contrast, prices the product on the basis of what benefit it will bestow on the end user.

7) Information companies are repositories of what is known or knowable

A seventh criteria by name of the information content companies is identified as a repository of what is known or knowable about a given area of business or human activity.

8) Information companies perceive their product to be Information

The essence of information company activity is one of perception. If the information company recognises that its basic product is information content, that firm is in the information industry whether or not it meets any or all of the above criteria. If the perception exists, the pattern of behavior is sure to follow.

While concluding on information industry we can recall some of the important points. Information industry is a part of infostructure of a country. Infostructure is a play on the word infrastructure which is defined by using a map of the information industry to show the interrelationships of eight industry segments: content service, content packages, facilitation services, information technologies, integrating technologies, communication technologies, communication channels and broadcast channels.

The integration of the infostructure holds great promise for the future and for the development of sound economic, social and political institutions.

Anyway, a proper balance must be maintained between the concept of information as a commercial commodity and the need in a democratic society to make information as widely and openly available as possible.

13.3.8 Information Industry Segments

Now we will examine each segment briefly.

a) **Content Services**: News services, databases (electronic and otherwise), indexes, libraries, information brokers, database distributors, and video tex appears in the content service segment. Two services _ newsletters and looseleaf services overlap both the content services segment and content packages segment.

b) **Content Packages**: In addition to newsletters and loose leaf services, which are in both categories; Day includes in the content packages segment newspapers, magazines, books, directories, films, reports, records, tapes, micro publishing and videodiscs.

c) **Facilitation Services**: The business activities included in facilitation services fall into four close-to-the-information-content group categories:

i) The processing of other people's information: time sharing and service bureaus

ii) Transaction processing: banks, electronic funds transfer

iii) Turnkey Services : Software Services, systems design, facilities management

iv) Targeted Services: Conferences, management consulting, market and business research and advertising.

Of the above categories facilities management, conferences, management consulting and market and business research earn most of the revenue of the industry.

d) **Information Technologies**: The businesses that are included in the information technologies segment of the map are data processing, computers, terminals, office equipment, microforms, business forms, and printing and graphic equipment. These are the items with which the information age is most readily identified.

These information technologies have raised today's civilization to a new plateau of human achievement, resourcefulness and literacy. They have given us the means to capture and manipulate the vast and complex information resources to lead us to a renaissance - like out powering of new human capabilities.

e) **Integrating Technologies**: Day identifies several technologies that are neither information technologies nor communication technologies. He places packet switching, modems, digital switches, facsimile technologies, and switch boards between the information and communication technologies segments, with switch boards on communication technologies border in the map. These technologies are critical to the process of pushing back the boundaries that limit the communication of information packet switching, for example, has opened up the whole database electronic publishing market.

f) **Communication Technologies**: The category of communication technologies can be divided in two parts. The first includes the on-site reception equipment: radios, television sets, videodisc players, and telephones; and the second addresses the equipment used in point - to - point communications : transmission systems, mail equipment, and the like.

g) **Communication Channels**: This segment includes surface delivery of physical objects as well as wired, wireless, and satellite channels for communicating information equivalents or messages. Fundamental to providing access to remote stores of information, these channels are increasingly moving towards digital transmission. The channels offer one-to-one, one-to-many, and many-to-many communication opportunities worldwide.

h) **Broadcast Channels**: These channels include radio and television networks and broadcast services, multi-point distribution sources and teletext. Simply listed together, these make up a major portion of the ways people find out about the world around them.
While concluding we can notice that today all those who are concerned with information are overwhelmed with the availability of information and are facing difficulty in tapping the right information at the right time. Even these people have realised the concept of selectively buying information and accessing it through a computer and telecommunication link. It has given scope for entirely new type of industries having information business which are called as information industries.

There are many organisations both in India and abroad which are engaged in the information Market. To name a few of them are Mc Graw-Hill, Renters, Dun & Bradstreet, Institute for Scientific Information from abroad and in India Informatics, Bangalore, Technology Information Forecasting and Assessment Council (TIFAC) set by DST and ICICI subsidiary Technology Development and Information company of India (TDICI).

In India the information industry is still in its infancy and it requires proper marketing of its products and customer education. It should build product awareness among early

adopters such as researchers, business men and policy makers and use heavy sales promotion to entice trial.

13.4 MARKETING

The term "marketing" is often synonymously expressed with selling advertising and promotion among the non-marketing academicians and professionals. But these constitute only a few of the whole gamut of activities associated with it. The principal component of marketing is a responsive attitude to the needs of the organisation's clients or customers. In other words, the organisation objectives are defined in terms of the attainment of goals related to customer satisfaction.

Definitions:

"Marketing takes the focus of the product and puts it on user needs. Products are developed from user's point of view and not the producers" (Kotler et al)

"Marketing is planning that focuses on products, place or mode of delivery adjustment of cost/price to the market and promotion to specifically targeted segments of the special libraries market". (Zaehart & Williams)

"Marketing is the process of creating value through the creation of time, place and form utilities" (Goldhar)

Application of marketing techniques and concepts once considered to be exclusive to the domain of profit-oriented organisations is now being increasingly used in the non-profit sector. The basic model of marketing is based on the exchange concept. A process occurs by which two parties freely give something of value to one another to satisfy some of their needs and wants". In this model goods or tangible objects are exchanged for money.

Later, Kotler and Levy broadened this concept of marketing by including the intangibles. In terms of this broadened concept library services and products are included so that an exchange takes place whenever something of value - whether money, goods, or information, is offered for something else in order to satisfy a need. Library and Information centers offer books, periodicals audio-visual materials, other services in return for user time and attention.

But the task of marketing for non-profit organisation is different from business oriented organisations in the following ways.

Marketing Concepts / Techniques

The marketing programme of any organisation encompasses various actions and policies. There are four major steps which can be broadly discussed under the following concepts.

I) Market Research and Analysis

Market research is essential to effective strategic planning. It is an investigation of current users and client bases as well as potential users and markets, plus the evaluation of

current services and products. The tools for marketing research can be drawn from the research methods applicable to social sciences - observations, surveys, consumer behaviour research. The information generated from the analysis from these findings can be put effectively in planning, designing and implementing the overall marketing programme.

i) A non-profit organisation has two constituents of transaction; the donor (funding source) and the consumer (customers) and the former may not be the same and only group that consumes the organisation's product and services. By contrast a profit motivated organisation has a single marketing constituency - "the consumers".

ii) An interesting consequence of this is that not satisfying the client's needs does not ensure a financial doom for non-profit organisations or consequently satisfying client needs might not necessarily increase the financial support whereas, for a business-oriented firm customer satisfaction will lead to rise in sales which in turn provide funds to continue its business.

iii) Sales volume and profitability are the two key parameters that help to measure the marketing performances for a business firm, whereas "success for a non-profit organisation is measured in terms of how well it meets the needs and wants of the clients".

II) Market Segmentation

Market segmentation is not opinion surveys studying usage behaviour, information gathering habits but it is a process of dividing the total market for goods and services into several groups so that each member of each group is similar with respect to the factors that influence demand." Basically, it is a marketing effort that determines the market potential for each and every product offered by the organisation. It is an important step which identifies the actual and potential market base for the organisation's products and services.

III) Marketing Mix

According to Kotler, marketing mix is a set of controlled and tactical tools that the firm blends to produce response it wants from the target markets. It is a set of four variables or tools popularly known as four P's which provides a good framework for matching the wants and needs of users with the marketing programme of the organisation. The four P's are:

a) Product
b) Price
c) Promotion
d) Place

Product is an ingredient which is produced by all organisations. The broadened definition of product which included the intangibles has been crucial in extending the concept of marketing to non-profit organisations. In the context of library and information services. The range of product may arrange from book, periodicals, audio-visual materials to traditional services like circulation, inter-library loan, reference etc.

The marketing programme using this ingredient would include decisions regarding designing and introducing new products, amendments / modifications to existing products or elimination of products and services which are not in use.

The tool of price has always been mixed in controversy in a non-profit environment of library and information centre. Traditionally library and information services are offered free of any charge. But the impact of information technology, rising costs and political philosophy favouring privatisation is forcing the managers, administrators and policy makers to review the policy of free services and initiate pricing policies for products and services. Pricing models are borrowed from other descriptives and their suitability, applicability is being tested to library environment.

Place is when and where a service or product is made available to the users. This tool is usually expressed under the subheading "Distribution". Library building was the sole outlet for users who were expected to seek services by visiting it personally. But the computer and communication technological aids have opened the doors for multiple access. The strategy involving this tool would be mainly concerned with studying the factors/ barriers which affect the distribution channels for all products offered by the organisation.

Promotion is the only concept that has been widely practised by library and information professionals. Public relations, advertisement, personal contacts, brochure, workshops, newsletters are all various forms of promotional activities that can be undertaken by library/information centers. It is an effort by which the target groups are informed about the services and products offered by them.

IV) Marketing Audit

Marketing audit evaluates the marketing programme once it is in operation for sometime. The evaluation can be in relation to the objectives of the marketing programme, the overall performance of programme, the appropriateness of distribution channels, the impact of promotional methods etc.

13.5 INFORMATION SOCIETY

The society was categorised as 'agrarian', and 'industrial' The present society is termed as information society in a general manner as it denotes the transformation of society in the information context. The society could perhaps be also called as 'scientific' or a 'high-tech' society, however it would be somewhat narrow for the kind of social change that is implicit here. Evolution of this type of society had been anticipated for over 30 years back. The best selling American Naisbett was of the opinion that the transformation from industrial to information society began in the 1960s based on his own observation of events in the American society.

The significance of information has been realised by the modern society. With the advent of information technology the total outlook of the society has been changing. People began predicting a great future for information. They feel that the industrial society will now be replaced by the 'Information Society'. Alvin Toffler in his *Third Wave* prophesied the nature and shape of a society fully influenced by information. Tom Stonier's *The Wealth of Information* (1983) brings in parallels and contrasts between industrial society and information society.

Masuda (1982), a Japanese author says that "the information society will be a new type of human society, completely different from the present industrial society". He is also

known for creating the term *Computopia* (means `automated state') in which every thing is controlled by computers. He laid down a framework for society based upon innovative technology, socioeconomic structure and values.

Nora - Minc Report in France has envisaged a link between converging telecommunications and data processing technologies and policies for social and economic development. The European Community's *Forecasting and Assessment in Science and Technology* (FAST) programme on the information society recognised the interplay between techno-industrial and social issues.

13.5.1 Definition and Meaning

Several authors defined Information Society each viewing it from a different angle.

William Martin (1988) defines Information Society as a society "at an advanced post-industrial stage, characterised by a high degree of computerisation, large volumes of electronic data transmission and an economic profile heavily influenced by the market and employment possibilities of Information Technology".

Manfred Kochen (1983) says that "an information society is a stage in the evolution of community brains", towards a "world brain". He observes that a society in which information rather than material flows constitute most of its `communication and control' exchanges. In such a society the following features can be seen -

a) most members generate knowledge by knowledge-based procedures that are knowledge-intensive;

b) information consistently reflects basic social invariants

c) reason and human values rather than strength and expediency manage conflicts between pressures to conserve invariants and pressures for adaptive change;

Blaise Crain defines Information Society as "one in which labor has been intellectualised; one in which the expression `to earn one's daily bread by the sweat of one's brow sounds decidedly anachronistic".

13.5.2 Characteristics of an Information Society

Thus, the essential features of an information society are :

a) an increased awareness of the value of information;

b) recognition of information as a resource and an increasing dependence on information for its exploitation;

c) information workers replacing industrial workers and labour;

d) increasing use of information technology; government support to enabling technologies of computing, micro electronics and telecommunications;

e) transaction of vast quantities of information, through communication satellites;

f) electronic offices aid in the home-delivery of computer based information and entertainment services;

g) emphasis on research and develoment activity;

h) an environment characterised by information conscious-ness, development of information sectors or economics and emergence of information related goals and values;

i) information-intensive products and services communicated through a wide range of media, many of them electronic in nature;

j) much taking about future rather than current development.

Cawkwell (1986) is of the opinion that "the prerequisite for an Information Society is a telecommunication based information service infrastructure, which gradually builds up until at some point a critical mass of terminal users will be connected to a more or less universal network".

Garfield defined an information society as a system "characterised by the fact that the rapid and convenient delivery of needed information is the ordinary state of affairs".

An information society is a society at an advanced stage of development where there is a very high degree of computerisation. With information technology playing a dominant role the information services in such a society is telecommunication based. Services in such a society are information based and the workforce is a dominant group of information professionals. The living standards, patterns of work and leisure, the education system and the market all influenced by advances in information technology. In such a society information is central to social development and access to information to everybody is almost guaranteed.

13.5.3 Criteria for the development of an Information Society

Martin (1988) has recognised the following criteria for the development of an information society.

Criteria	Characteristics
a) *Technological criteria*	IT as the key enabling force. Widespread diffusion of IT in offices, factories, education and the home.
b) *Social criteria*	Information as an enhancer of the quality of life. Wide- spread information conscious ness and end-user access to high quality information.
c) *Economic criteria*	Information as key economic factor as resource, service, commodity, a source of added value and employment.

d)	*Political criteria*	Freedom of information leading to a political process chara-cterised by increased partici- pation and consensus.
e)	*Cultural criteria*	Recognition of the cultural value of information through the promotion of information values in the interests of national and individual development.

13.5.4 Emergence of Information Profession

The erstwhile librarian as preserver of books and documents has slowly evolved into an 'Information Scientist'. But Information scientist, perhaps may not be the suitable term because average librarian's job is not that of research and investigation into the nature of knowledge and its ramifications. It will be sufficient if the librarians is having some peripheral knowledge about it. An alternative term for the librarian therefore is the 'Information Professional'.

Many feel that with the advent of 'Information Society' present day libraries and information centres slowly loose their significance. 'Info-business' or marketing of information is already on the anvil. Charging for information services rendered is being slowly accepted even in centres where it was not the case. 'Information Economy', 'Information Industry', Information Professional', 'Information Workforce' and similar terms are gaining ground now.

Information Profession is the body of people engaged in the generation, collection, codification, storage, retrieval, manipulation, management, dissemination, packaging, evaluation and marketing of information. Organisation for Economic Cooperation and Development (OECD) categorised the information professionals as i) Information producers, ii) Information processors, iii) Information distributors, and iv) Information infrastructure.

This emerging profession requires the revamping of the curriculum, training and research in the library and information science schools. Otherwise, they will become obsolete and soon be forgotten.

13.6 LET US SUM UP

Information is considered to be a vital input for the development of individual, society, and as such of a nation. The ability of the manager to obtain, store , process, retrieve and display the right information for the right decision is vital. Technological advances and innovations require proper and current information transfer in different phases of product design and development. Individual information needs like domestic or personal needs, recreational needs and research needs etc. for various purposes also have to be satisfied by proper channelising of information flow. Information industry is mainly concerned with various aspects of information generation and dissemination. Another important aspect of information industry is marketing of information services and products both for the benefit of the customer as well as the service agency. Proper realisation of the value of information and careful planning of infrastructure of a country will facilitate the increased use of information in various sectors. As a result an overall change and development in the society can be made possible.

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13.8 ASSIGNMENT

1) Consider different types of human activity in which the importance of information can be justified.

2) Discuss the factors we have to consider before starting any type of information industry.

13.9 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) How will you justify the role of information in the national development ?

2) What do you understand by the term 'information industry' ? Discuss various aspects of information industry.

3) Critically examine the importance of marketing in the field of library services.

4) What is Information Society ? Explain the characteri stics and criteria for the development of an information society.

II. SHORT NOTES

a) Decision Making and Information
b) Knowledge and Information
c) Content Services
d) Integrating technologies
e) Market Mix
f) Information profession

UNIT - 14 : USE OF INFORMATION

Structure

14.0 AIMS AND OBJECTIVES

This unit explains to you the use of information and also introduces the concept of user needs and role of library and information centres.

After studying the unit you will be able to

- explain why information has to be put into use
- explain the concept of information needs of users and information seeking behaviour of users
- describe importance of user studies
- discuss different methods used in conducting user surveys
- plan a user survey for a library.

14.1 INTRODUCTION

The importance of information has been dealt with in the previous unit. There you have noticed how information as a vital resource helps for overall development of the individual as well as the nation as such. This unit mainly concentrates on the use of information by different groups of users in different disciplines. For this purpose the basic concepts like library users and their information needs and information seeking behaviour have been explained first. The study about information seeking behaviour and needs of various specific user categories are covered in the second section. At the end, the unit also covers other important aspects related to the use of information viz. user studies. Under this heading you will come to know the importance of user studies, different methods usually adopted for finding out the real information needs of users and examples of findings of different user studies.

14.2 USE OF INFORMATION

14.2.1 Need to put Information into Use

Information as a resource, as a commodity, as an entity has various functions to perform. As explained in Unit-13, lack of correct and timely information will create so many hurdles to the overall development of a nation. The nation which fails to realise the vital role played by information in various sectors can not and will not progress. Information is also a key factor for the success of each and every human activity. Information is considered as means to an end but not the end in itself. It demands a continuous use in various forms for different purposes not only by the same individual but also by different individuals. Following are the principal functions performed by information which prove the importance of its utility in different ways.

i) Information adds to a representation. In other words the information we have collected and used strongly supports the opinions expressed and statements and arguments we have made.

ii) It has surprise value. Information conveys something the receiver did not know or could not predict. As a result it creates interest and curiosity and motivates the individual to pursue the task further. Besides it gives psychological satisfaction and happiness to the receiver.

iii) In a world of uncertainty, information reduces uncertainty. In case of doubt information collected by the individual clarifies all his doubts, gives clear perception and confidence to take a decision. It enables one to move a step forward and also to convince others if required.

iv) It changes the probabilities attached to expected outcomes in a decision situation and therefore has value in the decision making process. As all of us know, one of the phases in decision making activity is knowing as many as possible of the consequences related to each of the many alternatives under consideration. By having extra and new information there may be changes in the understanding about the expected implications of different alternatives. In other words, by having information our knowledge regarding the choice of best suitable solution to a particular problem can be broadened,improved and modified.

As mentioned above information has real value if put into use. Unless it is used and diffused it remains futile. Keeping this basic fact in view information is to be communicated,

transferred and disseminated. In this context an information centre or a library has a crucial role to play.

14.2.2 Role of Library/Information Centre in identifying Users' Needs

Information has been described by Yates as the "right lubricant for right action". According to him, in any task of turning ideas into action, the role of information centres, besides supporting it, has to ensure effectiveness of other factors involved in the task. It has therefore been rightly stated in the DEVSIS report that information system should,

– ensure that the substance offered by the system is indeed what the users need;

– ensure that form of the information offered by the system is that which the users find the most convenient and acceptable.

Burrows also expressed a similar view and states that while the main task of information centre is to monitor published information and bring this to the notice of its users, it has two other functions to perform. They are firstly, preservation of information and secondly, the liaison function. The latter is concerned with the need to think of users as individual information seekers so as to provide the required feedback to orient the services of the system according to user requirements. User studies, therefore, have assumed great importance and are considered a functional component of any well-organised information system.

You will learn more about user studies in the later sections of this unit. Before dealing with user studies, it is meaningful to know some thing about users, user needs, and their information seeking behaviour.

14.3 INFORMATION NEEDS

Information needs refer to individual needs of users regarding information, which are expected to be satisfied by the specific information system used by him. One of the basic problems of surveying user needs was of distinguishing the user needs from wants, demands and uses. Line defines each of them as follows:

Need : What an individual ought to have ?

Want : What an individual would like to have ?

Demand: What an individual asks for ?

Use : What an individual actually uses ?

Information needs may include present demand (actually expressed need), latent demand (needs which are felt but not expressed due to some reasons) and likely future demand.

King and Palmour have adopted an earlier model to demonstrate the complexity of the user situation, shown in Fig. 1

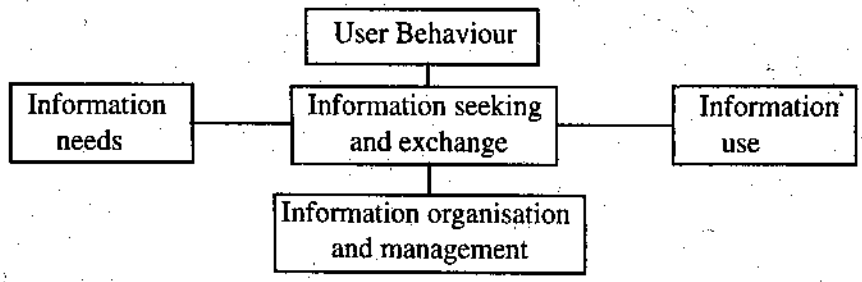


Fig. 1 : User Situation

The above diagram has been explained by the authors as follows:

"We prefer that information needs be expressed in terms of messages although many studies do not identify the user needs so discretely. These studies describe the needs in terms of media (articles, books, reports, conventions, colleagues and so forth). The reason for this is that these media are where messages are found and, in this form, they are readily identified by users. There is also a user process corresponding to their information seeking and exchange. This process, coupled with the organisation and management of information, describes the various channels that transmit messages from authors to users. The messages then are used in some way, such as in conducting research (back ground, design, reporting, and so forth), in writing an article, in professional development, in writing proposals and so on. The purposes for which information is sought are defined as information uses."

Among the different types of information needs, the library professionals are successful only in unlocking the actually expressed needs of users Unexpressed needs should be investigated. To help the user to express his needs, user awareness programmes have to be introduced on large scale. Such programmes are termed as "User education programmes" about which you will learn in the following sections of this unit.

14.3.1 Nature of Information Needs

From the user studies it has now been realized that information need is a composite concept of different types of requirements and approaches to information. A remarkable analysis of this composite nature was made by Melvin Voigt. The findings of his study showed that the same person could interact with the information system in different ways at different times depending upon his purpose in relation to his work, stage of his work, general interest, amount of information already available to him and so on. He identified three types of information requirements or approaches and later on a fourth type was added by other workers in the field. They are:

i) Current Approach

ii) Everyday Approach

iii) Exhaustive Approach

iv) Catching-up or Brushing-up approach

Now we will examine the essence of each kind of approach and its implications on the library or information centre.

14.3.2 Information Seeking Behaviour/Information Gathering Habits

Information seeking behaviour refers to the mode of action of an user related to the process of collecting and receiving information by different means. It may be through published or oral means/ institutional or personal means.

Information seeking behaviour of user can be observed while the user interacts with the information communication system/library in formulating needs, in information seeking and exchange, and in using the information. All these aspects of user behaviour and the configuration of the system as a whole are mutually influencing factors. (See Fig.1)

In order to clearly distinguish between the information needs and information seeking behaviour carefully examine the following two sets of questions.

Finding out about information needs involves asking the following questions:

Does he need information ?

Does he know he needs information ?

What kind of information does he need ?

What factors are likely to influence needs ?

Finding out about information-seeking behaviour involves asking the following questions:

What does he do about his need ?

How does he select information resource ?

How does he carry out a search for information ?

What factors are likely to affect his behaviour ?

The above list clearly points out the difference between the information needs and information seeking behaviour. Both are deeply interrelated.

i) Current Approach

Every active worker has to keep himself abreast of current developments, up to a fair degree, not only in his specific field of work but also in the broader field or fields of interest or areas, whose developments can substantially change the course of his present work. With such kind of requirement how the worker interact with the system? He interacts with the information system in a very general way - browsing through his favourite periodicals, going through the abstract journals etc., but all these without keeping in view any specific search for information. This type of approach is called Current Approach. The user with this approach requires constant interaction with the library/information system.

ii) Everyday Approach

This kind of approach stems from the research worker's frequent need, in the course of his investigation, for specific piece of information such as data, e.g. chemical formula of a compound, a method etc. The nature of information sought in such a situation is very specific and a quick answer is usually expected. Usually librarians call these type of queries as short range reference queries. Because of its frequency of occurrence, as compared to other approaches, this is called everyday approach.

iii) Exhaustive Approach

The third approach culminates out of the need of a worker or team of workers to take up a new area of investigation or have come to the stage of reporting the result of an investigation. Such approach to information demands the provision of all relevant literature covering a particular subject exhaustively. It can be easily realized that such approach would be occasional only.

iv) Catching-Up Approach

A worker at times need to have a brief but a complete picture of the recent developments of a related subject or a subject in which he was not very much interested or which did not come with this the area of his main interest. This is likely to be an area where he is not an expert. As a result of this he is not quite familiar with the subject. Hence, in such a situation, a device is required in the communication system which will help the user in quickly catching-up with the subject.

Different approaches of users will have different kinds of implications on the designing of the information services. User needs are shaped by these approaches.

From the previous sections, you would have got clear understanding of the meaning and implications of user needs and their information seeking behaviour. We have also noticed the importance of knowing the requirements of users for designing and services. But how to know the requirements of users? Are there any devices and means which can help the librarian to know about his users? It is possible to obtain information regarding users information requirement by conducting user studies'. The succeeding section deals with various aspects of user studies.

14.4 USER STUDIES

14.4.1 Importance

User studies are excellent tools for estimating information requirements of a specific group of users. These studies are often designed to identify and to analyze how various persons or groups use libraries.

Alice Lohren explained the need for user studies in librarianship as " what people really want to read, to review or listen to may vary considerably from what they are able to secure in books or through the air or screen. It is of great significance to know how we can produce better what the consumer of media needs,how we get the product to the consumer in our bookstores,

and how we can give better service to the patron in our libraries. Knowledge of what research tells us can help us to be more relevant in our programs of service and in producing better books and mass media".

User studies are similar to audience research in the field of communication. The significance and value of knowing the communication needs and practices of library users and potential library users are being increasingly recognized as librarians find themselves in keen competition for financial resources particularly new media of communication and innovations such as the electronic digital computer.

The second reason which necessitates the conduct of user studies is the need to eliminate wastage and duplication while utilizing the available financial resources. Information, today, is an expensive commodity and it is unthinkable that any single library can posess all that is needed by its clientele. The concept of National Information Systems, therefore, is to create networking within the country so that the entire country's resources can be made available to any user irrespective of his professional and organisational affiliations and socio-economic status. User studies can reveal the extent of country's overall resources and services and also the extent to which these systems and services have been of use. Such findings will help in proper conservation of information resources by enabling elimination as far as possible, of uneconomic duplication of effort.

14.4.2 Objectives of User Studies

The objectives of user studies, therefore, are:

Identify the potential users and categorise them

Identify the information requirements category-wise by the class of information needed, the level and type of communication media etc.

Identify the existing resources and services so that comprehensiveness of information can be achieved without unnecessary duplication of effort and finance

Evaluate the various existing services and facilities in respect of their utility to users to effect suit-able modifications and introduce new services whenever necessary

Achieve overall improvements in information systems from the feedback obtained as above

Using close and systematic observation of communication and information gathering habits of people, the librarian can predict future behaviour of their clientele in regard to library usage.

Thus user studies are often investigated as attempts to understand, justify, explain, or expand library usage and, consequently to gain more knowledge about the process of communication insofar as libraries and their clientele are concerned.

14.4.3 History

It is only in recent years that systematic studies of user community and the information behaviour of various groups with in it have started. Prefore that library professional neglected one of the most important component of an information system, namely, the user.

Most of the earlier studies of information needs were based on indirect methods, like citation counting of recent documents, library issue records,reference records etc. Later professionals found that what they required was much more than what these types of studies could reveal. They required a complete picture of the functioning of the entire system of communication and its components. This resulted in the use of more direct methods of studies in information use and information seeking behaviour of users. The two international conferences - The Royal Society's conference held in 1948 and the Washington Conference of 1958 - helped much to focus professional's concern and interest in this area. User studies have now been well accepted and performed by various direct methods. There is considerable accumulation of literature on user studies and more and more is being generated as can be judged from the reviews appearing on the subject. The establishment of the Centre for Research on User Studies (CRUS) is an evidence of the increasing emphasis on user studies.

The user studies have not been restricted to actual users alone; studies have also been made of non-users who are unable to use information services due to mental, physical and sociological reasons; or those professionals like doctors senior managers, social workers etc who are unable to visit the library or information centre due to their busy schedule. In a developing country like India, the number of such deprived groups must be enormous. User studies, have also therefore, to identify such groups who can be the potential users and point out ways and means to reach them.

Till now we have focused on the importance of user studies. The next discussion will be on types of user studies.

14.4.4 Types of User Studies

Based on their objectives and scope user studies can be grouped into different categories. This kind of grouping also helps in comparing the results of various studies and finding out the compatibility between them.

Herbert Menzel has grouped them all into three main categories - Behavioural studies, Use Studies, Information flow studies.

Surveys which are conducted to find out the pattern of overall interaction of the user community with the communication system, without reference to any specific information - receiving event are called communication behaviour studies.

In the second category are placed surveys which are conducted to find out the use of any communication medium, such as a primary periodical, a secondary periodical etc and are called use studies.

The third category includes surveys which are conducted to find out the pattern of flow of information in the communication system. They are known as studies in the flow of information.

Slater has identified three major types: General comparative studies; individual separate studies of the needs, demands or habits of specific user groups in isolation; communications; information transfer studies.

General comparative studies of information need and acquisition practices and habits necessarily range over a variety or number of user groups. They do not necessarily cover all

possible user groups with in a single study. Deliberation of the way groups differ is a major aim and outcome of such investigations. Results have obvious general practical applications. They can be particularly useful to planners of services on a broad or even national scale.

Individual separate studies of the needs, demands or habits of specific user groups in isolation - eg. academic users, chemists, physicists, medical men, studies of this kind are far more numerous than the comparative survey. Findings and applications are usually more detailed (for the group or discipline concerned), concrete and clear cut. They may have immediate usefulness to a particular service, or provide a solution to a particular situation or problem at a given point in time. Because of the diverse methods used by many of such studies, results can add less than what one might hope to the general picture of information needs.

Communication information transfer studies are investigations of the process of information transfer, and of phenomena which appear to impede this flow (such as language barrier). Such studies may be comparative, or confined to a special user group. Their scope is much broader than that of the conventional user study. They can, quite legitimately, escape boundaries of the document field, or even the area of interaction of people and systems, and usefully explore areas of interpersonal relations normally left to the social scientist.

Ennis divides use studies into four categories as in Fig.2

Fig 2. Ennis categorisation of Use Studies

Audience		
Use studies	General	Specialised
Inside Library	1	2
Outside Library	3	4

According to Ennis category-1 includes studies which investigate the information seeking behaviour of general audience inside a library; category-2 involves studies of how special groups use various library services or facilities; category-3 is chiefly occupied by readership surveys; category-4 includes most studies of communication patterns and information needs of different types of specialists. Ennis further subdivided category-4 into large scale surveys and small scale surveys.

So far we have reviewed various types of user studies according to different authors. It should also be mentioned here that quite a few studies have different aspects and hence overlap over the categories mentioned above. Further these categories may also be considered as different points of approach. The same survey may be approached from any one of these points of view.

14.4.5 Techniques/Methods of User Studies/Surveys

From the literature published so far on the subject it is quite evident that most of the general methods or techniques of social surveys e.g. interview, questionnaire, diary etc. have been extensively used the library professionals also for studying the information use patterns.

Different authors have grouped the methods in different ways. Guha categorized the methods as follows:

a) General or Conventional methods

   i) Questionnaire

   ii) Interview

   iii) Diary

   iv) Observation by self

   v) Operations research study

b) Indirect methods in the context of information use

   vi) Analysis of library records

   vii) Citation analysis

c) Special and Unconventional methods

   viii) Computer feedback

   ix) Unconventional methods

Exon in a useful review of techniques has proposed a simplified structure for a user study which contains just four elements:

a) Hypothesis formation

b) Selection of observation method

c) Analysis of observation

d) Interpretation results

Atherton has listed no less than 20 methods of collecting information about user needs, given below:

1) Study of the organisation charts of the institution

2) Study of its function/activities chart

3) Study of its annual reports, project reports, and other publications.

4) Survey of user requirements through questionnaire

5) Interviewing users:

a) Interview user

b) Interview of superiors of user (eg. person higher in the hierarchy, teachers, guides etc.)

c) Interview of subordinates of user (e.g.persons controlled, taught, guided etc)

d) Interview of persons of coordinating status, or who are colleagues of user.

6) Study of papers, books etc. published by users.

7) Attending seminars, colloquia etc. in which users participate.

8) Observing user at his work place (eg:office, school, laboratory, factory etc.)

9) Personal informal contacts with users.

10) Meeting users in small, preferably homogeneous groups periodically.

11) Feedback from information services rendered.

12) Providing for suggestions from users, about their subject interest, author interest, institutional interest etc.

13) Attending technical meetings within the institution at which projects and problems may be discussed.

14) Scanning correspondence and reports prepared and received by user.

15) Study of documents used by user

16) Study of reference queries received from users

17) Participation in institutional/work orientation programmes.

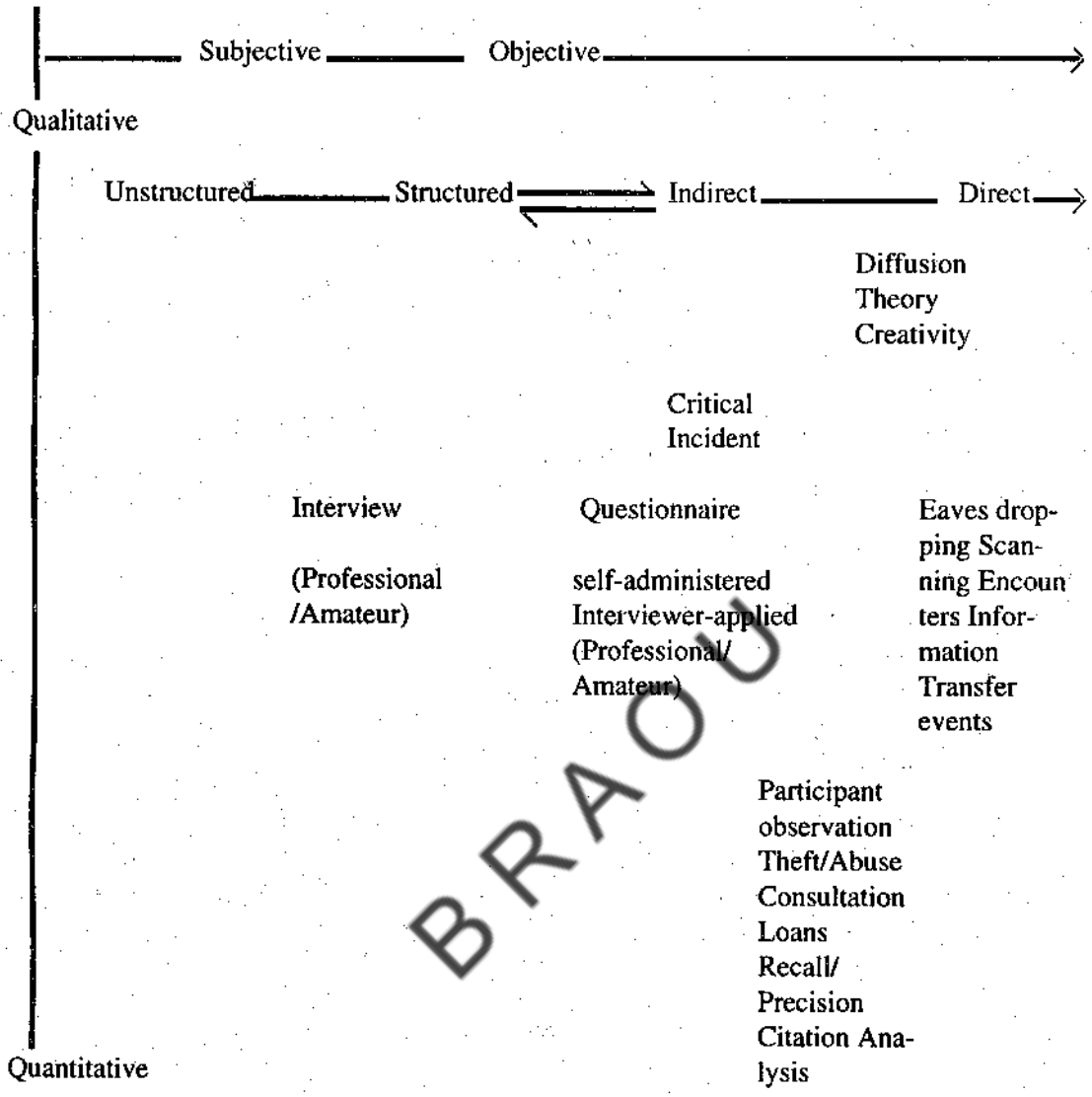
18) Orienting and guiding users in using the library's resources, tools and techniques.

19) Study of classification schemes and handbooks.

20) Liaison

Exon has summarized the available techniques diagrammati-cally and this is reproduced in Fig.3

Classification of investigative techniques:



The library professional should acquaint himself with such studies/surveys and areas their relevance to his own situation before embarking on any fact finding exercise himself. For the reasons already hinted at in this section, User Needs Surveys are difficult to design, execute and interpret and should not be taken lightly. Planning of User Survey has been dealt with in detail under section 14.4.6.

The user survey itself can be divided in any way that seems appropriate. We have seen different survey methods as general or conventional type as per Guha's (see 14.4.5) categorisation. They are Questionnaire, interview, diary, observation by self and operations Research study.

Let us have brief discussion on each of the above said methods first and then we will proceed to various aspects of plan ning of a survey.

i) Questionnaire Method

Questionnaires are written instruments, useful for collecting information from a geographically scattered sample or population at little cost. This method of using questionnaires

consists of a careful translation of the objectives of survey into a set of questions to be answered in writing by the respondents. A question may seek the opinion or factual information. The questions are framed in such a way that the answers can be given by checking yes or no; or by selecting one of the possible answers provided in the questionnaire.

While constructing the questionnaire the following points, however, may be kept in mind:

1) A questionnaire should not be too long. A lengthy questionnaire may tax the respondents and he may reject it.

2) It should be interesting and stimulating so as to draw proper response from the respondents,

3) The wording of the individual question in the questionnaire should be simple and clear. Familiar and well known terms should be used;

4) The questions asked must be sensible, specific and comprehensive.

5) Irksome, ticklish and embarassing questions should be avoided,

6) Questions should be framed in such a manner that the entire body of questions taken as a whole must meet the basic purpose.

7) Physical outlay of the questionnaire should be properly designed, questions should follow a logical sequence, and the general layout should be attractive.

Advantages of the Questionnaire:

a) Allows a wider range and distribution of the sample than the interview method

b) Provides greater access to more educated respondents and to persons in higher income brackets.

c) Provides an opportunity for respondents to give frank, anonymous answers.

d) Allows greater economy of effort (i.e. a single instrument, duplicated and distributed to numerous respondents, can produce a large amount of data)

e) Can be constructed so that quantitative data are relatively easy to collect and analyze.

f) Can be designed to gather background information about respondents, as well as original hard-to-obtain data.

g) Facilitates the collection of large amounts of data in a short period of time.

h) Allows the collection, in exploratory studies, of insightful information about a relatively unexplored problem area or subjects.

i) Can be completed at the leisure of respondents - with time limits set by the surveyor.

j) Through the preparation of a formal instrument, researchers are encouraged to define clearly the research problem, the implications of the problem and the nature of the needed research data.

h) In regard to ego - involving questions, it can enhance the collection of objective data.

ii) Interview Method

Interview method is also used to collect data by asking the questions in person. The misinterpretation of questions can be avoided in this method as the interviewer can provide the correct interpretation and the answers can also be checked. Secondly, there is no question of poor response as in the case of questionnaire method.

Interview can be either formal or informal. Formal interview is structured, controlled and inflexible. In it questions are worked out before hand and are asked in a particular order. In an informal interview no set questions are asked; and in fact, answer of one question may lead to the next question. This type of interview, hower demands greater skill on the part of interviewer, though it may dig deep and become useful for the complicated cases.

Interview method also suffers from some limitations. Firstly, it is difficult to reach a sizeable sample unless there is enough of money and time. Secondly, this method is expensive because interviewers will have to be trained for better results.
Thirdly, the respondents's behaviour becomes slightly unnatural when he is face to face with the interviewer. This is known as spotlight effect.

Well planned interviews and carefully worded questions usually produce the most useful information, as well as supplementary insightful observations and opinions from respondents.

iii) Observation Method

Observation is a method which involves some type of surveillance undertaken for the purpose of satisfying an investigator's interest or curiosity about a distinct research task. Where a research topic is amenable to direct observation this is the method that gives fairly correct results. Successful direct observation is possible where the object or subject of an investigation is being subjected to close usually visual surveillance and information obtained in the form of recorded data will then be related to more general propositions or theories.

As most observations have an element of sense perception and mental interpretation, it becomes very necessary to establish a proper relationship between the two. If it is not done, there is a danger that what we observe may not be true. Scientific observation is thus often a difficult task whether the situation is simple or complex. The difficulty arises because of the fusion of elements which are partly objective and partly subjective. Subjective considerations are to be avoided in observation for getting unbiased findings.

iv) Diary Methods

A diary is a record of selected actions, events, and thoughts in a person's daily life. As a method of investigation, it has to be maintained by the respondendents. The respondent is requested to keep a written or tape recorded record or diary of his activities over a period of time.

To help the respondents in maintaining the record as also to facilitate the final analysis of data, diary forms are supplied to the subject for different activities.

It is quite evident that in this method maximum effort is involved on the part of the subject. As a result some of the respondents may not record their information activity completely. This tendency will be more when the period of diary keeping is legthened. This method proved to be useful for a short period. It is mostly useful for obtaining facts about respondents information use habits.

v) Analysis of Library Records

Almost all well-managed libraries maintain annual reports, statistics and other library records. These documents and records can be used to ascertain information regarding various aspects of library user.

Circulation records, for example, are useful for finding out the reading habits of the users as also the working of the library services. The record of reference questions and literature searches will reveal the use of different types of documents, the number of documents used for a question, time taken to answer a question, the number of questions unanswered etc.

vi) Citation Analysis

This method entails the analysis of the bibliographical references that are usually appended with every research communication. Analysis of such citations can reveal useful information like the relative use of different kinds of documents such as books, periodicals, reports, patents etc. the age of these documents which reveal the rate of obsolescence of literature, the most frequently, used titles of periodicals, scattering of literature, language preference etc. The information generated by this method can be utilised for the acquisition of materials selection of periodical titles, judicious distribution of library funds etc.

However, it has to be admitted that citation studies can reveal only a part of the picture. They cannot give us an insight into the functioning of the entire communication system and its components.

vii) Computer - Feedback Method

This method makes use of records obtained by products of a computer search. Hence, this is also an indirect method which does not disturb or interrogate the user in any way. It can be used for studying users search strategies and their improvement.

viii) Unconventional Methods

One difficulty with conventional methods is that they tend to highlight the areas that the investigator thinks to be important and thereby run the risk of obtaining data about only those aspects of the information system that are of peripheral interest and concern to the user. Hence some people advocate more and more unstructured approaches.

For example, biographical or autobiographical works can be a source of information, uncontaminated by investigators's questions, about the ways in which one searches for information and make use of the formal and informal channels of communication. Also the extent of the popularity of a particular discipline may be revealed by the publication programme in that field.

14.4.6 Planning A User Survey

The above was a discussion on the various techniques available and relative advantages and disadvantages. But in conducting an information use study or survey, before selecting any of the survey techniques, different stages of activity of survey have to be planned systematically. The various stages of work in planning a survey are:

(1) Defining the objective of the survey

(2) Decision regarding the coverage or scope of the survey

(3) Choice of the timing

(4) Selection of the method for conducting survey

(5) Selection of the sample of users

(6) Pre-testing

(7) Full-scale survey itself

(8) Analysis of data; and

(9) Preparation of the report.

Now, we will look into each stage of work one by one in a brief manner to have an idea of planning and conducting a survey.

(1) Defining the Objectives of the Survey: This is the first step in the planning of a survey where we have to decide what we want to know. Carefully defined aims and objectives will explain the purpose of the survey and generate appropriate methodology and analysis.

(2) Coverage of the Survey: The second step is to be clear about the coverage or scope of the survey. Coverage means the users or the libraries or the records to be covered or fixing the scope of the survey geographically or otherwise.

(3) Timings of the Survey: In order to get clear picture of the situation, choice of timing for the conduct of survey is important. To choose an unrepresentative time for survey may be a serious defect as to study an unrepresentative sample. For instance, the use of the library on the eve of examinations may be much more than what it is otherwise. The conduct of survey during the examination period, therefore, may not give a true picture of the use of the library.

(4) Methods of Investigation: Already we have discussed at length various methods available for investigating the user needs and their information seeking behaviour (see 14.4.5)

From among the methods listed there, choice can be made keeping in view the situation to be surveyed and purpose of data collection. A combination of more than one method also can be used, to complement each other. A detailed description of these methods can be seen under section 14.4.5

(5) Sampling: Due to the constraints of resources, the examination of the entire user population is not possible. Surveys are, therefore, conducted by examining a part of the population, representing a whole of it. A truly representative population or sample is that which is free from bias.

Sampling can be done through different methods - random sampling, systematic sampling, multistage sampling, quota sampling, cluster sampling, multiphase sampling and stratified sampling.

A *random sample* is a sample selected so that every item in the population has an equal chance of being included. Systematic sampling is simply a quick means of picking a random sample. If all items in a population are listed, and a 20 per cent sample is required, the sample can be chosen by taking every fifth item on the list. In multistage sampling, the country, or a long bibliography, is partitioned into a number of areas, and three or four areas are selected at random, each selected area is again subdivided and another sample of areas are taken at random. This process is repeated until a number of small areas or sections have been identified for study. In quota sampling, interviewers are instructed to interview all the people they meet with specified characteristics (e.g. accompanied by children, placing an enquiry on a specific day). Quotas are often further subdivided into sub-quotas for various types of persons.

Cluster sampling may be as lost resort when there is no other means of collecting a sample. The country is split into small areas, and interviewers are issued with instructions to interview every person they meet with certain characteristics in specified randomly picked areas.

Multiphase sampling is useful for collecting broad background information, allied with detailed information about certain groups stratified sampling is the only sampling technique than can improve upon random methods. The likelihood of bias is lessened by ensuring that the sample contains calculated proportions of units with sought features. The population is divided into subgroups and samples are drawn from each group.

(6) Pre-Testing: Before full scale survey is undertaken, its pre-testing is advisable to see that the objectives of the survey will be achieved. Mistakes are rectified and methods are improved to make the full scale survey a success.

(7) Full-Scale Survey: After the successful pre-testing or pilot study the full-scale survey should be conducted, following the correct norms and methodology. All the relevant facts should be collected to make the conclusions based on them as accurate as possible.

(8) Analysis of Data: After the collection of data, it is necessary that the data is analysed properly and statistically to draw valid conclusions. In fact proper analysis can only lift many of the information use studies from the level of opinion surveys to specialised surveys that can provide sufficient insight into the functioning of library and information systems.

(9) Reporting: The objectives of the survey, details of its methodology, its conduct, the conclusions drawn and the suggestions offered are presented in the form of a well - organised written report. While presenting the results of the survey tables graphs, diagrams charts etc can be used for precise and effective communication. Following are the areas to be taken care of in a report:

(a) Purpose and coverage
(b) Mention of and reference to any related surveys
(c) Nature, method and extent of collection of information
(d) Methods of numerical manipulation
(e) Numericals and their accuracy
(f) Assessment of the achievement of the survey, including any conclusions and the extent to which the purpose was fulfilled
(g) Cost
(h) Note on the person or organisation responsible for planning and executing surveys.

Keeping in view all the above points in view, a report has to record only the actual findings without any error or bias.

So far, you have studied various aspects of users, their needs and their information seeking behaviour. You also know various techniques that are available for studying the user needs and behaviour. Now we will proceed to the next section which reviews different findings regarding user information requirements and use patterns based on the different studies conducted so far. But it has to be clearly stated here that the coverage may not be a comprehensive one. The findings will serve to demonstrate only few surveys on different aspects of users. Most of the studies conducted are mainly concerned with science and technology. However, there are a few studies that cover information requirements in social sciences and humanities.

14.5 INFORMATION LIBRARY USE SURVEYS - SOME STUDIES

The total spectrum of findings has been divided by Rowley into different aspects related to library use; materials used; availability of information services; informal information channels; relative significance of formal and informal channels; User profiles and non users.

14.5.1 Library Use

Some of the surveys are conducted simply to gauge the type of use made of library facility. The use made of libraries again has been dealt with under different heads like who uses libraries; frequency of use; motives for using libraries; and searching techniques used for required information in libraries.

i) Who uses Libraries ?:

Usually this query can be answered by considering the type of library under investigation. Almost all types of libraries except public libraries have a well defined population. In this context two studies are worth mentioning.

(a) Elements, in a survey of thirty three public reference libraries in Britain, compared the organisational background of personal visitors, and telephone, telex and postal users, and obtained the pattern shown in Table-1.

Type of the Library	Personal visitors (%)	Postal, telex & Telephone enquiries (%)
Industry	0.7	30.3
Commerce	8.2	6.8
Local government & civil service	7.0	6.0
Private individuals (Including students)	52.6	22.4

(b) The National Lending Library (later called as the British Library Lending Division, BLLD and now Document Supply Centre BLDSC) carried out a study of the people requesting social science literature. Their major users were industrial organisations accounting for 28.7 per cent of requests, and Universities, accounting for 29.1 per cent. From industries 46.5 percent of requests came for scientific and technical periodicals and universities accounted for 15.4 per cent of requests for the same. Comparison of these two findings shows a pattern of use as: Users of social science literature are more likely than users of scientific and technical periodicals to be working in Universities.

(c) Clements' study also showed that the incidence of library use is inversely proportional to the square of the distance between the user's base and hisclosest library facilities. He found that over 90 per cent of his personal visitors had travelled less than ten miles to the public reference library and about 50 per cent had travelled two miles or less. These figures are reiterated by even other studies by Department of Education and Science, Great Britain and by the Osborn and Smith survey of Manchester library.

(d) It has been found that a user whose place of work is distant from the library tends to clump requests. Slater found that 34 per cent of the users of technical libraries had two reasons for using the library, and 8 percent had more than two reasons.

ii) Typical Frequencies of Use

There are a number of studies on the frequency of use of various libraries. Some of them briefly described below.

(a) Department of Education and Science Survey suggested that the regularity of library visits is little affected by loan periods,contrary to expectations. Half of the public library users used the library at least once a week, and three quarters, at least once a fortnight.

(b) Manchester survey has given very similar usage pattern as shown by the survey of Department of Education and Science.

(c) But Slater's study reports a slightly more intensive use in technical libraries, with only 13 per cent of users visiting the library less than once a week, and 46 per cent visiting several times a week.

iii) Motives for Using Libraries

For what purpose people make use the library? To find out the reasons for using the library also studies have been conducted. Following are the examples of such studies.

(a) Clement's study noted that 39.8 per cent were in the library for the purpose related to their occupation, 22.3 per cent for both personal and occupational purposes, and 36 per cent were there for purely personal purposes. The main purpose of users was to seek information (52.5 per cent), 16.6 per cent were seeking known items of literature, while 17.5 per cent were using the library as a place to study.

(b) Slater also found that 11 per cent of technical library users seeking workspace; this was mentioned by 38 per cent of academic library users.

(c) A survey of Department of Education and Science, Great Britain also reported that between 6 and 10 per cent of central public library users came to use study facilities.

(d) The Case Institute study by Burkett also showed that of the chemists and physicists only a small percentage of them read in the library.

(e) Studies made by Herner and Tormedd on use of scientific information separately indicated that scientists prefer to borrow materials to read elsewhere showing the heavy incidence of study use.

The above kind of studies which deal with reading habits carry implications for the provision of both loan and accommodation facilities.

Many studies have also examined the nature of the demand that brings the user to the library. Demands can be grouped in various ways, and different analyses are appropriate for different purposes. Take a note of the following examples.

i) According to Slater 56 per cent of demands in technical libraries arose from the central subject field of work 15 per cent peripheral or unfamiliar subjects and a further 10 per cent arose from practical problems at work (regarding equipment, materials, prices, sources of supply etc.)

ii) Wood also made a similar study on the information demands of mechanical engineers. According to this study 18.2 per cent require exhaustive information in the course of a week, 67.1 per cent require everyday information, and 26.8 percent require information outside the field of mechanical engineering with in a week.

iii) Other studies attempt a subject type analysis. For example, the inquiries received at Manchester Commercial Library were subjected to a subject analysis yielding:

15 per cent were for product information
22 per cent were for market information
8 per cent were for import/export information
34 per cent were for companies information
11 per cent were for statistics
6 per cent were for maps
16 per cent were for timetables

iv) Scott's study of use of scientific information by electrical engineers demonstrates a different way of categorising scientific information:

Established scientific theory	57%
New Scientific theory	34%
Accounts of apparatus	30%
Physical and Chemical constants	30%
Methods and procedures	24%
Standards and specifications	22%

v) Slater study also reveals the reasons for obtaining information by different types of users. The results below indicate the motives for seeking information.

Need for background information; find out about part work in a field	22%
Keeping up to date ; find out what other workers are doing and planning	17%
Material for essays (mentioned mainly by students)	16%
Prepare for and supplement lectures (mentioned mainly by students)	12%
Information about a process, method or technique needed to carry on with a current project	10%
Information needed to instruct, train or inform others	8%
Data equations, facts and figures for immediate use in calculations	8%
New ideas and stimulation	8%

iv) Searching Techniques

Studies were also conducted on the ways of searching for information in libraries by users.

(a) Regarding the individual's prior training in library use, Wood's study reveals that 11.8 per cent of mechanical engineers reported having undergone literature tuition.

(b) Ford through his study on user behaviour in university libraries suggests that instruction is more effective if available on demand, in the form of, perhaps, tape-slide presentations and printed and tape recorded directions. Introductory lectures have a weak impact on students because the student has a poor appreciation of his own requirements at the beginning of his course.

(c) A review of studies on the extent of use of searching tools like catalogues and abstract journals also reveal many interesting findings. From the studies of catalogue use, it was found that catalogues tend to be placed low in lists of useful information channels. Users frequently go to the shelf when they know the title and author of the book. According to Ford and McGarry users remember titles more easily than authors, and known item searches are more common than subject searches in catalogue.

(d) Regarding the use of abstracts journals, INFROSS study of social scientists use of abstracts journals reveals that 65 per cent of them are using only one abstracting or indexing service. Despite the scatter of social science information one quarter of the social scientists never used abstracts journals or indexes. Scott study on the use of technical literature by industrial technologists revealed that 69 per cent of electrical and electronic engineers do not use abstract journals and 62 per cent claimed not to know of any services in their field. Similarly, Slater's study shows that in technical libraries 26 per cent of scientists, 19 per cent of engineers and 15 per cent of non-technical personnel resorted to abstracts journals.

(e) It is interesting to note the effect on search success of the librarian's contribution to searching. Studies conducted by Flower, Glass, Herner and Tornudd indicated that academics are widely acclaimed as the most independent group of library users. This is mainly due to the detailed subject knowledge that is a pre-requisite to finding the information required by academic, and the difficulty of formulating precise instructions.

v) Materials

The subject regarding materials has been further divided into bibliographic forms of literature, scanning current documents, language problems and personal holdings.

a) *Bibliographic Forms of Literature*: The value assigned to any specific form depends on the reader. As per Wood and Hamilton mechanical engineers use trade literature very heavily and engineers in general according to Slater make heavier use of data books and textbooks than scientists. In contrast, studies by Herner, Tormudd and Wood have revealed that books and journals are of primary importance although their relative significance varies. Slater's study shows that postgraduate students make heavy use of journals and books, while other students and teachers are generally, heavy users of textbooks. Social scientists heavily use print media, mostly (57%) in the form of periodicals and books. In public libraries as per the findings of Clements, there was a higher usage of reference material (year books, directories, abstracts, bibliographies).

b) *Scanning Current Documents:* INFROSS study of social scientists shows that 40 per cent cited abstracting and indexing periodicals, 19 per cent cited personal communication with individuals, 13 per cent cited browsing in bookshops and 13 per cent cited consulting book reviews.

According to the studies of Line and Wood most applied scientists reported several problems; engineers had particular trouble with German literature, chemists need help with Russian and Japanese and social scientists admitted a very weak foreign language knowledge.

c) *Personal Holdings*: The influence of personal collection of books and periodicals on the extent of library use was also covered under user studies. As against the expectations, INFROSS noted that the smallest collections connected with current research belonged to those who employed formal methods of obtaining references least, and those social scientists who owned most volumes were the heaviest library users.

d) *Availability of Information Services* : The level of provision of library and information services will have some effect on information acquisition. Slater's study of technical libraries about the services they offered revealed the following results.

Services	Percentage of libraries providing the services
Journal circulation	100%
Literature searching	93%
Photocopying	86%
Accessions lists	83%
Literature scanning	79%
Translations	76%
Bibliographies	66%
Library bulletins	66%
Internal abstracting services	62%
Selective dissemination	62%

A study by Blick revealed that 84 percent of the sample considered it moderate or very important to know soon after a publication.

vi) Language Problems

Existence of foreign-language barrier was noticed as long ago as 1962 by Holstrom. According to him about thirty five to fifty languages contained significant amounts of scientific and technical documentation which cover different subjects. Later study by Wood also emphasized this phenomenon to through the language breakdown of periodical literature acquisitioned by National Lending Library, Great Britain (Now British Library, Lending Division). On the basis of these results, Wood estimated that in 1967 about 750,000 articles per year were published in languages other than English and made available via the NLL.

A University of Sheffield study of University teachers on language barrier indicates that 31 percent thought they probably missed the research done outside English speaking countries. A stronger suspicion of having missed items was apparent among technologists.

Wood's study indicates that except mathematicians, 80 percent of the sample had encountered an article in a foreign tongue within the last year which they would like to have read but could not, and 64 percent had faced this situation with in the last month.

14.5.2 User Profiles

Users may be grouped in a variety of permutations in an attempt to define their information needs and activities. Line distinguished the following characteristics as influences on information habits- age, experience in research or particular job; background, qualification; seniority; whether solitary or team workers; persistence, thoroughness; orderliness; information threshold, limited by absolute capacity and rate of absorption; awareness of sources of published information; awareness of sources of non-literary media of information and languages understood. Examples of studies on the impact of all these variables are not available. But the effect of some of these variables was reported by Slater. Some of the profiles drawn her are summarised in the following paragraphs. These profiles prepared from data revealed that the employer group as the most discriminatory, followed by work activity, then discipline. Slater's profiles are supported in several key respects by other studies, some of which are already mentioned in the previous sections.

Users' needs based on Slater's study on use made of technical libraries by different users, are given below:

i) Employer/Library Group

a) ***Industrial Users*** dependent on resources of their own library and inclined to use it as a first resort.

Their main features are:

Not frequent library users

When seeking information outside their own library, they were twice as likely as other employer groups to use personal channels.

Practical problems concerning equipment sources of supply etc, were a more frequent reason amongst this group for using the library

High level of demands for both specific information and documents.

Did not use library much as a place in which to work

More librarian-dependent than any other groups

Industrial users had a high success rate in obtaining desired documents or information and were persistent in following up unsuccessful demands

Time factor was more important than in other groups

Users reported obtaining `Useful results along anti cipated lines' more frequently than other groups

Acquisition of information about an object, process, or method was highest in this group.

b) ***Government Users***

The main features of Government users are

Similarity in pattern to industrial users

Like industrial users they used the library less fre- quently, but used the library as a first resort more often than other groups.
When seeking information outside their own library first, the most frequent methods were: Consultation of personal or departmental notes, records or files or use of another library.

Incidence of peripheral or unfamiliar subjects was relatively high, although practical problems rated low as a reason for using the library.

Not interested in libraries as a place in which to work

Use of librarian assistance was low

Highest success rate in searching

Time was a factor for 6 - 7 percent of users

Shortest search period (10.2 minutes)

Use of periodicals and current - awareness journals was above average

The level of findings that were `interesting but not immediately useful' was highest in this group.

c) ***Academic Users***

The main features of academic users are

Frequent customers of their own organisation's library

Tended to make multiple demands on the library's resources; unlikely to attempt elsewhere first and if they did, they usually consulted another library

Showed a high level of core demands

Equally interested in information/specific documents

High use made of librarian's assistance

Low success rate in searching

Time factor was less important, and they tended to experience delays in library service more frequently

More often carried out a methodological search than any other group

Average time spent for searching was low

Made heaviest use of textbooks and average use of periodicals, abstracts journals and indexes, current- awareness journals and data books.

d) ***Public Library Users***

Least regular user group

Attempts to get information elsewhere first were highest in this group, normally by consulting other libraries

Demands were less likely to be concerned with the central subject field, although the level of consul tation about small practical problems encountered in work was above average

Use of library as a quiet work place was mentioned by 30 percent of users

Users in the public library did their own searching more often than government or academic users did

Unlike all other groups, information was sought more frequently than specified documents

Success rate at 68 percent was above the academic user level but below that of other groups

Time factor was not a real problem

Heavy users of text books, journals, dictionaries and encyclopaedias

Tended to achieve useful results along anticipated lines

Also high level of accidental useful findings

ii) Discipline-wise Categorization

a) *Scientists:* Were the most frequent users of library services and were least likely to try somewhere else first'; prior sources of information were usually other libraries

Demands were likely to arise from central subject field of current work

Lower level of practical problems

More interested in keeping up to-date and more inclined to do own searching

Time element was less important than for other discipline groups

Made heavier use of periodicals, abstracts, and indexes than other groups

The level of `useful results along anticipated lines' was lower for these two groups than it was for non-technical personnel whereas the level of `interesting but not really useful' material was slightly higher

b) *Engineers:*

Were the least frequent library users, and were more likely to go out side the resources of their own library than scientists, using friends, colleagues; and experts more than the other groups
Brought the highest level of practical problems for the library

Asked for information (rather than specific documents more frequently than other groups and depended on librarian assistance more often

Lowest success rate (52 percent) in searching, despite longer searches (13.6 minutes)

Low use of periodicals compared with other groups, tended to use handbooks, databooks, standards and specifications

Level of occurence of `description of an object,process or method ' was highest for engineers

Appeared to have most problems with getting information

(c) ***Non-Technical Personnel:***

(Employed by science and engineering based organisations) surprisingly the library service seems to cater better for this peripheral group than for engineers

Frequent library users and tended to use other library resources more frequently than scientists and engi- neers

In many respects their information use lies between that of scientists and engineers

Useful results along the anticipated lines' were most frequent in this group.

iii) Work Activity-wise Categorisation.

(a) ***Qualified scientist or engineer*** (working as such)

Used the library often than technicians, but less than teachers or students

Tended to make multiple use of the library

High level of demand for practical information (although less than technicians) and for peripheral and unfamiliar subject material

High demand for documents, as opposed to information

High need to keep up to date

More likely to ask the librarian for help

Highest success rate

Usage of periodicals, abstract journals and indexes was fairly heavy, although below that seen in post graduate students

interesting but not immediately useful group is at a higher level than any other group and the second high est group is`useful results along anticipated lines.

(b) ***Teachers and Lectures:***

Were fairly frequent library users, although not as frequent as students

Very prone to make multiple use of the library, and least likely to make prior attempts to get material outside the survey library

High level of core demand

Need to keep up to date felt most keenly by teachers

Like student, appeared to do their own searching

Success rate was highest (72 percent) of any group

Deadlines were mere of a problem to teachers than any other group

Claim to have a methodical approach to search procedure, and certainly have short search times

Highest incidence of *useful results along anticipated cipated lines* and picked up the highest number of `simple facts for immediate practical use'.

iv) Others

Slater's Study has covered most of the categories of information users and their behaviour. The user groups not covered by this study are given below:

(a) ***Information Needs of Managers***

Management can be viewed at three levels- Top management/senior management; Middle management and Junior management

The three levels of managers are involved in three types of decisions making process:

Top management: Strategy planning/Policy decisions

Middle management: Management control (periodic control or programme) decisions.

Junior Management: Operational control/Interpretive decisions

Nature of information required is:

1) General:

Basic information: Personal information- Job Context- Employees place in the organisation
Operational Information: Job content - for performance

Background information: Job relevance - for motivation maintenance

2) Specific categories of information

External information
Internal information
Informal information/un official information

Strategic planning information
Control and planning information

(b) ***Information Needs of Physicians*** (doctors)

Information needs of a physician are to:

i) Find out answers to questions relating to a specific patients health problems

ii) Keep himself up to date on technical aspects of medical practices

iii) Get continuing education

In order to find answers to specifiable questions he requires previous case studies dealing with different specific health problems for being up to date, he must be aware of current research on drugs, diagnostic aids etc. As medical knowledge is growing and changing at a fast rate, a physician may require further study for his careers development.

Ramesh Kumar's study on information seeking behaviour of medical scientists working in different leading medical institutes in Delhi reveals the following findings:

(1) Most of them indicated their order of priority for different information sources as review articles, consultation with professional experts, abstracting and indexing services, consultation with colleagues, library catalogues and library staff.

(2) Among the indexing and abstracting services, mostly used service is `Index Medicus' followed by current contents: Clinical Medicine; Excerpta Medica and Biological Abstracts.

(3) Participation in scientific meetings exchange of ideas was found to be significant among medical scientists.

14.5.3 Non-Users

To study the implications of a library to the fullest extent, the information requirements of people who do not use the library is also an essential prerequisite. Very few studies have investigated about the needs of non-users of libraries.

Grose has studied the problems of non-users of libraries in obtaining required information needed in their job and personal lives. Half of the respondents agreed that they are having information problems. The need for uptodate information and methods, laws, taxes, finances and accountancy emerged. It is suggested that busy practitioners like teachers, health service employees, solicitors, local authority officers and trading standard officers have insufficient time to be able to keep uptodate.

14.6 LET US SUM UP

In discussing information use through out this unit we have chiefly been concerned with the importance of information to the well-being of individual as well as the society. We have seen the vital role played by an information system in disseminating right information to the right

user at right time. While discussing about the role of an information centre we have noticed that unless the planners of information services know fully about users, no information service worth its name can be planned. As part of this discussion we have tried to define users, user needs and their information seeking behaviour. Users can be conveniently categorised according to their positions, work activity and discipline. Their needs as we have seen are largely based on their approach to information for various purposes. While trying to get the required information they interact with the library or information system in different personal ways and create various demands on the information system.

While emphasizing the need to know about the user needs and their information seeking behaviour, we have come to the point of how to know about the user and the different techniques employed for this purpose. User studies or surveys are the principal means available to ascertain the information needs of users. Different survey techniques are made available to the planner of the surveys which can be used either in combination or alone depending upon situation and the expected outcome of the studies. In this context the relative merits and demerits of each technique of user survey have been brought to your notice. We have also seen how to plan a survey scientifically to study the users behaviour and their needs.

While concluding the unit, we have gone through various interesting findings based on different user studies by professionals in the field. The examples cited in these sections will give some insight into the information needs and information seeking patterns of different user groups. Many of these results could help in formulating the hypotheses which may lead to further research with different user populations. This account of findings of user studies is highly selective and makes no claims to comprehensiveness. The student is urged to seek out additional survey reports to have further knowledge regarding this specific aspect.

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14.9 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) What are User Studies? Explain their importance in planning information services.

2) Explain different techniques of studying the information needs of Users.

3) Discuss the merits and limitations of any two methods used in Users survey.

II. SHORT NOTES

a) User survey methods
b) Objectives of User Studies
c) Categories of Library Users
d) Non Users
e) INFROSS Study

UNIT-15 : INFORMATION POLICIES - INTERNATIONAL AND NATIONAL

Structure

15.0 AIMS AND OBJECTIVES

This unit aims to introduce you to the international and national information policies.

After reading this unit you will be able to

- explain the relevance of preservation and transmission of information
- explain the concept of information infrastructure and the need for international cooperation
- identify different forms of international cooperation
- define information policy and assess the need for a national information policy
- explain various components of national information policy
- compare information policies of different countries like USA, UK and India
- explain in detail the national information policy of India.

15.1 INTRODUCTION

We have already seen how information is useful for various purposes; and how the progress of an individual as well as the society is interlinked with the use of information from Units 13 and 14. However most of the nations have extremely limited capabilities and resources, both human and financial to devote to the production and acquisition of information, especially scientific and technical information. Many of the developing countries produce less than one percent of the world's scientific literature and perhaps an even smaller proportion of the total technical information. Some very advanced countries produce a little more than 5% of scientific literature. These facts are relevant only in demonstrating that a country's development depends on its application of knowledge and information rather than in the generation of new knowledge.

The knowledge and information are readily available somewhere in the world; they must however be made accessible to all kinds of decision makers, to entrepreneurs and scientists, engineers and technologists. The means for communication and transfer must be established. In fact, in many countries it is the gap in information accessibility and transfer, and therefore of use, which must be bridged if economic progress is to be achieved. In order to fill this "information gap", strengthening the `information infrastructure' of a country is a crucial area to be considered by the concerned government.

15.2 INFORMATION AS A RESOURCE

Information is considered as a vital resource for growth and development. It is essential for the development of a country or a region. The socioeconomic activities and a nation's progress is dependent upon easy availability, transfer and utilization of information. Information is available from organized as well as unorganized sources. There is a need to exploit it and allow its free flow from all the sources to increase the productivity and to modernize the production. Flow of accurate and reliable information is possible through a sound policy of information and systematic development of networks.

15.2.1 Preservation

As mentioned earlier owing to the importance attributed to information as a resource it has to be preserved and conserved as man's cultural heritage. Preservation is the maintenance of materials close to their original condition as far as possible, or until they are no longer needed. It is an integral and important aspect of librarianship.

Preservation of records of information and information as such is required for the following reasons.

1) A basic function a library is to have the responsibility of collecting the documents or information of the past and of the present and to keep and maintain them so that they are available to both the present and future users.

2) Preservation of information/materials is not only necessary, important and urgent but also it is an integral part of contemporary librarianship. The complexity and magnitude of the problems generated by deteriorating library collections and the considerable time, money and effort invested by the information centre demand the preservation of material.

3) Some of the information materials become valuable over a period of time., what was once a current manual or novel can later become one of the few surviving copies. Hence they must be preserved for scarcity and specimen value.

4) By and large the present days are of consolidation rather than expansion of libraries. As the budgets shrink and the cost of books and other information sources escalates, librarians are obliged to see that their existing collection lasts as long as possible. Thus conservation and preservation of information and information sources have become primary concern of the library managers.

The causes of the preservation problem in libraries are essentially physical and chemical. In addition to the scientific origins of the difficulties, however, environmental and social factors have also played a critical role. The whole problem has been compounded by the greatly increased use of libraries in all industrialized countries in the last 40 years, and by the ever increasing flow of books and documents into permanent repositories. The solutions to the preservation problem, therefore, are only partly scientific and technological; we must also look for managerial actions which will develop appropriate policies and provide both the financial and human resources to enable those policies to be implemented. With this view it can be suggested that the development and implementation of national information policy should also accommodate the provisions for preservation programmes at different levels from the global to the institutional.

15.2.2 Transmission of Information

Transmission of information is one of the most important prerequisites for a country to progress. International cooperation in this regard is also essential for higher productivity by individual nations. In the last few decades, the experience of the United Nations agencies, and Unesco in particular, in facilitating the development of national information infrastructures and of international mechanisms designed to enhance the capacity of member states (and especially the developing countries) to handle, transfer exchange, access, and effectively utilize information in development-related activities bear out these views on the real world situation- the need to use information effectively and to solve the problems of providing the users with appropriate information at the right time in a convenient form.

With this background knowledge on importance of information, its preservation and transmission, we proceed to the next section where the discussion will be on the importance of establishing an information infrastructure for a nation.

15.2.3 Information Infrastructure

Information Infrastructure can be defined as "the national capabilities for making knowledge and information accessible, for the transfer of knowledge and information and therefore for putting knowledge to work". Different components of information infrastructure are : a nucleus of physical information resources; a supply of trained information personnel; linkages to personal information sources; linkages to significant decision-making bodies, institutions, research development establishments and technological institutions; two way communications channels with users; an organizational system that brings together and energizes these resources, personnel and linkages; and national policies that promote the systematic development of the infrastructure.

This unit mainly focuses on the last two elements of the information infrastructure. Here we have tried to bring together pertinent information about the efforts to be made at the national and international levels to plan and develop information policies and systems.

15.2.4 Access to Information

The international information transfer can be defined as the processes and systems that promote the flow of information from creating nation or organization to other nations or organizations. This particularly includes the issue of transborder data flow and the question of free access to information.

Free access to information has two major components:

1) As said above international information transfer involves the processes and systems that promote the flow of information from creating nation to other nations. eg: International cooperation.

2) International information policy can be accomplished by those efforts by national governments and international organizations to develop official policy or law for transmission and receipt of information from outside national borders. Great efforts have been made in dealing with problems of information transfer by many intergovernmental organizations. Eg: Transborder Data Flow (TDF) etc.

15.3 INTERNATIONAL CO-OPERATION

The recognition of information as an international commodity has been motivating countries to work together and cooperate more and more regularly in this field, or to take it into consideration in the other aspects of their relations. Today acquisition and dissemination of information is of major and growing concern to national and international activities.

15.3.1 Need

Throughout history, the transmission has always involved a great deal of international exchange the meetings of scientists and the circulation of documents. In the modern world, such exchanges have become even more important because:

a) Scientific and technological activities are developing rapidly throughout the world;

b) A growing number of countries are contributing to these activities; and

c) Science and technology are having an increasingly important and direct impact on all aspects of social and economic life.

15.3.2 Objectives of International Cooperation

In the field of information, the objectives of international cooperation are:

a) To provide a more satisfactory response to the needs of users throughout the world.

b) To make the fullest possible use of mankind's accumulated block of knowledge in order to speed up progress

c) To improve the productivity of existing information systems by attracting more users.

d) To ensure, by task sharing, that individual systems are not brought to a halt by the increasing quantity of data to be processed and the costs involved.

e) To foster the gradual harmonization and interpretation of information systems with a view to attaining the foregoing objective.

f) To see that all countries have information systems in keeping with their needs.

15.3.3 Forms of International Co-Operation

International cooperation takes a great variety of forms, including:

a) Direct contact between individuals and organizations

b) International meetings

c) The communication of as yet unpublished documents and information

d) The circulation of published documents

e) The exchange of regular publications

f) International programmes for research and data collection

g) International information systems

h) Technical cooperation for setting up or improving information systems etc.

15.3.4 Framework of Cooperation

The framework of co operation also varies widely.

In some cases, individuals and organizations establish and maintain informal contacts; while in others, a formal agreement or programme is drawn up, occasionally involving the creation of a special organization, which may in turn expand until it eventually acquires an independent status.

It is becoming increasingly common for governments to step in and arrange cooperation through bilateral or multilateral conventions either of

a) a general nature (for example,conventions for scientific and technical cooperation, measures according preferential customs treatment for documents) or

b) More especially concerned with the exchange of information (agreements for co operation in scientific and technical information the creation of international information systems etc.

Technical cooperation with developing countries is exemplified by

a) The short or longterm assignment of skilled personnel to help design or implement programmes;

b) The supply of documents and equipment;

c) Assistance with staff training either locally or abroad (awards of scholarships for regular courses, special training courses, study tours); and

d) Help with methodology.

This kind of cooperation may be focused on the national system as well as on individual systems and may provide assistance at all levels: planning, implementation, evaluation, system enhancement, staff training, user education, promotion etc. It is now playing an increasingly important role in most developing countries.

15.4 NATIONAL INFORMATION POLICY (NIP)

Policy can be defined as a statement or general principle of intent that helps translate programme objectives into accomplishment by providing administrative guidelines for decision-making and implementation. Information policies provide guidelines for action that help an

information agency achieve its objectives by standardizing activities, facilitating decision making, minimizing confusion, coordinating the actions of various units and conserving time in training personnel.

As national and international awareness of the value of information has grown, the policy makers at national and international levels thought to ensure that the world's professional and specialized knowledge is fully and properly used in guiding social and economic evolution. These policies on the development of information services should be part of a nation's scientific, technical and economic planning and policy. Several developing countries have embarked on the planning of national policies and systems.

National Information Policy (NIP) is a statement of objectives/goals relevant to the information field with in national boundaries and the means to be adopted to achieve them.

15.4.1 Need for an NIP

The need for a national information policy has arisen for a number of reasons which are stated below.

The first and probably the most decisive element is doubtless the fact that the sum of knowledge and data which the individuals, enterprises and public administration that make up a country cannot do without; creates an overall need for information at the national level. If this is not fully satisfied, development itself may be adversely affected. The danger is particularly great for those countries, like the developing countries, who are obliged to generate new activities.

Secondly, the total cost of the necessary information and of its processing must rise, if only because more and more is needed. If there is no co-ordination of scientific and technical information activities, it will become prohibitive, and if these activities are left entirely to private initiative only the most prosperous sectors will benefit; they might even be tempted to use this advantage to the detriment of other sectors.

Thirdly, public institutions have, to begin with, an important role in the production and processing of information.

Finally, as a great deal of information can only be obtained from foreign countries this naturally has repercussions on their international relations with each other.

The problem then is to ensure that the country's information needs, or at least its priority needs, are satisfied as far as possible by utilizing available resources with maximum economy and effectiveness. This cannot be done without a collective effort in the preparation and implementation of policy decisions, joint action, compromises and the coordination of activities.

15.4.2 Goals of an NIP

In the national perspective, national information policy should have the following goals.

1) To ensure optimum utilization of accumulated knowledge in science, technology, economics and social sciences in order to achieve national objectives for the betterment of society.

2) To ensure the availability of adequate information for decisions for management and for policy making both in government and in private enterprise.

3) To provide information services relevant to present needs together with a capability, for developing services to meet the future needs of generators, processors, disseminators, and users of information; and

4) To focus the attention of governments and private organization on the problem of information availability and use;

5) To promote national and international cooperation on the exchange of information and expertise.

15.4.3 Pre-requisites Of an NIP

In order to implement the decisions taken through National Information Policy, any country will require the following infrastructural facilities. The general prerequisites include:

1) The legislative framework to ensure development of strong infrastructure.

2) Advisory and administrative infrastructure to prepare information system plans and to monitor the implementation (see next section for detailed discussion under administrative arrangement)

3) For sound planning of network of information services development of good communication facilities such as long distance telephone and telex for linking the users to the network of information centres. Telecommunication facilities suitable for digital data transmission at fas rate and coaxial cables, microwave and satellite communication channels to facilitate transfer of information in computerized data networks.

4) National acquisition policy for both conventional and nonconventional media. Information resources centres must be equipped with adequate collection of all types of documents. There should be efficient and reliable access to tools such as union catalogues, referral services etc to mobilize resources and services.

5) Improvement in the level of staffing which ensures the induction of high level of manpower to articulate the users needs tapping the specific information resources using the advanced information technologies.

6) Establishment of standards for different library materi- als operations, techniques and services including latest technologies. The national standards should also confirm to internationally developed standards.

7) Establishment of networks or strengthening of already existing ones. Formulating guidelines for user access to these networks.

8) Assessment of user needs vis-a-vis information resources developed.

9) Development of end user training programmes for effective achievement of the objectives and goals of NIP.

15.5 NATIONAL INFORMATION POLICIES OF USA AND UK

15.5.1 National Information Policy Of USA

The origins of concern in federal information policy have been traced back to the mid-thirties. At that time the focus in the policy was on communication. In the next two decades the focus was on scientific information and, in the seventies, on the libraries and information networks. Today the focus is on information technology and the effective management of government information resources. Although there are many connotations, all have one thing in common: they deal with the policies that govern the way information affects society.

Kathleen Hein refers to information policy of US as "a catch term as it includes different streams of information". According to Eileen Truth US information policy is characterized as decentralized and "implicit in nature consisting of collection of laws, precedents expectations and social norms which are generally autonomous and have emanated form diverse sources".

Congressional Research Service's annual review (1986) of the bills and resolutions concerned with information policy and the utilization of advanced information technologies used nine major categories in this review and gives the best indication of the range of legislative activity:

i) Telecommunications, broadcasting and satellite transmission.

ii) International communication and information policy.

iii) Library and archives policy.

iv) Information disclosure, confidentiality, and the right of privacy.

v) Computer security and crime.

vi) Intellectual property.

vii) Information technology for education, innovation and competitiveness.

viii) Federal information resources management

ix) Government information systems, clearinghouse, and dissemination.

Hernon and Mcclure have stated 14 significant issues which have the greatest impact on the effectiveness with which the government in US provides information and organized them under five broad categories:

1) Federal organization for information policies.

2) Relationship between the federal government and other stake holders in the information sector.

3) Information technology

4) The economics of government information

5) Public access and availability to government information.

i) Federal Information Policies of the 1980s and 1990s

Some of the active bodies currently involved in the information policy arena are in the legislative branch and the executive branch. More attention is likely to be paid to the role of the judicial branch in future years.

The following paragraphs illustrate the efforts made and various tasks performed by US congress and other related bodies for the implementation of federal information policy.

ii) The Government Printing Office

The most visible and familiar actor involved with federal information policy is the Joint Committee on Printing because of its involvement with the Government Printing Office and the Depository Library Program. The work of the Ad-Hoc committee on Depository Library Access to Federal Automated Data Bases is also noteworthy. The Government Printing Office has established an Information Technology Program for funding and implementation of pilot projects in the area of information policy.

iii) The Congress and its Sub-Committees

The primary actors in the formulation of federal information policy are in the legislative committees. The Congressional Research service is now monitoring the information related legislation. During different Congressional meetings, different bills and resolutions related to information policy were introduced. For example, during the 99th Congress in 1985-1986 alone, more than 500 bills and resolutions were introduced. A few of them are discussed below.

Two of the most active subcommittees have been the House committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture; and the House Committee on Science, Space, and Technology; Subcommittee on Science, Research Technology.

iv) Sub-Committee on Government Information, Justice and Agriculture

This committee is concentrating on government information systems, especially the electronic filing and dissemination of information by federal agencies. Its report is issued in 1986, *Electronic Collection and Dissemination of Information by Federal Agencies: A Policy Overview,* addresses the major policy issues in that area, especially government competition with the private sector. It mainly concentrates on the real problem of "how to minimize the conflicts between government and private information companies".

v) The House Committee on Science, Space and Technology

This committee has been involved with the efforts to stop privatisation of the National Technical Information Service. Its most important and recent initiative has been in the reviewing area of Science Information Policy.

vi) Office of Technology Assessment

It is congressional support agency involved in major information policy studies at the request of Congress, focussing on information technology and services. It has funded different projects on areas like federal information management, the changing nature of federal information dissemination and so on.

vii) Federal Library and Information Centre

This is a inter-agency committee, located with in the Library of Congress. Its active participation in the area of federal information policy can be noticed through a series of annual forums held by it on federal information policies. The main objective of organizing such forms is to give those in academic and the public and private sectors an opportunity to articulate concerns regarding trends in governments information policies.

viii) Office of Management and Budget (OMB) and its Office of Information and Regulatory Affairs

Within the executive branch, the single most powerful body has been the Office of Management and Budget (OMB). Assuming monitoring of government policies related to the collection and distribution of information, OMB has through a series of circulars and bulletins established new directions for the management of government information.

The central issue regarding the US information policy is related to the extent to which federal information policy is the responsibility of the executive branch and what role the legislative branch has in setting government wide information practices and policies.

15.5.2 Information Policy of UK

In the United Kingdom the speed of development of library services of various kinds has quickened markedly over the past ten years. The rapid development has witnessed two important aspects - one, the re-organisation of the public library system and the restructuring of the British Library. The re-organisation of public libraries was affected through the enactment of the Local Government Act (1972). The Act helped to form a coherent system of libraries which were previously under local governments. The establishment of British Library in 1973 was based on the reports of the two national committees, namely, the Parry Committee (1967) and the Dainton Committee (1971). From its inception the planners and administrators of the British Library have undertaken numerous measures for its development from time to time. Let us examine some of the recent policy studies which helped to modernise the LIS in the United Kingdom.

The following policy documents published by the British Library and their reviews assisted in the formulation of coherent plan for determining objectives, priorities and resources towards a strategic information policy for the United Kingdom.

1) Advancing with Knowledge (1985)

2) Automation Strategy (1988

3) Gateway to Knowledge: the British Library Strategic Plan 1989-1994

4) Acquisitions policy at the Document Supply Centre and the collections portfolio (1992)

5) For scholarship, research and innovation: strategic objectives for the year 2000 (1993)

I. AUTOMATION STRATEGY

"The British Library's strategy for automation designed to respond to flexibility and rapidly to changing demands.

1) The main aim in reader services is to provide users in the St.Pancras library and other buildings with OPAC terminals, linked with an automated book request information system and allowing entry into the 12 most heavily used catalogues of the London-based collections.

2) The integration of catalogue access, information services and document supply, considerable potential for providing high-value, rapid response services by exploiting developments - such as availability of fulltext digitized video disc and CD-ROM storage and improvements to find fax and telecom networks.

3) In Acquisitions and Cataloguing priority would be given to serials acquisition control and its data structure. Catalogue records would increasingly hold details of the item's preservation status, its availability in other media forms and its precise location in the collection.

4) From Boston spa and St.Pancras the British Library would offer an integrated service based on a single collection and a number of national and international cooperation schemes.

5) An improved service to scholars and researchers in the business and industry, a growing range of value-added information services offering data analysis, and a swifter and more comprehensive external document supply service aided by new techno- logies.

6) Rationalization of the use of the Library's buildings in London, a relocation of a number of activities from London to Boston spa.

II. SERVICES

7) Spend less on adding to, and caring for collections, but to make progress both in the better organisation and exploitation of own resources, and in cooperative arrangements with other libraries.

8) The British Library is also contemplating with sponsorship, joint funding, private sector involvement in publishing programmes; collaboration with other institutions in research projects.

9) All its collections were now treated as a single entity; duplicates in specific fields had been reduced and certain other material, previously held for reference only, was now made available for loan when necessary.

10) In the humanities the primary aim remained the development of the collection of English-language material. For foreign material most emphasis would be a high quality research material published in Eastern and Western Europe and in the Orient.

11) Efforts would be made to apply a common stock principle to the scientific and business collections at the Document Supply Centre (DSC) and SIRIS.

12) In the field of catalogue record creation three key strategies were propounded to reorganise and restructure catalogue procedures in an effort to arrive at an effective balance between resources, workload and users' requirements; to modify record content

and format favourable to the British Library's largely automated interactive systems and to develop the national bibliographic service in the lights of changes in record design and the changing information environment.

13) A centralized acquisitions, processing and record creation directorate for all UK Copyright and overseas English language material would be located at Boston spa although a subsidiary unit would remain in London where language skills were available.

14) Staff development was given a stronger profile on the second strategic plan. An internal document ***In to the 1990s : Staff development and training in the British Library*** prepared by Central Training Unit (1989) advocated that the required scholarly material, specialists and entrepreneurial skills would be recruited and developed within the Library's overall philosophy of service.

By the year 2000, when 13.3 million items will be held in the London collections and 7 million at Boston spa a single copy of an item will be used to support both document supply and reference function whenever possible and practicable.
The Chief Executive Office submitted in March 1993 a set of six strategic objectives on which the Library will work towards' in the period 1993-2000.

1) establishing a single library and operating a single collection based on two main sites;

2) restoring the acquisitions and preservation budgets;

3) maximizing access to services through the full use of new technology on-site and over electronic networks to other major library networks and users;

4) ensuring the Library remains a world centre for the capture, storage and transmission of electronic documents;

5) developing a programme of exhibitions to widen access to the collections; and

6) acting as a leader in the development of library systems and services.

Priorities for Research 1989-1994 an A4 information sheet issued in January 1989 and reproduced verbatum in International Journal of Information and Library Research I(1), Jan 1989 outlined the parameters within which the new Research Grants Section would presumably operate. The type of research programme that would attract support is listed as

1) Research into the applications and implications of IT, including electronic publishing and library automation;

2) industrial, business and commercial information research bearing in mind the value of information for economic development;

3) Information policy research, including library policy research and the economics of information;

4) Basic and strategic information research which examines the underlying principles of information storage and retrieval;

5) Research into information handling in the humanities, particularly into ways in which new technology can be applied;

6) Library research where such issues as the management of change and constraints on funding are important;

7) Research aimed at improving library and information services through studying the needs of users in pure, applied and social sciences as well as the general public;

8) Educational research relating to new curricula;

9) Research into manpower, education, and training for the Library and Information profession.

Information UK 2000

`Information UK 2000' was the name given to a programme of linked studies examining the likely impact of technological developments and of social, political and economic factors on the production, storage and use of information in the 1990s and into the 21st century.

The British Library Research Series published a book in 1990, entitled ***Information UK 2000,*** edited by John Martyn, Peter Vickers and Mary Feeney. It is a summary of the findings and recommendations of a number of task forces, charged to consider the likely patterns of information and library provision at the turn of the millennium. An overview provides a factual summary of the technological, communications, publishing, social and organisational and educational environment within which the programme operated. Implications of the study for research community, information industry, government, the training sector and the library and information profession are thoroughly examined. A strong call is made for government intervention and a national information policy.

The report has identified five broad policy issue areas from the policy-maker's view of possible changes in the national and international information policy. The issues are summarised below:

1) Technological Policy Issues

1.1 *Infrastructure* : The main trust in the technological developments will be the establishment of a telecommunication infrastructure for network services.

1.2 *Employment:* Advances in technology over the next decade lead to decentralisation of workforce for cheaper locations, widespread adoption of home-working, major increase in the number of women at work, increased pressure to move work to people rather than moving people to work.

1.3 *Economics :* Technological developments will also influ- ence towards the concept of a paperless and cashless society; the ability to store documents electronicaly and only print them as required; the use of Third World countries for the processing of raw data for the developed countries; shortage of UK workforce.

2) Legal and regulatory policy issues

2.1 *Copyright:* The new technological developments raise certain critical questions over intellectual property rights, their regulation and control. The sanctions against nations that fail to meet recognised standards of copyright protection; adjusting copyright regulations to cope with new technological formats.

2.2 *Security:* Policy markers need to be aware of the impli-cations of the issues related to the law of contract, prote- ction against criminal activity and freedom of information versus personal privacy. Censorship in the provision and use of certain classes of material.

2.3 *Training*: Policy issues should concentrate on issues such as imposition of VAT on books; single European market; purchasing power of LIS; pricing mechanisms for supply and use of information; provision for value-added services as revenue earning activities; promoting sponsorship and joint ventures with the private sector in service promotion.

3) Education and training policy issues

3.1 *Workforce:* A workforce which is relevant to employment needs and which acquires and maintains the necessary skills, continuing professional development and much greater attention to training by employers will also be required.

3.2 *Population:* In the interests of information industry need to encourage and support the acquisition and development of information handling skills throughout the population to cope with the technological changeover.

4) Political policy issues

4.1 *Central government:* Features such as the reduction of public expenditure as a proportion of GDP, targeted benefits rather than generalised subsidies, freedom of individual choice, increased personal accountability, reduction of government intervention and bureaucracy and promotion of private sector will provide the political framework for policy makers.

4.2 *Local government:* The changes affecting the local governments, such as privatization of services, contracting out, joint ventures with private sectors and competitive tendering, tighter control of financial resources through the community charges and likely abolition county councils which would lead to restructuring of public library system.

4.3 *International governments:* The integration of the two Germanies and the establishment of new economic, social and cultural relationships with Eastern Europe will have influ- ence on the trans-border information flow in Europe.

5) Organisational policy issues

5.1 *Partnership:* Technological, economic and political environments will promote partnerships between different agencies in information community in production, marketing and service delivery. The partnerships may be trans-sectoral involving the public, private and voluntary sectors

5.2 *Planning:* Strategic plans allow a wide range of part- ners to plan ahead over a reasonable time-scale, better use of resources, enhanced products and services

5.3 *Representation:* Representation to the government or to the community will be difficult due to too much fragmentation, professional rivalry, inability to measure information are some of issues to be faced by information industry.

15.6 INFORMATION POLICY OF INDIA

Over the last few years information policy has presented itself as a powerful tool to aid the solution of many of the problems faced by a planned economic development with emphasis on rural development. Today it is recognized that all developed and developing countries are heading towards an information economy in which information policy is preeminent and a source of innovation for the society. Ken Gilmore has developed a theoretical policy frame which is applicable both for developed and developing countries. According to him the information development also follows the same basic evolutionary pattern. This has been observed from a study of library development in the countries like Asia, Africa and South America. The same can be noticed in terms of information generation,use and library development in India.

In India, it is estimated that there are about 1000 libraries attached to scientific organizations, 500 social science research institutes, 170 University Libraries and over 600 government libraries. Besides these,a chain of public libraries have been established in the country. Different types and levels of services are provided by these libraries. There are libraries like National Science Library, National Medical Library, Indian Agricultural Research Institute library for specialized areas in addition to the National Library, Calcutta. During the last couple of years Indian libraries are coming the impact of information technology other areas which are catching the attention of the librarians are use of online services, CD-ROM databases, E-Mail, data communication facilities including satellite communication for networking and online searches, Fax etc. Many bibliographic networks at the national level,regional level and local level have been developed and some of them are in planning stage, such as INFLIBNET, NICNET; DELNET, CALIBNET etc.

Even though there is a dire need and potential for formulating a national information policy for India, so far no such policy has been formulated by the government of India. However there are policies on many related aspects like the Education policy, the Science policy and Technology policy etc. Due to the joint efforts of professionals and professional bodies,the government of India appointed a committee to submit a report on the National policy on library and information system in October 1985. The committee submitted its final report in May 1986. The Government of India is yet to take a decision on the acceptance of the national information policy However, the government has announced some policy statements and formulated some programmes in the sixth and seventh Five Year Plans. There

is an urgent need to declare a National Information Policy in the proposed 9th Five year plan. Several seminars have drawn the attention of the planners on the need and content of such policy. Several individual contributions by professionals also expressed their views about the need, parameters scope of the proposed National Information Policy for India.

15.6.1 Objectives of the NIP of India

The following are the main aims of the National Policy on Library and Information system of India, as stated in the report of the Committee on National Policy on Library and Information system:

(1) To foster, promote and sustain, by all appropriate means, the organization, availability and use of information in all sectors of national activity.

(2) To take steps for mobilizing and upgrading the existing library and information systems and services and initiating new programmes relevant to our national needs, taking advantage of the latest advances in information technology;

(3) To encourage and initiate with all possible speed, programmes for training of library and information personnel, on a scale and calibre adequate to provide the library and information services and to recognize their work as an important component of the quality and level of such service;

(4) To set up adequate monitoring mechanisms for ensuring a rapid development of library and information facilities and services for meeting the information needs of all sectors and levels of the national economy;

(5) To encourage individual initiative for the acquisition and dissemination of knowledge and for the discovery of new knowledge in an atmosphere of intellectual freedom;

(6) In general, to secure for the people of the country all the benefits that accrue from the acquisition and application of knowledge;and

(7) To preserve and make known the nation's cultural herit-age in its multiple forms.

Besides the above said objectives the policy statement of the committee also mentioned about the thrust areas under different heads viz., the public library system, the academic library systems, special libraries and information systems, the national library system and the bibliographical services, manpower development and professional status, modernization of library and information systems, general professional issues, and implementing agencies and Financial Support.

The internal deliberations of the committee and its exchange with leading professional experts have led it to the conclusion that India must have a National Policy on Library and Information System. Partly its need is supplementary to that of the New Education Policy. Besides, library and information services are required to provide the basic inputs for planning and modernizing different sectors of education, culture and economy.

15.6.2 Factors governing the NIP of India

There are several factors which govern the formulation of a national information policy.

i) Users and their information requirements

ii) Information resources of the country

iii) Hardware/software facilities in the country

iv) Manpower development

v) Organizational structure that exists; and

vi) Finances available

While concluding the discussion on National Information Policy for India it can be emphatically stated that there is an urgent need to announce the NIP for India sooner than later. India among the developing countries has good libraries and information systems. In order to coordinate and cooperate various centres and systems in the implementation of various related policies i.e. National Book Policy, National Educational Policy and Science and Technology Policy and to avoid duplication of efforts a national information policy must be resolved by the Union and State governments. This provides access to required information whether generated internally or imported from abroad to all possible users in the interest of the nation.

15.6.3 Planning of NIP for India

While planning the NIP for India some of the key issues that are to be considered are:

i) The role of Government in the creation and dissemination of information to the individuals.

ii) The concept of public good and effect of information

iii) Application of new technology in information procuring and transfer by adopting appropriate low cost software techniques.

iv) Creation of National Commission for Information systems and Library Services. It has to act as an apex body to formulate and execute the national policy.

v) An action plan to implement the INFLIBNET speedily and formulation of national information systems to meet the growing needs of the economy.

15.7 INFORMATION POLICY *VIS-A-VIS* INFORMATION SYSTEMS

15.7.1 Planning and Development of Information Systems

Under Section 15.4.2 we have noticed different goals to be achieved through a national information policy. These broad goals will give rise to two policy questions i.e.,

i) Shall the information system in a country be centralized or form an interconnected network of relatively independent segments?

ii) To what extent should a country attempt to be self self sufficient rather than relying upon foreign or international sources ?

In response to these questions posed above, Unesco, through a feasibility study of a world Science information system, recommends the following strategy for a national information policy in developing countries:

Strategy for Developing Countries:

(1) A national agency should be established with governmental (or inter governmental) support, for the purpose of planning for improvements in scientific information services, of promoting the growth of scientific library resources, and of developing a pool of qualified manpower. This would, in short, be a development agency, charged with the dual responsibility of increasing domestic resources, and of liaison, under the UNISIST programme, with foreign services. Where the geographical circumstances permit, this agency might well be regional, rather than national in character, and be based on the voluntary cooperation of the independent governments in that area.

(2) A strong, well-equipped library and documentation structure should be developed to provide necessary support for effective participation of the developing country in UNISIST. While any developing country will of necessity turn to library resources external to the country for support,it is desirable to build and to organise reserves of heavily used books and journals, to inventory national holdings, to develop interlibrary lending, and otherwise to strengthen the library functions.

(3) In preparation for adaptation to computer retrieval systems of the future, the developing countries should ensure, through these national or regional agencies, that their information activities and procedures accord with international standards.

15.7.2 Planning a National or Regional Information System

While designing a national or regional system of information we have to take care of the following aspects:

i) Establishing the priorities

ii) Deciding upon the responsibilities and functions of state or Government

iii) Deciding design elements using a systems approach

iv) Statement of structures and main links in the national system of information

v) Decisions regarding finances

vi) Plans for manpower planning

vii) Plans for computer-based information services

viii) Plans for reprographic equipment

ix) International and regional cooperation and assistance in information system planning.

(For further details please refer to Unit- of Course-04 Information Systems and Programmes)

15.7.3 Role of International Organizations

Earlier we have learnt about the importance of international cooperation between countries. Under Section 15.3, we have seen different aspects of international cooperation including its objectives.

It is important in this context, to distinguish carefully between international information activities and programmes in the field of information on the one hand and international information systems on the other.

International activities and programmes are relatively coordinated actions, decided upon by international organizations or the representatives of a number of countries, which usually fall within the framework of their normal activities and are intended to improve the circulation and exploitation of information.

International information systems, on the other hand, handle the actual processing of information by means of a coherent methodology and are therefore able to supply data.

For example, UNISIST programme covers a series of activities aimed at facilitating the interconnection of scientific and technical information systems but does not itself supply references on scientific subjects. The AGRIS system, on the other hand, assembles bibliographical data and information and constitutes files by means of which documents can be identified.

Because the sheer amount and complexity of international activity in this area makes a complete panorama impossible, the following account will simply examine its main aspects and offer some significant examples.

Activities of the United Nations agencies:

After the Second World War, the United Nations system, composed of countries cooperating voluntarily to attain a common goal-peace and economic and social order with in and among all nations-provided an appropriate framework with which a cooperative information network open to all nations could be initiated as well as a forum where the concept of such a network could be discussed. Their activities include:

i) Their routine operations, with meetings of their consti-tuent bodies, working groups, training, study tours, consultations, studies and publications, can in itself be regarded as an important mechanism for the international transfer of information.

ii) Their information activities in the strict sense are conducted at a number of levels: international information systems, the encouragement of international cooperation systems, the promotion of international information systems and of information systems for developing countries. Most of these organizations, which number about thirty in all have their own information units.

iii) There are many different types ranging from the traditional library to computerized digital data banks and the fact that they handle documents produced by their organization or received from elsewhere given them an international field of action.

iv) These units work mainly for the officials of their representative organization but also for those of other organizations and for the delegation of member states and consequently for a great many countries.

v) Some of them allow research workers and specialized bodies to use their services.

vi) Moreover, many of their products and services are open to all users free of charge or, more often, for a fee.

Since we cannot describe all these international information systems, we shall illustrate their diversity and considerable resources by examining the most important ones.

a) *United Nations* in New York has a large library with a computerized bibliographic information system and a documentary system, the latter for the Organizations own documents. In addition, it is developing specialized services in economic and social questions, marine resources, natural resources and human settlements.

b) *United Nations Office* in Geneva has a large library and systems specialized in social developments in Europe and in narcotics.

c) *Economic and Social Commission for Asia and the Pacific* (ESCAP) located in Bangkok, has an information centre and clearing house for demographic questions connected with its region and is developing specialized systems for agriculture, sea transport and trade.

d) *United Nations Industrial Development Organization* (UNIDO) in Vienna has an industrial information section providing a number of services. A library and documentation unit offers services in the field of industrial information for UNIDO officials. The industrial information system indexes and abstracts UNIDO documents with the aid of the Thesaurus of industrial development and produces Industrial Development Abstracts by computer. The publication unit issues a monthly information newsletter and guide to information sources for various branches of industry.

The industrial information service, with the help of its many correspondents in various countries, runs a question-answer service on industrial problems for developing countries; it also maintains an international directory of consultants and provides a referral service on

information sources regarding industrial machinery and equipment. An industrial and technical information bank has been established as a pilot project for the iron and steel industry, the fertilizer industry, and the agricultural industries and machinery sectors; it utilizes UNIDO's own and other information resources to collect and analyze technological information on behalf of institutions concerned with industrial development in developing countries.

e) *United Nations Institute for Training and Research* (UNITAR) in New York, has a library on international relations, economic and social development and other research fields of the Institute. In liaison with other United Nations institutions, it organizes seminars on international documentation and on the documentation of international organizations.

f) *International Labour Organization* (ILO) in Geneva, has information services on special education and employment for the blind, on the cooperative movement, safety at work, social problems and employment, vocational training, special training for the handicapped, labour legislation, and employment for women. Its central library and documentation branch has developed and utilize an integrated computerized system (ISIS) for managing its library operations and producing a monthly bibliographic bulletin and index of the ILO library's acquisition and main publications. This data base, also obtainable on magnetic tape, is used for retrospective searches and an SDI Service, both of which are available on request. The ISIS a processing system has been adopted by many national and international systems and organizations. It is at present maintained by Unesco, which also arranges training courses in its use.

g) *United Nations Food and Agriculture Organization* (FAO) in Rome has information systems on rural structures, crop reactions to fertilizers, plant genetics, agricultural statistics, food contamination, rural populations, papers and pulp resources, forestry resources, water sciences and fishing, fish catches, and the contamination of aquatic organism. The FAO Library and Documentation Unit offers computerized services and publishes bibliographic bulletins and indexes in printed and or on magnetic tape.

h) *United Nations Educational, Scientific and Cultural Organization* (Unesco) in Paris, has a library, a computerized documentation system for Unesco documents and those of its affiliated institutions, a documentation system for human and social sciences, a referral system on data relating to the marine environment and an information system on education managed by the International Bureau of Education (IBE) in Geneva.

Certain institutions of the United Nations systems have been given the responsibility of setting up international information systems and then helping to run them by acting as both input centres and coordination centres.

For example,

i) The United Nations information system on population (POPINS)

ii) FAO coordinates three international systems: AGRIS (Agricultural Information System), CARIS (Centre for Agricultural Research Institution) and AGLINET (Network for Agricultural Libraries).

iii) The AEA coordinates an international nuclear information system (INIS)

The Unesco, in association with the FID, has established an international directory on research in documentation (ISORID) in which seventy-four national centres take part. It coordinates an information system on the application of science and technology to development (SPINES). Within the framework of its General Information Programme, Unesco provides support for an International Register of Serial Publication Terminology (INFOTERM) in Vienna, an International Centre for Bibliographic Descriptions (UNIBID) in LONDON, a Clearing House for documentary languages (IINTE) in Warsaw, a world Referral Centre for Scientific Data (CODATA) in Paris, and an International Referral Centre for Information Handling Equipment (IRCIHE) in Zagreb.

As for the promotion of information systems, the Inter Organization Board for Information Systems (and Related activities) (IOB) in Geneva seeks to foster cooperation harmonization between the systems of different agencies.

Unesco has designed and currently executing a General Information Programme whose purpose is to provide a conceptual frame-work for the development of information system and more particularly to promote information policies and programmes at the national and international levels, the adoption of uniform standards and methods for information systems the development of information infrastructure and specialized information systems, the training of information specialists and users.

15.7.4 Activities of Regional Organizations

In the field of information, the activities of the regional organizations are essentially similar to those in the United Nations System. They include the same three aspects of internal systems, the establishment and promotion of international system the promotion of information systems and technical cooperation among member states. For example:

Organization for Economic Cooperation and Development (OECD):

It has for many years brought together the representatives of member countries with in an Information Policy Group which has held consultations and carried out studies on the responsibility of governments, the functions of national focal points, the description of existing facilities in member countries, the possibility of multilateral cooperation in the field of information, the future of scientific and technical information, and the criteria on which governmental decision should be based.

15.7.5 Activities of International Non-Governmental Agencies

These bodies also contribute greatly to international co- operation, exchange of information and promotion of information systems.

Most of the scientific disciplines have international associations usually formed of national associations and individuals or institutional affiliates. Through their regular congresses, publications, working groups and the personal contacts so fostered, these associations are essential to the international circulation of information. Many of them have working groups and programmes specifically concerned with the transfer of knowledge and the promotion of information systems.

i) **International Association of Library Associations and Institutions (IFLA)**: The objectives of this association are to foster understanding, cooperation, discussion, research and development in all the fields of activity of libraries, including bibliography, information services and staff training and to represent the interests of librarianship at the international level. It has opened a regional office for Asia and plans to open one in all the other regions. Its secretariat is based at the Hague in the Netherlands, IFLA, with support from other quarters, has established in London an International Office for Universal Bibliographical Control responsible for promoting this important project inspired by IFLA and maintaining the ISBD, and an international lending office within the Lending Division of the British Library at Boston Spa (United Kingdom). It has also launched different programmes for the development of libraries and the training of librarians in the Third World, whose purpose is to provide a framework for financing, from external resources, projects submitted by members from these countries. It publishes the work of its various sections and two journals.

ii) **International Federation for Documentation (FID)**: It serves to promote all aspects of documentation, including practical activities, research and training. Its General Secretariat is at the Hague, in the Netherlands. But it has two regional commissions, one for Latin America and one for Asia and Oceania, which are relatively independent centres. The FID, through its various technical committees, encourages research in classification and terminology; education and training, industrial information; linguistics in documentation; patents documentation; and research on the theoretical basis of information and the problem of developing countries. A central committee on classification manages the Universal Decimal Classification, an important FID contribution. The FID publishes the work of its committees, its conference proceedings and two journals.

15.7.6 Activities of National Agencies (India)

These bodies play an important role in facilitating cooperation and promote information systems in developing countries. For example in our country we have different national information Services and systems like National Information System for Science and Technology (NISSAT), National Informatics Centre etc.

National Information System for Science and Technology (NISSAT) : NISSAT was put under the charge of the Department of Scientific and Industrial Research (DSIR) in the Ministry of Science and Technology and was formally launched in September, 1977. It is being implemented as a decentralized network involving standardized and mutually compatible systems for collection, storage and dissemination of information. The NISSAT head- quarters at present functions as the national focal point in the field of S & T information.

a) Objectives of NISSAT

The overall objectives of NISSAT are

- to interlink and coordinate a large number of systems, sources and services into an effective information network under a coordinating agency
- to identify and fill the gaps in information sources and services in India

- to evolve and apply internationally compatible national standards and guidelines for information-handling techniques

- to facilitate interchange of information at national and international levels.

b) NISSAT Network

The NISSAT network comprises the following

i) Sectoral Information Centres (SIC)

ii) Regional Information Centres (RIC)

iii) Other Specialized Services

c) Sectoral Information Centres (SIC)

The SIC are expected to satisfy the information needs concerning a particular discipline, mission or product. A SIC should coordinate its activities, with the other relevant information centres called Local Information Units (LIUs) in that particular field.

A SIC therefore has to be part of a national level research laboratory engaged in R & D work in that particular discipline, mission or product so. The services of subject specialists would also be available for various jobs such as abstracting, information analysis, etc. This would also help in a better utilization of the information facilities and products created by the centre.

The following are the examples of Sectorial Centres under NISSAT:

1) National Information Centre for Leather and Applied Industries (NICLAI) at Central Leather Research Institute (CLRI), Madras.

2) National Information Centre for Food Services and Technology (NICFOS) at Central Food Technology Research Institute (CFTRI), Mysore.

3) National Information Centre for Machine Tools and Production Engineering (NICMAP) at Central Machine Tools Institute (CMTI), Bangalore.

4) National Information Centre for Drugs and Pharmaceuticals (NICDAP) at Central Drug Research Institute (CDRI), Lucknow.

5) National Information Centre for Crystallography(NICRYS) at the Institute of Crystallography, Madras. etc.

d) Regional Information Centres (RICs)

In view of the large size of the country, it was agreed in the original plan that a system of Regional Information Centres (RICs) to act as contact points be created in the NISSAT network. However, because of various reasons, including financial constraints, these centres are yet to be created.

e) Other Activities of NISSAT

Other activities of NISSAT include :

a) Computerised SDI services using commercial databases

b) Online access to foreign databases are in planning stage through NISSAT

c) Creation of databases on areas like current Research Projects on S & T ; Directory of Testing Facilities and National Union catalogues has been promoted by NISSAT through INSDOC.

NISSAT also sponsored special studies and projects on different areas of information processing and dissemination, micrographics, manpower development etc.

Besides, the NISSAT has also been playing important role in bilateral cooperation programmes in S & T information with several Countries such as the USA, USSR, France and Germany with in the overall framework of India's agreements in Science and Technology. The NISSAT Advisory Committee functions as National Committee on UNISIST in India as well as for collaboration with Unesco including ASTINFO.

15.7.7 Institution-based Information Systems

Two institutions which are operating at the national level actively in the dissemination of scientific information can be taken as examples of institution based information systems. As an example, a brief account of INSDOC activities is given below.

i) Indian National Scientific Documentation Centre (INSDOC): As a constituent unit of the Council of Scientific and Industrial Research (CSIR), the INSDOC was established in 1952 with the technical assistance from Unesco. Since 1963, when administratively it became an independent unit with a full-time Director, it has expanded its scope of programmes to include activities such as computer-based information services and developing a National Science Library. It has three Regional Centres at Bangalore, Calcutta and Madras to survey and utilize information resources of the region and meet the information requirements of the users in those regions.

The main objectives of the INSDOC are:

i) to develop collections of relevant sources of information in the field of science and technology to complement and supplement the total national document sources;

ii) to render all appropriate and feasible information services in the field of information science and technology;

iii) to develop appropriate linkages with the information systems and services organized in the country;

iv) to establish a national repository for reports and scientific works of the nation both published and unpublished and be a channel through which this informa tion is made available within and outside the country

v) to contribute to advancements in information science and technology including documentation and library science through research and other activities

vi) to adopt and promote appropriate technologies management practices to enhance capabilities and productivity of information networks and services in the country; and

vii) to participate effectively in international information exchange of scientific matters.

INSDOC brings out the following publications on regular basis as part of its dissemination of scientific information programmes:

i) *Indian Science Abstracts:* A fortnightly abstracting service of scientific literature published in Indian Journals, conference proceedings, theses reports, patents and standards;

ii) *Russian Scientific and Technical Publications:* A bimonthly bibliographical list of Russian publications received under Indo-Soviet Scientific and Technical Agreements;

iii) *Contents List of Soviet Scientific Periodicals:* A monthly list reproducing the contents pages in English of 250 Soviet scientific periodicals and;

iv) *National Index of Translations:* A monthly list of documents translated by the major R & D institutions in India.

In addition, the INSDOC has brought out directories giving information scientific and technical institutions, scientific periodicals, scientific information services and facilities, on going research projects etc. in the country.

INSDOC is now having a computerized information storage and retrieval facility. It has developed different databases which facilitate on-line searching on current contents of Indian Journals. National Union Catalogue of Scientific Serials in India, polymer Sciences, Indian Patents, Medicinal and Aromatic plants Abstracts and Material Sciences.

At the international level, the INSDOC operates as Associated Centre for ASTINFO. It functions as the national centre for ISDS and assigns ISSN for serials published in India. It has been designated as the focal point in India for the proposed South Asia Association for Regional Cooperation (SAARC) Documentation Centre. It has bilateral exchange programmes with several countries and actively participates in coordination with other information systems with in the country.

Under different sections of national and international information systems we have covered only a few examples to know the basic nature and activities of these systems. You will learn more about them later.

15.8 LET US SUM UP

As we have noticed, there are a number of reasons whi necessitate the formulation of a national information policy. National Information Policy helps in ensuring the country's information needs, at least the essential information requirement of various groups of users.

In order to formulate and implement a national information policy the countries require infrastructural facilities like legislative measures, advisory and administrative infrastructure, effective communication facilities, sound acquisition policy of print and nonprint media, qualified and efficient staff, use of standards for various library operations and techniques compatible with the standards developed at the international level, established information networks, scientifically planned user studies to assess the real information need and demands along with organised end-user training programmes.

An in-depth study of the implementation of the national information policies in different developed and developing countries reveal the fact that still lot of effort and planning is required to exploit to the fullest extent the benefits of national and international information policies for the all round development of individual countries.

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15.10 RECOMMENDED BOOKS

1) Foster E. Mohrhardt and Carlos V. Renna. "National Planning for Library and Information Services". *In Advances in Librarianship/* ed by Melvin J. Voigt. vol.5. National Planning for Library and Information Services, New York: Academ ic, 1975. pp.61-106.

2) *Guidelines on the planning of National Scientific and Technological Information Services and Networks.* Paris: Unesco, 1975.

3) *Information Policy Objectives* (UNISIST proposals) Paris: Unesco, April 1974.

15.11 ASSIGNMENT

1) Critically evaluate the National Policy on Library and Information Systems (NAPLIS) recommended by the Dr D P Chattopadhyaya Committee.

2) Explain the role of Unesco in strengthening the national information infrastructure of developing countries.

15.12 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) Define `National Information Policy'. Explain the need goals and prerequisites for an NIP.

2) Compare the Information Policy of India with those of USA and UK.

3) Discuss the role of Information Policy in planning and development of information systems.

II. SHORT NOTES

a) Information as Resource

b) Access to Information

c) Information Infrastructure

d) NAPLIS

UNIT-16 : LIBRARY AND INFORMATION STUDIES: EDUCATION, TRAINING AND RESEARCH

Structure

16.0 AIMS AND OBJECTIVES

This unit aims to introduce to you the concepts of Librarianship, Library Science, Documentation and Information Science and their evolution. It also gives a broad picture of the present pattern of LIS education and research.

After reading this unit you will be able to

- describe the evolution of library science, documentation and information science
- assess the importance of LIS profession and professional ethics
- explain the development of LIS education, training and research
- discuss the issues such as manpower needs, professional outlook, accreditation and the challenges of IT in LIS education.

16.1 INTRODUCTION

The profession of librarianship had witnessed radical changes over the centuries from mere custodians of documents to active providers of information using uptodate sophisticated technology. These developments had a direct bearing on the professional education and training.

Library and information science is now over hundred years old. Starting with an apprenticeship, it raised through different stages like certificate, diploma, bachelor's, master's degree, M.Phil. doctorate and postdoctorate level programmes. The advancement of knowledge levels has also raised the status of the profession. It is essential to have a panoramic view of the education, training and research in the field of library and information science to understand the future needs of the profession in a broader perspective. This unit traces the evolution of this field from librarianship to information science and touches broadly on the development of library and information science education.

The profession of librarianship is based on social philosophy. The professional education must have social relevance and must reflect the needs of the society in its curriculum. The education programmes must have clear cut aims and objectives. The objectives of the progress in librarianship should be to prepare librarians capable of monitoring the changes and move constantly forward.

Basically librarianship involves the preparation of librarians, that is the persons responsible for locating, processing, storing and retrieval of the information and its dissemination. "The real goal of librarianship is to acquire, organize and service the record of the social transcript" (Shera 1974; p.285). Whatever the form and format of the document, the purpose for which they are used are education, information, recreation, enlightenment etc. Keeping the purpose in view, education and training for librarianship provides clues to organization and service of recorded human knowledge. The profession has developed its own knowledge base with adequate theoretical foundations as well as practical skills for the systematic study and training essential for practice of the profession. But in the process it has passed through different phases.

16.2 LIBRARY SCIENCE

In a changing society social agencies and institutions will reflect the corresponding change in their nature and functions. It has been true in the case of library and the profession of librarianship as such. The library as a social agency had to go through successive stages of development in its nature and functions, though it has retained its basic social purpose of facilitating human communication through documents.

When rapid development started taking place in science and technology a new area of library activity emerged on the scene viz., documentation and information retrieval. This shifted the emphasis from books to documents and to the information contained in documents.

With the advent of technological revolution of automation coupled with the increasing demand for information services for decision making process, the need for reviewing the scope and coverage of library science/librarianship was felt. Efforts were made in USA to use a term which would be more co-extensive with the recent developments in mechanisation. As a result the `Information Science' came into existence and it became quite familiar. Thus accumulation and storage of information and making the information of various sources available by means of library and bibliographic methods are regarded as features of information science.

Information Science therefore refers to the theoretical and practical study,with corresponding techniques, that aim to process all types of documents, so that information contained therein is made available for mankind.

16.2.1 Librarianship - Early Concepts

Along with the conceptual changes of the library,the purpose of librarian has also changed from era to era. The ancient image of the librarian was the collector, preserver and interpreter of graphic records. He was looked upon as a `Keeper of Books'.

In the beginning of the 19 th century,his main responsibility was to keep the books in safe custody and if any of the books were lost, he was held personally responsible for those books. The image of the librarian is that of a caretaker. But with the advance of democracy coupled with the Acts of Compulsory Education in countries like UK and USA, the librarians took it as their moral obligation to help the common man to educate himself. Lawrence Powell expressed the most liberal and democratic function of the librarian: "He must be a reader of books,and a servant of readers. The rest is housekeeping".

Now a days the librarianship must be treated as salesmanship and library staff has to act as the canvassing agents for their wares converting library as a service agency. Very recently libraries are developed as information centres or information service centres, so we call any librarian as information professional (Information Scientists, Information Officers etc) who deals with the collection, organization, dissemination, packaging, consolidation of information and facilitate access to information.

According to Lancaster "the major professional tasks that librarians perform are all tasks in which the librarian acts as a type of consultant. The librarian is or should be, a recorded knowledge consultant".

16.2.2 Library Science as a Science

Library Science is treated as science as it fulfils the most of the characteristics of a science subject.

i) Meaning and Scope of Science

Science means knowledge ascertained by observation and experiment, critically tested, systematized and brought under general principles.

Webster's New Twentieth Century Dictionary of English Language defines `Science' as "systematized knowledge derived from observation, study, and experimentation carried on in order to determine the nature or principles of what is being studied".

According to the *Shorter Oxford English Dictionary,* `Science' is "a branch of study which is concerned either with a connected body of demonstrated truths or with observed facts systematically classified and more or less collated by being brought under general laws, and which includes trustworthy methods for the discovery of new truth within its own domain".

ii) Basis for Library Science

Science collects material and from them it establishes laws, theories and explanations. Dr. S.R. Ranganathan in his `Five laws of library science' claims that "the formulation of the five laws has set the spiral of scientific method into action. This justifies deriving library science to be a science".

Ranganathan's enunciation of the Five laws is truly epoch making, It is he who established the claim of subject to be a science on sound basis. The following definitions by wellknown librarians support this proposition:

According to Elizabeth Thompson it is "the knowledge and skill by which printed or written records are recognized, colle- cted, organized and utilized".

Raymond Irwin defined it as "the collection, preservation, organization and use of recorded communication".

16.2.3 Documentation

Documentation is a new technique being developed for the purpose of record organization and dissemination of specialized knowledge. It is an art as well as the science of locating, selecting, collecting, classifying, cataloguing and making readily accessible the new ideas and thoughts embodied in the document and retrieving them exhaustively and expeditiously in need and on demand of the scholars. It becomes a basic necessity in the industrial age.

i) Documentation - Definition and Meaning

An authoritative definition, as adopted by ASLIB in 1945, says, "Recording, organization and dissemination of specialized knowledge, or in other words, documentation means collecting,organizing and providing micro-thought to the scientist and research scholar".

Dr.S.R. Ranganathan defines it as, "Documentation is the complex of processes involved in pin-pointed, exhaustive and expeditious service of nascent thought to specialist".

According to S.C. Bradford, "it is the art of collecting, classifying of making readily accessible the records of all kinds of intellectual activity".

It means that documentation involves all the library practices invoked from the stage when the new knowledge is created and published, to the ultimate stage of dissemination the locating of each documents, of abstracting, classifying and indexing it and retrieving it on demand.

ii) Nature of Documentation

Documentation is impossible unless backed by every facet of library activity from document selection through acquisition,accessioning, classification, cataloguing, circulation work, reference service, and maintenance work to every detail of library management developed to a higher pitch of efficiency. However it is possible to recognize and make special mention of the following five facets of documentation.

1) Documentation work or preparing a list of relevant documents
2) Documentation service or procuring the documents or copies of them for the use of readers
3) Abstracting work
4) Document reproduction Service
5) Translation service.

Documentation is done at the international, national and local levels.

Documentation has progressed so steadily during the past 50 years that it now attempts at world coverage of scientific lite-rature through a network of proposed and existent national documentation centres spread over different countries. With the emergence of computers, interest has shifted towards mechanized handling of information.

16.3 INFORMATION SCIENCE

Information Science as a new discipline originated just a few decades back. As it encompasses other disciplines in its scope it is termed as a multidisciplinary subject.

16.3.1 Origin of Information Science

One major consequence of the expanding role of information and knowledge has been the emergence of a new discipline `Information Science'. It was born out of the technology that produced data and information processing equipment.

The term Information Science has been in use at least since 1957. During the 1960s more attention was paid to the Information Science in the U.S. and many dreams of Information Scientist turned into realities.

Foskett and many other writers have conceived Information Science as a discipline emerging at the intersection of library science,communication science, computer science, psychology, linguistics, management science, etc.

16.3.2 Meaning and Scope

According to Pauline Athurton, "Information Science is recognized as a complex multi-disciplinary subject ranging from computers and tele-communications through cybernetics to psychology, logic and techniques of classification and indexing, and as such the information work and information science may be defined briefly as professional disciplines concerned with the accumulation, storage and transfer of recorded knowledge".

J.E. Rowlay and C.M.D. Turner say "Information Science is that discipline which investigates as to how to apply more effe-ctively the objective knowledge that we have."

The aim of Information Science is to plan and organize effective information service. It locates, procures, organizes information-bearing documents with a view to disseminating information contained in them.

Its scope covers various aspects such as the origin, selection, organization, storage and retrieval, interpretation, transmission, dissemination and utilization of information. Information processing devices and techniques such as computers and software developments are also considered.

16.3.3 Evolution of Information Science

Information Science emerged and grew after the Second World War alongside the whole class of communication fields such as information theory, computer science,game and decision theories, new linguistic theory, general systems theory, etc.

The emergent direction of Information Science is towards scientific, technological and professional development. As a discipline, it may concern itself with :

1) Generation and growth of information in different envitonments

2) Collection, storage, organization and processing of information facilitating access and use

3) Dissemination, diffusion and transfer of information in different user environments

4) Use, abuse and impact on individuals and groups in different contexts.

5) Design and development and management of information systems, services, manual and machine based.

6) Social, economic, political and legal features of information and information services.

7) Education and research in information.

The expanding role of information and the emergence of Information Science as a new discipline have also created an imperative need for building up a quality manpower to take care of the numerous demands for information.

16.3.4 Relationship with Other Disciplines

Information Science' is inter-disciplinary in character and emerged from a cross fertilization of ideas involving the ancient art of librarianship, the new art of computing, the arts of new media of communication, and those of sciences, such as psychology and linguistics, which in their modern forms bear directly to all problems of communication in transfer of organized thought.

Both Borko and Cuadra stress on interdisciplinary aspect of the `Information Science' in defining it:

"It is an interdisciplinary science that investigates the properties and behaviour of information; the forces that govern the flow and use of information; and the techniques both manual and mechanical of processing information for optimal storage, retrieval and dissemination".

Information Science has been taken as an expanded concept of library science, has been viewed from a technological point of view relating it to computer science; from the communications point of view and so on.

There are a number of disciplines that claim to be dealing with the phenomena of information as their central core. Machlup listed out some of these disciplines as:

* Electrical Engineering: e.g., signal transmission over-noisy channels as propounded in the information. Theory of Shannon;
* Computer Technology: e.g., information processing, storage and retrieval;
* Physical Sciences: e.g., information considered as an abstraction similar to matter and energy; also analogues of the phenomena of movement and entropy;
* Biological Sciences: e.g., information processing in living beings;
* Behavioural Sciences: e.g., cognitive processes of information;
* Social Sciences: e.g., sociology and economics of information and knowledge. Here information is viewed as a resource and an economic commodity;
* Philosophical Studies: e.g., conventional and modern studies on epistemology;
* Linguistic Studies: e.g., expressing, structuring, coding and communicating ideas and information;
* Library and Information Science: e.g., application of Information Technology for conventional practices of librarianship and the new dimensions that are evolving, including the newly emerging information systems and services;
* Information Science and Technology: e.g., studies involving the intersection of the disciplines mentioned above.

Machlup says,

> "the bond among information sciences is their focus on information as the object of study, though it is important to bear in mind that the word information is interpreted very differently by various groups of researches. The assembly of different fields under the collective designation would have solved a good many problems or some problems. Like the Natural Sciences and the social Sciences, Information Sciences need no single paradigm, no overarching scientific research programmes, no common fundamental postulates and framework."

Machlup has given a panoramic view of the Information Science and its relation with other disciplines in a diagrammatic form.

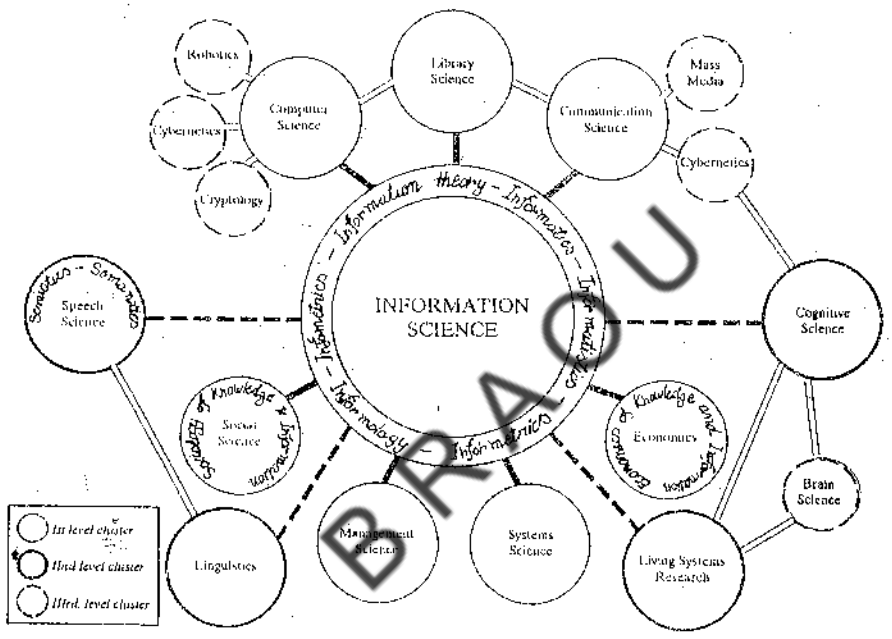

Fig.1 : A Panoramic view of Information Science: A cluster of Disciplines and Specialities (Source: Machlup: Study of information interdisciplinary messages)

16.4 LIBRARY AND INFORMATION SCIENCE PROFESSION

Professionalization seeks to clothe a given area with standards of excellence, to establish rules of conduct, to develop a sense of responsibility; to set criteria for recruitment and training; to ensure a measure of protection for members; to establish collective control over the area; and to elevate it to a position of dignity and social standing in the society.

16.4.1 Profession - Definition and Purpose

The Oxford English Dictionary defines a profession as "a vocation in which a professed knowledge of some department of learning or science is used in its application, to the affairs of others, or in the practice of an art founded upon it".

A Dictionary of the Social Sciences says that "the term professions denotes occupations which demand a highly specialized knowledge and skill acquired at least in part by courses of a more or less theoretical nature, and not by practice alone, tested by some form of examination either at a university or some other authorized institution, and conveying to the persons who, posses them considerable authority in relation to `clients' .... At present the term usually denotes certain occupations whose members give service rather than engage in the production and distribution of goods".

16.4.2 Components of A Profession

Among the essential elements/ components of a profession which are generally agreed upon by analysts of the subject are

1) A systematic theory which delineates and supports the skills that characterize the profession.

2) A level of authority which comes from extensive education in the systematic theory.

3) Community sanction and approval of this authority as expressed in the conferring on the profession of such powers as accreditation, formulation of standards of performance, and establishment of rules for admission into the profession.

4) A code of ethics which regulates relations of professional persons with clients and colleagues.

5) A professional culture sustained by formal associations, consisting of its values, norms, and symbols and having at its center the career concept.

6) A service orientation.

16.4.3 Library and Information Science Profession

Librarianship is, certainly an occupation which demands specialized knowledge and skills. It is based on a systematic theory which delineates and supports the skills that characterize the profession. Librarianship has its professional organizations which promote excellence in the work of the members; influence public sentiments; support; values, norms and symbols; and endeavour to raise it to a position of dignity and social standing. It has at its centre career concept and from the beginning it is service oriented.

Carr-Saunders and P.A. Wilson state "a profession can only be said to exist when there are bonds between the practitioners, and these bonds can take but one shape that of a formal association". Viewed from this angle also, library and information Science is qualified to be called a profession because of the strong professional association it has at the international, national and regional levels.

Librarianship is a noble and exalted profession. It requires dedication, patience, perseverance, satisfaction, selflessness, and sufferings on the part of librarians. Service of mankind is its motto.

i) Needs of the Profession

The usefulness and prestige of any national service depends upon the ability, professional training, enthusiasm and spirit of dedication of the leaders, and the rank and file of the profession.

The normative principles of good management imply the identification of different categories of library personnel.

1) Professional personnel

2) Non-Professional personnel consisting of clerical, artisan, unskilled labour such as janitors, helpers and cleaners.

UGC has grouped the library professional staff into the following categories although actual designations may differ in different types of libraries.

i) Senior Professional

ii) Junior Professional

iii) Semi Professional

This categorization is accepted among the personnel in academic, public and special libraries and documentation centres.

ii) Training and Skills

Any proposal, to put the country's library service on a sound footing must involve a programme of training of librarians.

iii) Administrative Duties

The administrative duties may be performed on different levels. The duties of the professional personnel are

1) Interpreting and clarifying objectives or Basic Aims:

- Relating the library to community and user interests
- Conferring with authorities
- Participating in meetings of governing body and library committees

2) Formulating policies including:

- Transforming of objectives into policies and plans
- Overall or long-term planning
- Planning and initiating new activities
- Selecting locations for new Services
- Planning the budget
- Investigating administrative problems
- Management tools
- Automatic data processing
- Determining records and statistics required

3) Execution of policy, which includes:

- Organizing
- Coordinating activities
- Determining records, statistics and forms required as management tools
- Supervising the work programme
- Supervising service points
- Conferring with library users
- Planning and modifying buildings and purpose-built equipment
- Directing maintenance of buildings, grounds, plant (including vehicles etc)
- Planning and organizing the moving of stock and installation of service points
- Executing and controlling the budget
- Determining accounting methods and procedures
- Selecting supplies and equipment
- Giving professional information
- Preparing reports
- Framing rules and regulations
- Representational duties

iv) Non-Professional duties

The duties of the non-professional personnel are

1) Book-keeping and accountancy work
2) Compiling statistics and preparing graphs and chart
3) Receiving and distributing in-coming mail and dispatching out-going mail
4) Routine Correspondence
5) Filing correspondence and care of office files
6) Taking minutes of meetings
7) Taking and transcribing dictation, typing, duplicating, microfilming, photocopying, photography, operation of data processing machines
8) Handling consignments of books and supplies.
9) Purchasing supplies and equipment, controlling supplies and stock
10) Taking supplies and equipment inventories.

11) Maintenance of buildings and grounds, office and audio-visual equipment, vehicles, etc.

12) Supervision and control of reading rooms and other public rooms

13) Operating telephone switchboard and telex

14) Receiving callers (i.e. reception)

15) Messenger services

16) Driving library vehicles.

16.4.4 Professional Ethics

Ethics of Librarianship, an essential element of library profession, denotes the conduct and behaviour of those who adopt the profession. The Five laws of Library Science are cardinal principles to be observed by a library professional in all his possible relations. Joint Council of Library Associations of India (JOCLAI) adopted A code of Etkics for Library and Information Professionals'.

Ethics of Librarianship indicates that a librarian is for the users and he is called `the guide, the philosopher and the friend' of the uninitiated and the scholar alike; he owes a duty to the book to save it from destruction by its enemies; he should cultivate `professional habits'; he must treat his colleagues and users with sympathy and love.

A librarian to be a successful professional must keep burning the "Seven Lamps of Conduct" They are

Impersonal Book Selection,
Service before self,
He must have a split mind,
Sympathetic behaviour,
Must be tactful,
Must be industrious and patient and
He must be a scholar himself first.

16.5 LIS EDUCATION, TRAINING AND RESEARCH

Information plays a vital role in society and that an adequate library and information system is therefore essential. Such a system requires professional library and information personnel of high quality in sufficient numbers to plan, organize, manage and operate a wide range of libraries, information centres and services; it should be able to draw upon a theoretical foundation established by fundamental research in library and information science (LIS). This requires skilled personnel. It is thus the objective of a higher degree programme in LIS to train graduates who are capable of undertaking these various tasks.

Modern libraries and Information centres need professionally educated and trained personnel and it is only achieved by establishing proper training institutions to educate the library and information personnel as a scholar, as a sociologist, as a scientist, as a technologist and as an administrator.

LIS Education is a professional education and it is a specialized area of human training. The primary aim of education for LIS should be the training of the intellect in matters pertaining to human knowledge and information. Its goal should be the achievement of the highest wisdom in promoting the utilization of knowledge and information for the benefit of mankind.

16.5.1 History of LIS Education and Training

Early public libraries are voluntary libraries and voluntary workers acted as librarians. Their objective was mainly to conserve the library material and make it available under proper custody. The early method of training of a librarian was "Apprenticeship".

Realizing the importance of professionally trained personnel to manage and run libraries effectively and efficiently,library training programmes were started at several places. On 5 January 1887 the first library school, the School of Library Economy at Columbia College in New York City, USA was opened by Melvil Dewey.

In India W.A. Borden started the first training school for librarians in the year 1911 at Baroda. Later Asa Don Dickinson started a library school at Punjab University Library, Lahore in 1915. In 1929, Madras Library Association started the School of Library Science and later Madras University took it over in 1931. In 1934 Dr.M.O. Thomas, Librarian, Andhra University had run a School of Librarianship. These stand as milestones in the annals of LIS education in pre-Independent India.

16.5.2 Pattern of LIS Education

After independence LIS education made rapid strides. Today the pattern of LIS education consists of professional manpower development programmes through formal and non-formal system. The system has involvement of library associations, women polytechnics, institutions and university LIS departments. The LIS education pattern has been shown diagrammatically.

i) Levels

The levels of courses are five. They are CLISc, BLISc, MLISc, M.Phil. and Ph.D. These can be broadly classified into semi professional and professional. The semi-professional level courses are CLSc/Dip Lib.Sc and the professional level courses include BLISc, MLISc, M.Phil, Ph.D.

The library associations and institutes (non-University level) are primarily concerned with semi-professional courses. The non University level courses can further be grouped into vocational and non -vocational courses. There are a few instances where even some universities still conduct CLISc courses. The University LIS departments (University level) are primarily concerned with professional level courses. The courses offered by INSDOC and DRTC shall also come under this category.

The university level courses can further be grouped into Undergraduate (BLISc) and Post-graduate (MLISc, M.Phil and Ph.D.) courses.

The courses offered by the open universities and institutes of correspondence courses of the universities (non-formal) under distance learning mode add a new dimension to LIS education in India.

Curriculum Development Committee (UGC, 1992) report suggested that Special Courses may be organized on the recent advances in sub topics of the core subjects as well as electives of BLISC and MLISc programmes. For example, Marketing of Information; Information Technology; Computer Applications and so on.

The minimum admission requirements, the duration of the courses and the name of the sponsors of the different levels are clearly stated in Table-1.

LIS Education in India:

Course Title	Sponsors	Minimum Admission requirements	Duration	Overall Objectives
Certificate	Library Associations,University affiliated colleges &institutions	Matriculation/senior secondary/ 10th/SSLC, with 55% to 45% of marks variation still persist in various states	2to6 months also 1 year part-time	To give the student a knowledge of elements of library science to practice in library
Diploma	Women's polytechnics; Library associations	Matriculation/ Senior Secondary SSLC/ SSC/ 10th Class	1to2yrs	To give the student an understanding of the normative principles and theoretical foundations of LIS. The Preparation and use of library tools and in the library management of various types libraries
Bachelor's degree	University departments	Degree in arts/Science commerce or their equivalent certain schools have in addition, a system of admission tests or interviews.	1to 3 years	Similar to thatof Diploma course

Master's degree	University departments	Degree in LIS and an admission test is prescri bed by most of the lib. schools. A few schools also prescrive few years professional experience as an essential requirement	1 to 2 years
Associate ship	Autonomous Institutions	Master's degree in any discipline; degree in LIS; or degree in Engineering Medicine etc with 2 years experience in a special library and Selection test is prescribed and Interview	1 to 2 years
M.Phil.	University Departments	A Master's degree in Lib Sc with second division is usually insisted upon by most of the universities	1 to 2 years
Ph.D.	University Departments	A Master degree in Lib Science in some universities it is M.Phil,whereas in some universities a pre-Ph.D. Viva voice examination is conducted to test the ability of the student certain universities have a system of admission test for both M.Phil and Ph.D.	2 to 3 years

ii) Courses Offered by Universities and Institutions:

At present about 75 Universities in the country are providing LIS Education. All these 75 University level LIS schools conduct one year post-graduate course leading to the award of B.Lib.Sc./B.L.I.Sc. About 60 of them offer further one year course leading to MLISC degree except the University of Calcutta, Madras, Mysore, North Eastern Hill University, Karnataka University, Nagarjuna University, and the Andhra University, which have a two year programme.

About 35 universities enroll students for Ph.D. degree in India, whereas about eight University schools now offer M.Phil programme. These are - University of Delhi, S.P. University (Anand, Gujarat), Gulbarga University, S.V. University (Tirupati), SKD University (Anantapur), Andhra University, Osmania University and Sambalpur University.

In addition to the university level courses as mentioned above, Courses in Information Science (previously known as `Associateship in Information Science') and `Associateship in Documentation and Information Science' programmes are offered by INSDOC, New Delhi and DRTC, Bangalore.

Besides a few women`s polytechnics (For ex: Govt. Polytechnic for women at Bangalore, Chandigarh, Ambala and Womens Polytechnic, Delhi etc.) library associations, directorates of correspondence courses attached to various universities etc also offer under-graduate level courses known as certificate (CLISc) and Diploma (DLISc) in Library Science.

In the non-formal stream that is correspondence/distance education system the B.Lib.Sc./BLISc and MLISc programmes are being undertaken by open universities and correspondence schools of formal universities.

iii) Distance Education in LIS

Distance education has great potential to serve the multitude of eager learners. The term `Distance Education' denotes education through correspondence, open learning, off campus, home-study etc.

It is a boon for in-service candidates, individuals who are place-bound and have employment or house commitments.

In India the courses in LIS education through distance education are offered primarily by universities, either conventional or open, which leads to undergraduate, graduate or post-graduate courses. There are twelve Universities (please see the Table-) which are imparting LIS courses at different levels through distance education.

DISTANCE EDUCATION PROGRAMME FOR LIS IN INDIA

Courses offered	Name of the University
CLISc:	Annamalai, Kakatiya, Madras, SV University
BLISc:	Annamalai, Barkatullah University (Bhopal) Dr.B.R.Ambedkar Open University, IGNOU, Kakatiya, Kashmir, Kota Open University, Kurukshetra, Madras, Madhurai-Kamaraj, Punjabi University and S.V.University
MLISc	Dr BRAOU, Annamalai, IGNOU and Univ. of Madras

iv) Course Contents

a) C L Sc / Dip L Sc Course

The number of papers at certificate level varies from 3 (Annamalai University) to 8 (Gujarat). In most cases they are 5 to 6. Various library committees viz., Sinha Committee, Ranganathan (UGC) committee and Ekbote Committee (A.P.) suggested different course contents. At this level the course contents consist of library classification, library cataloguing, reference/information service and library administration combined with practical work in libraries and/or documentation centres.

b) BLISc Course

In BLISc, the number of theory papers varied from 5 to 6. There are 2-3 practical papers. Even today classification (Theory and Practice) and cataloguing (Theory and Practice) occupy nearly half of the courses of the BLISc programme. The internal assessment constitutes upto 25% of total marks in some universities.

The syllabus of BLISc followed by most of the university library schools was drawn up by Ranganathan and approved and recommended by UGC Review Committee (1965). Certain changes and modifications have been made in the scheme of papers by restructuring the contents, scope and allocation of marks for purpose of evaluation by a few library schools during the past 10-15 years.

At present the curricula of BLISc Programme in most of the schools include core subjects in which basic competencies are presented. Some library schools curricula are totally based on traditional courses like classification, cataloguing, management etc. some have incorporated certain topics that give elementary concepts of Information Science. Curriculum Development Committee (UGC, 1992) suggested a scheme of papers consisting of six core papers and two electives (out of 16) of 50 marks each in the BLISc programme.

In order to respond to the changing manpower needs of the library and information centres, there is need to bring in new elements of information technology and to restructure the conventional course contents accordingly.

c) MLISc Course

The number of papers at MLISc level varies from 5 to 7. The number of practical papers varies from 2-3. Some universities have a dissertation in the MLISc programme.

The curricula of MLISc course in most of the university library schools is almost the same as suggested by the UGC Review Committee. In some library schools just a few courses/topics on Information Science have been included as a cosmetic change. In other library schools the courses are more or less the same as BLISc with the prefixes `Advanced' Depth' and `Information' etc. Besides the traditional subjects, several new areas are included in some library schools like `Computers and their applications in Libraries', `Systems Analysis', `Information systems and programmes', and `Information storage and Retrieval systems etc. The Course at University of Madras (viz. M.Sc. Library and Information Science) is more advanced one compared to other university courses as it includes courses on Information Technology.

CDC Report suggested five core papers and two electives (out of 6) of 100 marks each at MLISc (one-year programme), whereas it included five core papers at two-year MLISc (Integrated programme) in the first year five core papers and five more core papers in the second year. In addition, two electives of 100 marks each in the first year and two electives of 100 marks each in the second year (One each from Group-A (out of 10 electives) and Group-B (out of 12 electives) are made mandatory.

d) Associateship in Documentation and Information Science (A.D.I.Sc.)

The two-year A.D.I.S. course offered by the DRTC, Bangalore is divided into two parts. In the first year the contents include comprehensive instruction in the theory and practice of documentation and information Science. The second part is to complete an approved research project and prepare a dissertation on it and submit it for evaluation.

e) Course in Information Science

The course offers comprehensive instructions in all the aspects of information sciences, with particular emphasis on the practical side. First year is devoted to teaching of 10 papers

(including one elective) and the second year is to be devoted to a dissertation which every student has to undertake.

f) M.Phil. Programme

The pattern of course content had been recommended by the UGC. It is based on the overall pattern followed for M.Phil courses in other subjects in Universities or institutions of higher learning.

The curricula is divided into two parts. Part-I consists of three papers and part-II is a dissertation.

g) Ph.D. Programme

The Ph.D. programme in library and information science is generally governed by the overall rules and regulations of the concerned university as applicable to other subjects.

16.5.3 Infrastructure

Faculty

Upto the late 1950s the teaching faculty in library schools consisted of part-time teachers usually drawn from their respective university libraries and the librarian functioned as head of the library school. Now about 90 per cent of the schools have full-time teachers as heads. According to a study made in 1986, there were 125 full-time and about 90 part-time teachers in LIS schools in India. The teacher student ratio was 1:12. The UGC Review Committee recommended one Reader and two lecturers for a department conducting B.Lib.Sc. programme and one Professor, two Readers and four lecturers for a department conducting M.LIb.Sc. Course.

UGC Panel's Recommendation (1982) are endorsed by the CDC as follows:

i) Staff Pattern

For BLISc course (having not more than 40 students) Professor 1, Reader 1 and Lecturers 3. If the number of students is more than 40, provision should be made for one additional teacher for every ten students or part thereof. For a Department running BLISC and MLISc courses (with not more than 40 and 15 students in each class respectively); and ii) Professor 1, Readers 2 and Lecturers 5. In case the number of students exceeds 15 in the MLISc course, provision should be made for one additional teacher for every 5 students or part thereof.

ii) Selection of Students

The majority of the students joining the bachelor's degree course are fresh from Universities. Many of them do not possess such characteristics (traits) as a proper aptitude for library work, a strong general background, and interest in books and users and a good personality, all of which are viewed as essential for being a competent professional librarian.

Screening of the applicants in addition to minimum academic qualification through a system of an admission test followed by an interview could be used for this purpose. To attract top students various incentives, such as scholarships and fellowships should be offered.

The student strength should be decided by:

1) Manpower needs of the region
2) Strength of the faculty
3) Physical facilities
4) Level of the course

iii) Teaching Methods

Expository method (class room lecture) though traditional, could be made much more effective by supplementary methods such as demonstration, dialogue, discussion, commentary, study groupsand talks. In addition to these, observation (by organizing study tours, educational tours, visits, etc.); role playing, practical work in real situations; tutorials etc could be still more fruitful.

A variety of other teaching-learning styles such as individual tutoring, counseling, clinical method, micro teaching should be used for effectiveness.

iv) Teaching Aids

New teaching aids like films, slides, overhead projectors slide projectors, discs, audio-video equipment, radio, television, computer etc can be very well used in teaching LIS.

The faculty should also invite experienced professionals to supplement teaching work by delivering lectures on their subject of specialization.

16.5.4 LIS Literature

As in other professional subjects, most of the texts or recommended books used in teaching are those published in the United States or the United Kingdom. During the past 10-15 years a good number of books written by Indians also have been published.

The first book of library science in India attributed to John Mac Farlane was published in 1903. After that *Hints on library administration* by B.H.Mehta and *Punjab library primer* by A.D.Dickinson were published in 1913 and 1916 respectively. Among the Indian publications, Ranganathan's books are the most important works.

Because English is gradually being replaced by Hindi or regional languages as a teaching medium, library Science literature in regional languages is also coming up in a big way.

The number of journals in English which contain articles of good quality and research value is very small and includes:

1. *Library Science with a slant to documentation* (DRTC)
2. *Journal of LIS (Delhi University,* Dept of LIS)
3. *Annals of Library Science and Documentation* (INSDOC)
4. *Herald of Library Science* (Lucknow)

16.5.5 LIS Research

Research in LIS has an important role to play in the educational process towards creation of new knowledge and finding solution to the problems faced by librarians and other information professionals. Maples states " The purpose of Library Science Research is clearly to support the functioning and development of library as a social and educational institution."

The need for research especially at the Ph.D. level and particularly in LIS has been aptly described by Krishan Kumar and Sardana, "research in LIS has an important role to play ... towards creation of new knowledge and solutions of problems faced by librarians, information scientists and documentalists. Incidentally, these programmes will also enable the information profession to achieve academic and professional respectivity, which it lacks to a certain extent at present. Thus there is a need to set up research programmes in library schools.

The research activities in India can be broadly classified into two categories:

1) Research conducted in library schools leading to the award of M.Phil and Ph.D. degrees or fellowships by professional associations or research institutions

2) Research carried out by individual researchers or research teams in library schools, libraries, documentation centres etc on certain problems without leading to the award of any formal degree.

1) Ph. D. Programme

Research courses leading to the award of M.Phil and Ph.D. degrees are offered by the University library and Information Science departments in India. Research at the Ph.D. level was initiated by Dr.S.R. Ranganathan in 1948 at the University of Delhi. The first Ph.D. degree in the LIS was awarded to D.B. Krishna Rao in 1957 by the University of Delhi. Now it is offered by 35 universities. Until 1993 nearly 190 Ph.D. degrees have been awarded.

For Ph.D. programmes in LIS the minimum requirement is M.Phil degree in LIS. But candidates with Masters degree and few research articles published in professional journals and with working experience are directly admitted to the Ph.D. programme as regular or part-time candidates. Those candidates who have qualified the UGC-JRF Test and awarded Junior Research Fellowship are also admitted to Ph.D. Programme.

Ranganathan committee recommended that

i) Either a second class MLISC degree or a second class BLISC degree plus a second class masters degree in any subject of a recognized University.

ii) Candidate must show sufficient evidence of capacity research as a requirement for admission to Ph.D. Programme.

The situation has completely changed now and in practice most of the Universities presently insist upon MLISc/M.Phil degree for admission to Ph.D. programme and persons with just BLISc qualification and Master's degree in any other discipline are not admitted. Duration of the course ranges between 2-3 years.

2) M. Phil. Programme :

With the recommendation of Sen Committee (UGC) M.Phil programmes in various disciplines were initiated in different Universities. University of Delhi was the first to introduce this programme in LIS in 1980. Today 8 Universities are offering this programme.
The minimum admission requirement is Masters degree in LIS with second division. The UGC report on curriculum development 1992 has also recommended MLISc qualification with a minimum of 50 per cent marks for admission into M.Phil.

In some universities the duration of M.Phil. is two years (part-time), otherwise it is only one year (full-time).

3) Other Research Programmes in LIS:

In addition to M.Phil and Ph.D. programmes most of the University LIS departments prescribe a Dissertation for MLISc as a partial fulfillment of the degree.

Besides universities, research work is also carried out by centres like DRTC and INSDOC. The DRTC has done outstanding research work under the supervision of S.R. Ranganathan. It is the only Institute which is engaged in individual and team research so far as the aspects of LIS are concerned.

Research work on special projects is also being undertaken by individual teachers, students, and librarians and team research funded by UGC, ICSSR, NISSAT etc. To some extent IIT and research institutes also undertake research. The Government of India has also realized the importance of research for national development and so established several research institutes and laboratories which function under the Council of Scientific and Industrial Research (CSIR).

LIS research is also carried out at International level by professional organizations such as IFLA and FID. Besides UNESCO, International Atomic Energy Agency are also actively involved in conducting and supporting research through publications, conference, seminars, and the development of information systems, UNESCO has been particularly prominent internationally in conducting statistical and other research and in supporting the projects of other International organizations and National Associations.

16.5.6 Continuing Education Programmes

The need for continuing education programmes (CEP) has been recognized by various committees and commissions on higher education and professional education.

Several continuing education programmes (Seminars; workshops/refresher courses; specialized courses on year to year basis; and self directed learning) are being conducted in LIS from time to time by various institutions and agencies in the country.

NISSAT organizing many new training programmes of short duration (about four to six weeks) with particular reference to Information Technology (IT) and its application to library and Information work with the active assistance of INSDOC, DRTC, DESIDOC, CSIR, ILA etc during the seventh and eighth Five Year plans. All these courses are open to professionals of all cadres including teachers.

There are other CEPs being organized regularly for various sets of professionals. These include seminars/conferences/workshops organized by the university departments, ILA,IASLIC, Society for Information Science, Micrographic congress (India), Computer Society of India, IATLIS, etc, at the national level. We have already IFLA,FID,etc at the international level and so on.

The Academic Staff Colleges, established by the UGC, organize refresher courses/ orientation programmes to the teachers and librarians. In addition to these programmes the UGC organized a couple of summer/winter courses, workshops in the computer applications for teachers of LIS.

16.6 ISSUES IN LIS EDUCATION AND TRAINING

The LIS professional education is confronted by various issues which need to be settled. Some of the issues are briefly stated here.

16.6.1 Manpower Planning

Manpower constitutes an important component of any library and information system. Professional staff at different levels and with requisite qualifications and aptitudes is needed in libraries and documentation/information centres in the country.

Manpower planning at the organizational levels has been defined as a "strategy for the acquisition, utilization, improvement and retention of an enterprise's human resources". (India, Dept of Employment, 1976).

The need for Manpower planning requires no emphasis as the efficiency and effectiveness of libraries and information centres would largely depend on the academic and professional competence of the staff and on the facilities and environment provided for their work and development.

According to Edwards and Silver, "the need to establish recruitment levels and number of promotions, anticipate redundancies and avoid unnecessary dismissals, allow for proper training and development and provide for the organizational infrastructure, argues well for manpower planning to enable the organization to make best use of one of its most valuable resources in accordance with its goals".

Manpower planning includes determining the staff required, selection and recruitment,appropriate placement, promotion, provision of opportunities for maximum individual contribution under desirable working relationships and conditions, provisions for professional personnel development as well as improvement of working conditions to obtain maximum productivity and efficiency under specifically emphasized consideration for individual and human elements. In other words, the objectives should be to estimate, retain,utilize and develop an adequate staff by which to carry on efficiently the operations of the library; and to help fulfil the aspirations and capabilities of the individuals who compose the staff (Osteen,1954).

i) Staff Formula for University and College Librari – The Library Committee of the UGC (1957) laid down the strength of the different sections to be determined roughly on the following basis:

Book Selection: One person for every 6,000 volumes added in a year.

Periodical Publications Section: One person for every 500 current periodicals taken.

Reference Section: One person for every 50 readers (Other than the users of the textbook collection) in a day.

Technical Section: One person for every 2,000 volumes added in a year.

ii) Staff Formula for Public Libraries: The staff formula recommended by Ranganathan for different sections of a public library is:

Book Section: One person for every 6,000 volumes added in a year.

Periodical-Publication Section: One person for every 1000 periodicals currently taken.

Classification and One person for every 2,000

Cataloguing Section: Volumes added in a year.

Reference Section: One person for every 50 readers using the library in a day of the year etc.

16.6.2 Professional Outlook and Attitudes

Although commendable work has been done, the overall image of the library/ information profession is not very bright. The professionals have not been able to project in proper light the tremendous potential of library/information services in national development. What is important is that a professional librarian must adopt professional outlook, which will go a long way towards professionalization. The urgent need of the day is to highlight, through various media such as press, television, radio, etc., the good work done by the libraries and make out a case for additional support financial, manpower and infrastructure for the improvement of library information services.

In the information age, the library professional must posses the following knowledge, skills and attitude:

i) The library professional must have the knowledge of the new technologies and possess traditional skills of acquiring, organizing and dissemination of information; skills in communications, systems analysis, interpersonal relations and financial planning; managerial skills; skills to analyse, synthesize, interpret, consolidate, evaluate information and advocacy skills, a greater sensitively to social and political forces.

ii) Expertise, training and orientation facilities will have to be given to the staff to develop the above mentioned skills and attitudes and to cope with the structural changes due to the changing information scenario. This will necessitate formulation of a national policy and plan for continuing education for library and information professionals, and also restructuring the training courses to prepare librarians as effective managers.

16.6.3 Accreditation

Accreditation is "an effective catalyst for improvement and general raising of standards in institutions and their programmes". (Givens, Johnnie E, and Sivells W.K. "Accrediting agencies and library cooperation in education". IN *Library Trends* 24:2 Oct. 1975. p.p. 361-378).

The following reasons stress the need for accreditation of library science education in India:

a) To standardise LIS Education in order to achieve uniformity and to meet the information needs of the country

b) Situation in other countries having accreditation system

c) Indian problems in the absence of accreditation facility

Differences in languages and medium of instruction

Absence of suitable reading materials in the regional languages.

Mobility of the qualified people at national level.

d) Major differences in the course contents including the core courses and options.

e) Absence of revision policy pertaining to course contents.

With the alarming increase in the number of library schools the quality of the training programmes has certainly got affected adversely. At present there is no system of accreditation as such of the library schools at the national level. The UGC is charged with the responsibility of ensuring and maintaining proper academic standards of higher education in the country but till now its role has generally been of a recommendatory nature rather than of an accrediting agency. For example, Bar Council of India and Indian Medical Council are the accrediting agencies as for legal and medical education.

In USA and Canada, ALA was the first recognised accrediting agency and later the Council of National Academic Awards (CNAA) was established. In U.K. the Library Association (LA) was the accrediting agency. As such a separate body like Indian Council of Library and Information Science should be established to become an accrediting agency.

Certain standards with regard to different aspects have been discussed and useful recommendations have been made by the workshop (1973) and seminar (1977) held at the University of Delhi as well as by the UGC panel on LIS. It has also been emphasised that library schools should conduct courses only at the postgraduate level, and that the undergraduate level courses should be under the purview of library associations, women's polytechnics or state libraries.

16.6.4 IT and Challenges to LIS Education

The implications of the new technologies in communication and computer fields have a direct bearing not only on the library and information profession but also on the LIS education. So far the new technologies and their applications have not been paid proper attention in imparting practical training to the LIS education. The LIS schools are finding it

difficult to design an interdisciplinary curricula for LIS schools. Unless the professional education adopts the topics on changing technologies and their related techniques like databases, online retrieval, records management archives and marketing of information, it would become obsolete. The professional experts visualises a threat from the computer professionals, systems analysts, communication specialists, management scientists and others who are slowly encroaching upon our profession.

The LIS curricula is expected to provide trained personnel capable of handling information and managing information dissemination functions from libraries and information centres more effectively even in a technological environment. To cope with the changing environment there is a need for altering the existing curricula in LIS schools. The Curriculum Development Committee (CDC) on Library and Information Science of the UGC in its Report (1992) made several recommendations. The main recommendations include -

1) The LIS courses should improve their quality, in particular by the incorporation of advancing information technology

2) Paraprofessional training courses may be undertaken by other appropriate agencies but care must be taken to ensure uniformity and quality of such training all over the country

3) LIS professionals must be given every facility to refresh his/her expertise, so as to keep abreast of advancing knowledge by a planned development of continuing education programmes in the field.

4) There should be an accreditation agency to ensure the standard and quality of the training in LIS field.

5) There is a national need for furthering higher education and research in LIS, which may be undertaken by a National Centre to be established for the purpose.

The Distance Education Council of Indira Gandhi National Open University has also been working out to formulate norms and standards for LIS education through distance mode, which may be applicable to open universities as well as correspondence schools.

16.7 LET US SUM UP

In this unit you have studied about education, training and research in the field of Library and Information Science. Librarianship deals with acquisition, organisation and dissemination of information embodied in the documents. The profession of librarianship emerged from a mere custodian of books or its earlier forms and has been proceeding towards a "virtual library" with the use of sophisticated information technology. Consequently, the education and training for librarianship has also radically changed over the decades from a mere apprenticeship to systematic training at various levels starting with certificate diploma or bachelor's and masters degree to research degrees leading to doctoral and postdoctoral qualifications. Information Science, an interdisciplinary field which has its roots in library science is concerned with accumulation, storage, dissemination and utilization of information. It takes the fields like computer and communication technology, linguistics, economics and management science into its fold and emerges as one of the major disciplines.

Library and Information Science is a full-fledged subject at the university level. It is offered in India by over 75 Universities at Bachelor's level and 60 Universities at master level. Continuing and Distance education programmes have also taken up LIS education to support manpower development. The introduction of Research programmes leading to M.Phil and Ph.D. degrees has further strengthened the profession of librarianship in recent times.

16.8 RECOMMENDED BOOKS

KUMAR, P S G (ed): *Library and Information Manpower Development.* New Delhi: Indus, 1988.

MANGALA, P B (ed.): *Library and Information Science Education in India.* Delhi: Macmillan, 1981.

RANGANATHAN (S R) (ed): *Documentation and its facets.* Bombay: Asia publishing House, 1963.

Report of the curriculum Development Committee on LIS. (Chairman: P.N. Koula. New Delhi: UGC, 1992.

SHERA, Jesse H. *Libraries and the organisation of knowledge..* Hamden, CT: Archon Books, 1965.

UNIVERSITY Grants Commission. *Library Science in Indian Universities, (1965).* (Chairman: S.R.Ranganathan)

VISWANATHAN (C G): *Elements of Information Science.* New Delhi: Today and tomorrow, 1976.

16.9 ASSIGNMENT

1) Compare the contents of any course with that of CDC Report.

2) Analyse course contents of any one course of CDC Report with those of Unesco Guidelines for Curriculum Development.

16.10 MODEL EXAMINATION QUESTIONS

I. ESSAY QUESTIONS

1) "Information Science is a multidisciplinary field". Discuss.

2) Trace the origin and development of Library Science.

3) What is the importance of manpower planning for library and information science education?

4) How accreditation will help improve the quality of LIS education?

II. SHORT NOTES

a) Professional ethics
b) Characteristics of a profession
c) Curriculum Development Report of U.G.C.