UNIT 1: INFORMATION AND ITS ROLE

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1.1 LEARNING OBJECTIVES

After going through this unit you will be able to

- Define Data, Information and Knowledge;
- Establish the relationship among Data, Information, Knowledge and Wisdom;
- Know different properties of Information;
- Know the stages that constitute the Information Transfer Cycle;
- Know the different theories of information;
- Define Information need and the role of information in different contexts.

1.2 INTRODUCTION

This is the first unit of the third course of the diploma programme on Library and Information Science. Here in this unit we will deal with the Information and its role. This unit will provide an overview of data, information and knowledge. It will describe the properties of information, information transfer cycle and theories of information. It will also give emphasis on the information need of the people and the role of information. Apart from this, the unit will also explore the concept of information explosion and the factors that contribute to information explosion.

1.3 DATA, INFORMATION, KNOWLEDGE AND WISDOM

Data, Information, Knowledge and Wisdom are the products of the mind. The Data, Information, Knowledge, and Wisdom are evaluated in an ascending scale of values, Data having the least value, Wisdom the greatest.

a) Data: The word “data” is Latin in origin, & literally, it means anything that is given. In sum, the term includes facts, figures, letters, symbols, words, charts & graphs that represent an idea, object or condition. Webster’s Third New International Dictionary defines data as “something given or admitted facts or principles granted or presented, that upon which an interference or argument is based, or from which an ideal system of any sort is constructed.” According to Oxford Encyclopaedic English Dictionary, Data are “known facts or things used as a basis for interference or reckoning.” UNESCO defines data as “facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing by human or automatic means. In simple, Data is a unit of fact and a raw material of information. It is derived by observation and experiences.

By nature, data are either quantitative or qualitative. Quantitative data are numerical and qualitative data are descriptive. It is also possible to transform qualitative data into numerical values. Additionally, in science, data can also be graphic in nature.

The following are the properties of data:

i) Amenability to Use: Data must be amenable to use. The use may differ with the context.

ii) Clarity: Data should necessarily display clarity.

iii) Accuracy: Accuracy is an essential property of data.

iv) Essence: Data should be compressed & refined. Only the refined data can present the essence of value.

b) Information: The word "information" is derived from two Latin words "forma" and "formatio". Both the words convey the notion of giving shape to something and of forming a pattern. Information is the processed data, organized and presented by someone. The data becomes information when these are collected, processed, interpreted, presented or communicated to some one in an organized or in logical form to facilitate a better comprehension of the concern issue. Information is the knowledge concerning some particular fact, subject or events in any communicable form. It is a structured collection of data i.e. sets of data, relation between data. It consists of data that have been retrieved, processed or otherwise used for informative or inference purpose, argument or as a basis for forecasting or decision making. Let us mention some of the definitions of Information-

According to Harrod's Librarian's Glossary and Reference book compiled by Ray Prytherch, 7th ed, 1990, information is "an assemblage of data in a comprehensible form capable of communication".

Mikhailov et.al (1966) has cited Brillounin's definition. According to them "information is the raw material and consists of a mere collection of data".

Hayes (1969) defines information as "result of data, usually formalized in processing".

Davis (1974) has defined information as "data that has been processed into a form that is meaningful to the recipient and is of real perceived value in current or prospective decision".

Stevens (1986) has defined information as "the factual data, ideas and other knowledge emanating from any segment of society that are identified as being of value sometimes gathered on a regular basis, organized in some fashion, transmitted to others and used in some meaningful fashion".

According to S. C. Blumenthal in "Management Information System" (1969), "information is data, recorded, classified, organized, related or interpreted within context to convey meaning".

According to A. J. Evans et al, information is a "sensible statement, opinion, fact, concept or idea, or an association of statement, opinions or ideas. It is closely associated with knowledge in that once information has been assimilated, correlated and understood it becomes knowledge".

c) Knowledge: The word "knowledge" means an assured belief or that which is known. It is the information read, heard or seen and understood. It is an organized set of statements of facts or ideas – presenting a reasoned judgments or an experimental result which is transmitted to others through some communication medium in some systematic form. When information is stored in mind, it constitutes knowledge, particularly when relationships are established between items of information.

The Webster's New International Dictionary of English language defines knowledge as, "Familiarity gained by actual experience, practical skill, technical acquaintance". It has also been defined by Webster as "Acquaintance with fact; the state of being aware of something or of possessing information; hence scope of information".

When man knows the entities (things or concepts), knowledge is established. As man knew more and more about entities knowledge grew, in order that knowledge already gathered is not lost from the scope of posterity and it must exist in recorded and stored format. Due to the comparatively larger age of human, living of three generations in a family within society, ability to reason and analyse, ability to transfer

the accumulated knowledge to its posterity increase his/her stock of knowledge.

Knowledge is the ability of an actor to respond to a body of facts and principles accumulated over a period of time. The quality of knowledge depends on the properties of the agent. Knowledge can be viewed in terms of the following

i) Knowledge is the structure or organization of information including the relationship among items of information.
ii) Knowledge is created and modified by new information.
iii) When information is applied by people it becomes knowledge.
iv) Knowledge is universally regarded as a much wider concept than information, both in the everyday world and within the specialty theory and practice.

Further, knowledge is individual to each person and does not depend upon humans to exist; when it exists apart from information it can only be useful if it becomes a commodity or a resource.

Knowledge can only reside in an organic brain. As soon as it is objectified outside of a biological organism it becomes disembodied information, capable of entering production similar to a manufactured product or commodity. Some of the characteristics of knowledge are

i) It is dynamic, ever growing and continuing.
ii) It is contained in the subjective realm.
iii) It is structured, coherent and often of enduring significance.
iv) It is a stock, largely resulting from the flow, inputs of information.
v) It is the basis for action.

d) Wisdom: Wisdom is the distilled and integrated knowledge and understanding. It is the most precious human capital in all developmental processes.

Cleveland, Ohio Association for System Management, 1979 has treated raw data from "birth" into evaluated form as information, through maturity as knowledge, to "death" and inclusion in the knowledge base. It may be noted in passing that in common social process, data, information and knowledge are regarded as mutually sustaining

elements at times distinctly different, on occasions overlapping, and interchangeable. Both data and information have intrinsic properties. While information is shareable, knowledge is individual to each person. Again, information depends upon humans to exist but knowledge does not depend upon only humans to exist.

1.4 PROPERTIES OF INFORMATION

Information has an origin. It is communicated from the origin or from a "source" where information is termed as "message". The message needs a "medium" for communication. The message is aimed to be communicated to a "recipient". At each step the information possesses certain characteristics. Some of the characteristics or properties of information are listed bellow

a) General Characteristics

i) Information is Heterogeneous: Information is extremely heterogeneous with virtually infinite variation in response to individual conjunctions of supplier, processor, user and channel of communication. It is inter-disciplinary in nature.

ii) Information Itself is Valueless: Information is rarely of value in itself. It always requires a content structure or model within which it can be interpreted.

iii) Information is Central: The role of information in any organization is central and can be viewed as a fundamental factor of production like money and manpower.

iv) Protection: The supplier and the user of information often need special protection by means of government intervention such as copyright and patent laws, privacy legislation, fraud statutes, etc.

v) Demand Varies: Demand for information is a function of such variables as age, perishability, convenience, reliability, source, etc.

vi) Un-destroyable: Information is not consumed in its use.

vii) Shareable: It can be shared by many and can be used simultaneously without any loss to anyone.

viii) Democratic Resource: Information is the best democratic resource that can be consumed by the poor and the rich alike depending upon their intake capacity.

b) Characteristics at the Source of Origin

i) Reliable and Genuine Source: When information is received from a valid, reliable and genuine source then only it should be considered for communication to the recipient or end user.

ii) Communicability: Information should be in a communicable form.

c) Characteristics as a Message

i) Accuracy: Information should be precise and free from error.

ii) Timeliness: The information should be timely. To achieve this, modern electronic device can be used.

iii) Completeness: Information as a message should include all the relevant information.

iv) Explicitness: The message should not leave any doubt in the mind of the user as to its validity, comprehensiveness, etc.

v) Availability and Accessibility: Information must be available and readily accessible to the user.

vi) Verifiability: The message must be verifiable so that its validity, accuracy, appropriateness, etc can be assessed.

vii) Biasfree: Information should be free from any kind of bias.

d) Characteristics at the end of the Recipient

i) Adaptability: Information should be adaptable for a new use, need, situation, etc.

ii) Cost Effectiveness: Information should improve the performance of a system at an acceptable cost or at no cost or should reduce the cost without unduly effecting performance.

iii) Currency: The information should be timely available. It should not be obsolete as well. Timely information will be of high value.

iv) Relevancy: Information should be relevant to the user.

v) Conciseness: Information should summarize the relevant data so that it will be useful for the managers.

1.5 INFORMATION TRANSFER CYCLE

Cycle means a series of events that are regularly repeated in the same order. Transfer of information from its generation to its end user becomes possible through many processes. These processes are also regularly repeated in the same order. These processes completed a cycle, which is called Information Transfer Cycle (ITC). The ITC comprises generation, collection, storage, communication and retrieval.

a) **Information Creation / Generation:** Information is created with the happening of incidents and activities of humans. If an activity or an incident does not happen, no information is created. Information is mostly created by research and development programmes, government activities, survey and census of population, business and industrial organizations etc. and presented in format by author, scientist, researcher, editor, writer, poets, novelists, dramatist, etc. Over the web, information is produced by the general people irrespective of their background and is not restricted only to academics such as scholars, scientists, etc.

b) **Information Production and Dissemination:** It is the mass production of knowledge through publishing companies or others that will help the mass distribution of knowledge in some physical or electronic form. Previously the information had been disseminated in the form of book. Many conventional and non conventional, printed and non printed sources of information are nowadays available which are different in shape, size, type and format. Over the web, the production is accelerated by posting the information electronically over some kind of websites. It speeds up the transfer of information globally at a rapid rate instead of taking months or years to get published on paper.

c) **Information Storage, Organization, Retrieval and Communication:** The storage is the process by which the information described and presented in the documents are stored. Information is collected and stored by libraries, documentation centers, information analysis centers, data banks, data centres, etc. Computer has been accepted as a boon

for storing of information. It can store a huge amount of information in the form of database. Besides, the computer, disks and CDROMs are the newly developed and very significant tools of storing information.

Organization is how that representation of knowledge is found among others of its kind. In the library environment, the classification and catalogue, shelf list, various kinds of guides, etc facilitate the retrieval function. All these tools are equipped with controlled vocabularly. In the computer environment, organization is facilitated by databases, search engines, etc. Knowledge is individual and the users determine its usefulness; so keyword and natural language searching in computer environment is more attractive.

Retrieval is a process of getting information from the collection of a library, for providing answer to the queries of the users, etc.

Communication is the process of transmission of information from one place to another, from the creator of information to its users. It is necessary for the best use of the same. It is the process of social exchange. In the library environment, communication of information can be made through telephone, CAS services, SDI services, teleconferencing, e-mail, etc. Sometimes the publisher also brings different kinds of information sources to the notice of the user community.

d) Information Diffusion and Utilization: Diffusion is viewed as a more targeted flow of information to a particular segment of society. The diffusion of information should find its way to people who actually need it instead of targeting the people who will use it for their own benefit.

Utilization is the adoption and implementation of the knowledge by the user. Information is needed by each and every person of modern society for some purpose or the other. When information is consumed by one person it gives new dimension to his knowledge. This knowledge when he applied to some other purposes it gives birth to new information. Thus the information cycle is continuum in nature.

e) Information Preservation and Destruction: The different kinds of libraries, archives are trying to preserve information in different format. Over web, the Internet archive and the cached page of search engines are serving some purpose in this regard.

The information that is less frequently accessed or has met its assigned retention periods may be considered for relocation to an archive. Then from the archive, it needs to be weeded at some time or other by means of appropriate procedure for the content.

1.6 THEORIES OF INFORMATION

At different times, different people in different context propose various theories of information. Some of them are listed bellow

a) Communication: The communication process requires at least three elements - *source*, *message* and *destination*.

i) Mathematical Theory: According to Shannon and Weaver, the amount of information in a message is related to the size of the vocabulary. If one is restricted to “yes” or “no” then the recipient has the fifty percent chance of guessing correctly. If the vocabulary has ten signals then the recipient has less chance of guessing and so amount of information in a message is increased.

ii) Semantic Theory: Fairthorne proposed the “phlogiston theory of information”. According to this theory, information is something that can be squeezed out like water from a sponge. Information will obviously be affected by the prior state of knowledge of the recipient.

As an alternative to the above theory Y. Barttiller and R. Carnap came out with semantic information theory. They suggested that a prior knowledge may increase information from a message (how precisely do the transmitted symbols convey the desired meaning).

iii) Information for Decision Making: M. C. Yovits proposed that “information is data of value to decision making”. Information involves reduction of uncertainty that is what the decision makers accept from the information system.

b) Commodity: Information is a commodity that is needed to do a job. Acquiring, storing and retrieving information are important for our daily life.

i) Zipf's Law: George Kingsely Zipf proposes a relationship that exists between the frequency in the use of words and their distribution in books, reports, documents and other printed matter. The Zipf's law was published in the book "Psycho-biology of language: An introduction to dynamic philosophy, Cambridge, Mass MIT press, 1935. According to this law, if the number of different words occurring once in a given sample is taken as X, the number of different words occurring twice, three times, four times, n times in the sample is respectively 1/2., 1/3, 1/4, 1/n of n upto, though not including, few most frequently used words.

ii) Bradfords Law: Samuel Clement Bradford in 1948 proposed another law. According to him, if scientific journals are arranged in order of decreasing productivity of articles on a given subject they may be divided into a nucleus of periodicals, more particularly devoted to the subject and several groups of zones containing the same number of articles as the nucleus. When the number of periodicals in the nucleus and successive zones will be as $1:n:n^2$ where n=5, that is, the second zones has five times the number of journals of the first zone and the third zones has 5^2 or twenty five times the number of journals in the first or nucleus zone. This law was extended by many, notably B. C. Vikery, F. Leimkuhler and B. C. Brookes.

iii) Lotka's Law: Alfred J. Lotka produced his law in 1926. Lotka's law states that there is an exponential relationship between the number of items contributed to the literature and the total contribution by those who contributed two, three or more papers. Lotka developed a general formula for the relationship between the frequency of y persons making n contribution as x^ny=constant. Finding the value of constant when n=2, he observed that "the number of persons making 2 contribution is about one fourth of those making one (1/

2^2), the number making 3 contribution is about ($1/3^2$) of those making one. The number making n contribution is about $1/n^2$ of those making one, etc.

iv) Law of Economics: According to the followers of this theory, information is analogous to energy (Meta energy). So it is also a resource that can be handled as a utility. It can be packaged, stored and distributed in various forms. In this sense, information has value and the laws of economics can be applied to it.

c) State of Process: Information represents the state of an organism following the reception of energy from the environment in the form of a symbol or datum. The transformation that takes place between datum and the resulting state, information is part of the function of all organisms. It reaches the highest known competence in the human being through the activities of the central nervous system. Electronics devices such as computer extends these capabilities.

d) Cognitive Process: Much of the human behaviour can be seen as information processing. Thinking, memory, learning and perception are in fact the function of processing information. A. Turing proposed automata theory. Scholars have applied this theory to the study of behavior. According to these studies, information can be considered as a process intrinsic to all organism activities and can be replicated by machines.

1.7 INFORMATION NEED

The information needs; demands and wants have been used interchangeably, although they may not be identical. Information need involves a cognitive process which may operate on different levels of consciousness and, hence, may not be clear even to the inquirer himself / herself.

People in different situations require information on a subject in different forms and with different emphasis and different depth of explanation. Even the same person seeks information in different ways

and forms on various occasions depending on his/her knowledge of the subject and the reasons for wanting the information. So, the information need is very difficult to define and categorize.

a) Definition: Information need is seen as a subjective, relative concept existing only in the mind of the experiencing individual. The Librarian's Thesaurus defined information need as "that need which library science and material are intended to satisfy".

Maurice B. Line has defined information need as "what an individual ought to have for his works, his research, his education, his recreation, etc".

According to Brenda Dervin, "an information need is an impediment preventing an individual from moving forward in cognitive time and space. The person is faced with a gap that must be brought by "asking question, creating ideas and for obtaining resources. Such gaps do not occur in the abstract but arise out of a particular critical event and situation".

Faibisoff and Ely (1976) viewed that information need as either shaped by activity such as problem solving or decision making or manifest through a passive reception of information which is stored as knowledge.

Krikelas (1983) has defined it as the "recognition of the existence of uncertainty". While, N. Ford in 1983 defined it as "recognition of the existence of uncertainty and described it as something which prevents an individual from making progress in a difficult situation".

b) Types: Information is a power and so it is needed in virtually every field of human thought and action and by everyone for some purpose or the other. According to Carol C. Kuhlthou (1991) in the process of information searching, initially a person first becomes aware of knowledge or understanding, feeling of uncertainty and apprehension. This is the stage showing the need for information. Information need generally varies from individual to individual, according to their working condition, the discipline in which they are working, the time, etc.

Tague has presented the following types of information needs

i) Social or Pragmative Information Need: Required to cope with day to day life;
ii) Recreational information need;
iii) Professional information need;
iv) Educational information need.

Krikelas on the basis of information seeking behavior, categorized information need as

i) Immediate Need;
ii) Deferred Need.

David Bawden (1986) identifies four kinds of information in particular for aiding the creative process. They are

i) Interdisciplinary information;
ii) Peripheral information;
iii) Exceptions and inconsistencies.

Melvin J. Voigt's (1961) study revealed that the same person could interact with the information system in different ways at different times depending upon his purpose in relation to his works, stage of his works, general interest, amount of information already available to him and so on. According to him, a scientist's use of information arises from three different needs. These are -

i) *Current Approach:* The need to know what other scientists have recently done or are doing. It keeps up to date with the current progress of a scientist's field.

ii) *Everyday Approach:* The needs that come to the scientist in course of his work for some specific piece of information. This need is directly connected with the research work or the problem at hand.

iii) *Exhaustive Approach:* The need to find and check through all the relevant information existing on a given subject.

Later a fourth type of information need was added to the Voigt's types of information need by other workers in the same field.

iv) Catching up or Brushing up Approach: A worker may at times need to have a brief but a complete picture of the recent development of a related subject in which he was not vary much interested or which did not come within the area of his main interest. In such cases he needs a catching up approach.

The need of the scientist at different levels makes him adopt different approaches to gather the required information.

Information needs also can be categoried as follows

i) Information for its Own Sake: Information for its own sake are live in this world in order to know the world and our surrounding environment. Therefore, no action is necessarily going to be taken on this type of information.

ii) Professional Need: Information is needed to meet the professional need, to cope up and compete with other professionals in the subject. Professionals such as doctors, lawyers, librarians and others need information to pursue their vocations. They cannot afford to ignore new development in their respective fields. Their ignorance about the latest development in the field would affect their performance. Engineers, technologist, business executives need information for solving the problems related to their respective profession.

1.8 ROLE OF INFORMATION

From the primitive days of human civilization to the present day, information has always been a component of growth and development and improvement of the living standard. Nowadays, the information has come to occupy the central position to be reckoned as the driving force for all human development. It is clearly interlinked with the growth and development in economic, political, social, occupational, cultural and other sectors of the society. Information and knowledge have become the principal generator of wealth in the form of educational institutions, research and development establishment, scientific and technological centres and other similar knowledge oriented bodies.

The impact of information and knowledge is seen in a number of human activities centering on information. Some of these are as follow, which will give a cursory account of societal changes taking place in a few sectors.

a) Education: Education is the process of acquiring general and specialized knowledge by means of study and learning that develop intellectual power of reasoning and judgment. At no point of time in the life of a person does education really terminate and in real sense it is a continuous process. While IT provides easy and effective access to the different types of educational kits, information is the life blood of education. It is the essential ingredient in new ideas, in course content and curriculum development, and in the creation of material and methods of technology and learning. Students need information for pursuing academic studies; teachers need information for teaching their students.

b) Research and Development: Research is a never ending spiral activity. It aims to provide solution to problems. The inputs as well as the output of research are information. So information is the life blood for research and development. The quality of information content alone will determine the success or growth and development of research. Researchers need information on a continuous basis for conducting research works.

c) Management and Decision Making: We are living in a world of change. We face complexities, uncertainties and risks unknown to our predecessors. The list of activities in our private life and its associated problems are virtually endless. In each of these personal activities decisions are required to be taken and information is needed to support the decision. People need information to make the best possible decision. People with information are likely to have better career opportunities and to be better equipped to make personal decision.

Information provides a means of improving the management of enterprises and services of all kinds. Information is needed by the decision makers in organizations. A common need basic to all decision

makers is an understanding of the purpose of the organization, that is, its policies, programmes, plans and goals. The decisions to be made in an organization do vary and the information needs also vary. A manager needs information to choose the possible alternatives presented in terms of ranges of values of particular attributes. Information provides a wider knowledge base for the solution of any problem; it gives new alternatives and approaches to the solution of technical problems and opinions for minimizing future fault. It improves effectiveness and efficiency of technical activities in the production and service sector. So information is used for better decision making in all sectors and at all levels of responsibilities.

Governmental officials of different levels need information for decision making. They need census, weather and other related information. Legislators need information of different types to argue a point on the floor of the legislature.

d) Daily Life of a Person: Naturally, living today is quite different from what life was about a generation ago. Nowadays people in different situations require information on a subject in different forms and with different emphasis and different depth of explanation. An ordinary person in his daily life needs to have access to information on many of his daily activities. It may pertain to the quality, availability or cost of a number of things like articles of foods, health care, education, entertainment, travel, social security, etc. One may need information on cooking, gardening, house decoration and maintenance, and a host of other subjects. In private life one needs information to organize vacation activities, to make intelligent purchases, fertilize a lawn, soup up an engine, prune a shrub, groom a pet, select a garment, vote for a candidate, choose a doctor or lawyer, protest a tax increase, evaluate career opportunities, pick an investment, select a course, make a trip, plan meals and so on. The list of activities in a private life is virtually endless.

e) Business and Industry: Information and knowledge are getting their appropriate place in enterprises that are not static, because it is increasingly being recognized today that external information on market, competitors, social and political environment, government regulations and trade and tariffs etc are invaluable if an enterprise is to thrive. It is only the central role of information that business and industries are day by day inclined to invest in R & D to generate new knowledge which would ultimately provide them an edge over their competitors.

In business sector, information helps in telemarketing, better financial management, customer service, training, sales, product development, market intelligence, looking for customers, etc.

In industry, the types of information needed are not limited to production, but cover all aspects of industrial activity. The major types are: identification of product, determination of technical and economic feasibility including the potential for use of indigenous resources; outlets for disposal of waste either as saleable by-products or for further processing, market or marketing, etc.

f) Scientific Development: The increase in population has resulted in mounting social pressure for increased production, but as population increases, natural and near natural commodities start depleting. So there is an urgent need for exploitation of new resources, and creation of artificial commodities. All these developments are impossible without the use of proper information and immediate use of new scientific discoveries.

Air transportation, the concept of global village, satellite communication, nuclear energy, exploitation of outer space, improvement in agriculture, health, environment, etc are some of the results due to exclusive use of information in the field of science and technology.

g) Government: Information improves the capacity of a country to take advantage of the existing knowledge and “know how” to achieve success in various fields. So, the governments of almost all the

countries of the world are the largest consumers of information and knowledge. All their commitment and responsibilities to create a welfare state, they need information and knowledge on every conceivable subject. They collect, organize and disseminate statistical data on all its activities which constitute the most important and vital information resources for their planning and later implementation and execution.

All ministries of the government need up to date and timely information on the overall management of the country's resources and general administration. Management Information System (MIS), Decision Support System (DDS) are widely used in planning and policy making.

h) Socio-Economic Development

i) *Entertainment:* With the viewer's complete control over programmes, and interactive television (to watch a missed TV show).

ii) *Health Care:* With information sharing and even diagnosis and treatment by means of interactive video link-up.

iii) *News:* With consumers able to point and click to select information for personally tailored news items.

iv) *Home Shopping:* With a 24 hours a day, virtual global mall accessed by two way video and digitized sales.

v) *Security:* Uses of electronic fingerprint, ratina scanning, voice recognition, DNA finger print, signature dynamics.

Today, information has become a great source of power as a principal driving force for the acquisition of wealth, political strength and more knowledge etc. Information-rich countries of today are becoming even more powerful than the colonial powers of the nineteenth and early twentieth centuries, on account of their expertise in creating new information and knowledge and exploiting them for their advantage. Information is not only the source of power but also an effective power in itself if released in appropriate time.

1.9 INFORMATION AS A RESOURCE / COMMODITY

The concept of information as commodity is wider than that of information as resource, as it incorporates the exchanges of information among the people and related activities as well as its use. The notion of information as a commodity is tied closely to the concept of value chains. With commoditized information gaining in value as it progresses through the various steps of creating, processing, storage, distribution, and use.

a) Information is a Resource / Commodity: Information possesses many characteristics that are the same as those of some other commodities. When we consider such characteristics, information can be termed as a resource and a commodity in a broad sense and people at large have accepted this view.

i) Information is a Natural Resource: Many resources were earlier taken for granted as common for all. For example, clean air and water. Information has also been similarly understood. Whoever is interested can get enough information for his daily needs through institutions established for that purpose. But specialized information is made accessible to those who have special needs and can legitimize its claim by status or by money. Just like the maintenance of clean air and water, the proper information demands some cost.

ii) Information is a Vital Resource: Information is looked upon as a resource like manpower, material and money. Information is a resource created by ingenuity of man to be used by man for the benefit of man; it can be used for the opposite also. According to K. J. McGarry, information becomes a resource by analogy with the classic resources of labour, capital and material. Management of these classic resources (man, material and money) now mutates to the "management of information". It is easy to see how information can be depicted as a resource as essential to productive success as are raw materials and skilled staff. But information needs to be controlled, manipulated and managed.

According to W. L. Saunders, information is that type of resource which is not scarce. It has also economic value as when company used the information effectively the level of trade and revenue are maximized. Information and knowledge become the principal generators of wealth in the form of educational institutions of research and development establishment and science laboratories.

No national development programme can succeed fully without proper information support. As such, it is regarded as a national resource like energy, coal, water, etc. vital for national development. It is an important input for nation building. The impact of fast, reliable and inexpensive information would be as great as that of electricity in national and international economy. IBM, the giant computer company, says that information is like an inexhaustible and renewable source of energy.

iii) *Information is a Major Criterion:* Information is vital for national development. The backwardness or forwardness of any county nowadays is mainly due to the use of adequate information, especially in the field of science and technology. Presently the world is divided on economic consideration into economically developed and economically developing countries. According to Herbert I. Schiller, in future the division will be based on possession of information into information rich or data rich nations and information poor or data poor nations.

iv) *Information as a Thing:* Buckland points out that in order to communicate knowledge it must be expressed or represented in some physical way as a signal, text or communication. Any such expression would, therefore, constitute information as a thing. The notion of information as resource attracts information economics and spreads to such diverse disciplines like management, transport and communication, consolidation and repackaging, pricing, marketing, distribution, exchange, etc.

v) *Information Satisfies the Economic Principle:* Information satisfies the economic principles of generation or gathering, processing, storage, dissemination, etc.

- *Demand / Market:* Information has a wider market. All people need information for some purpose or the other. There is a heavy demand for information from all around the world, so getting profit out of it; its production rate must increase.
- *Information Generation:* Information is generated mainly through research activities and research activities are highly price consuming business, which is just like other product whose production or manufacture involves a high cost.
- *Protection:* Information as a resource has been well established which is evident from the profusion of national and international laws and policies relating to storage, transmission and information related services including trans-border data flow. Just as in the case of various commodities or products, information is also protected by copyright and paten. However, the property right of information is weaker than the property rights of other goods we possess.
- *Consumption:* Information does not always flow across market. Within some private sectors information produced is entirely consumed within the organization itself, which is in the same line of other goods.
- *Different Forms of Products:* For the different categories of users, different forms of information are released into the market. In this regard, it is just like any other services provided in the market place. Information is provided through books, magazines, business, news, investment, advice, legal advice, medical advice, consulting services, formal education through school, colleges and universities, etc. So, we do have markets for information and people buy it depending on its perceived value. In this aspect information is like other goods and services.

- *Transportation / Communication:* High cost is involved when we use the information technology for communication and transportation of information just like any other product.
- *Storage:* If information is stored for a long period just like other consumable products it loses its value because particularly in case of science and technology, historical information is generally less valuable.

b) Information is not a Resource / Commodity: Judith Jordet complains about the notion that information is a commodity. According to him, this notion will not only interfere with real knowledge creation, it will unravel what knowledge we have! When information is seen as a commodity, the users are seen as customers consuming a commodity identified as information. Users define usefulness. If it is not used, it is not useful. But in reality, how many users use all the information that are the product of large research investment is itself a question. Again, against the view of information as a resource / commodity, the following arguments can be offered.

i) *Shareable and not Exchangeable (Public Good):* Most of the goods and services have the property that more for you means less for me; but in case of information, more for you does not mean less for me. Passing of information is not losing it.

ii) *Assigning Value:* It is very difficult to assign values to ideas because different people need information in different depth.

iii) *Tax:* Tax is not levied on information generation or its consumption; so it is not a commodity.

iv) *Publicity:* Before buying any other product or goods people know ahead of time what they are going to buy, but in case of information one will not be able to know the whole thing before buying it. If one knows the whole thing, then they may not feel the need to buy it.

v) *Expandable and Compressible:* Information increases with use, it can be expanded and compressed i.e it can be summarized, integrated, etc.

vi) *Non Materiality Problem:* The non-materiality of information creates several problems in respect of measurement, appropriateness, ownership, impact, costing etc.

1.10 INFORMATION EXPLOSION

There has been a continuous revolution in the generation, transfer and communication of information since the invention of printing. Though information generation is a continuous process yet the two World Wars had a very great impact on the very fast development of various fields of knowledge. Since the 2nd World War information, in fact, has been growing at an exponential rate and it is often referred to as "information explosion".

According to American Educational Association, it had to wait till 1750 since the beginning of the Christian era for human knowledge to double. The second doubling was completed 150 years later in 1900. The third doubling of all man's knowledge took place in the decade of 1950s, but today it is even growing at a faster speed.

Let us now discuss information explosion in terms of its definition, factors for information explosion, its impact and how it can be controlled. The following sections deal with these aspects-

a) Definition: The explosion image conveys the idea of sudden bursting out. The term "information explosion" attempts to describe the exponential increase and diversification of published data and information. "Exponential" is a technical term meaning produced or expressed by multiplying a set of quantities by themselves. The exponent is the sign written above to the right of the number or letter in mathematics to show how many times that quantity is to be multiplied. For example, in 5^3, the number 3 is the exponent. In y^m the letter "m" is the exponent.

b) Factors that Lead to Information Explosion: There are many factors which directly contribute to information explosion. Some of them are -

i) *Increased Literacy:* Creative contributions are born when a man or woman comes in contact with the light of education. Increased

literacy is a prime factor for information explosion because individual produced new information as he becomes more and more acquainted with knowledge.

ii) *Increased Number of Scholars:* The art of creativity is confined relatively to a very small proportion of the world's population, who could devise new methods, recognize the existing ideas and offer improved solutions to familiar problems. They set new standards in science and technology, literature, fine arts, business, industry and social leadership. When the society becomes devoid of nature's gift of talents then it would begin to stagnate and will ultimately perish. In 1800, there were 1,000 scientist and engineers in the world which increased to 10,000 in 1850 and in 1900, to 100,000. In 1950s, the numbers swelled to one million. It is this ever increasing number of scientist that accounts for the rapid proliferation of published materials.

iii) *Increased Research and Development:* The increase in research activities is also one of the factors of the exponential growth of information. Nowadays the scale and level of research funding have changed significantly as the research has become mission-oriented, multidisciplinary and assumed a matrix managed character.

iv) *Increased Literature:* Literature of a subject is its foundation. It represents a record of achievements of the human race. Literature is diverse, complex and multilingual in nature. It is becoming more and more interdisciplinary. It is growing at a fast pace. In science, it is almost doubling itself in every 5.5 years. In social sciences, it is doubling at the rate of every eight to twelve years and in the documentary media, book production more than double in a decade. According to Rider, American libraries which try to collect everything appearing on a given subject double their size in every 16 years.

v) *Origin of Different Types of Information Sources:* Earlier information sources are only published media and handwritten manuscripts but today the sources of information are diversified from databases, microforms, online journals, CDROM, DVD, optical disk to hypermedia and hypertext.

vi) *Growth of Technology:* Technology has multiplied by 10 times every 50 years for over 2800 years but nowadays its growth is very fast. Advancement in the field of communication and technology network has brought down the distances between the person, states, countries and continents throughout the world. Computer and telecommunication are converging very rapidly and its highest impact is felt in the information sector. Actually, the need for creative achievement has never been more recognized and designed than it is today.

vii) *Development of Society:* Information has been stored in people's mind and it has been updated and modified through social contact and communication. As society has developed and become more complex large quantities of information have been generated, published and disseminated causing an information explosion.

viii) *Development of Competition:* We will continue to be confronted with competitive forces leading to creation as long as one person strives to advance, as long as one business attempts to increase its share of the total industrial output or to improve its profitability as long as one nation attempts to improve its position in the world. The competitive forces are leading to the demand for more information. As a result, more and more information is produced.

c) Impact of Information Explosion: The impact of Information Explosion can be summarized as follows-

Due to the explosion of information

i) It has become difficult to keep pace with the proliferation of published materials.

ii) It creates a great problem in management of information.

iii) It is becoming difficult to locate and pull out specific information.

iv) It is tremendously contributing towards duplication of information generation. In UK, the estimated cost of unintended duplication in scientific research in the 1960s was Rs. 21.6 million.

v) It creates a great problem in bibliographic control.

d) Controlling Information Explosion: The terrific rate of expanding of knowledge and information can not be slowed down. So, the control of information explosion does not mean the controlling of growth and development of information; rather, it means the development and maintenance of a system of adequate recording, and storing of all forms of information published and unpublished, printed and non printed that add to the sum of human knowledge. So, actually, the control of information explosion means the mastery over information generation.

The need to be aware of different information sources arises from the fact that even a voracious reader is unable to read all the literature on his/her chosen subject. The interdisciplinary nature of subject and the wide variety of their characteristics have added to the confusion. But, for any scholar, it is very essential to keep pace with the all information that is coming day by day in his/her field of specialization.

The design and development of different information system can be a probable measure of keeping an eye on the information explosion. It should be equipped with the necessary databases, indexing and abstracting services. The librarians also have to devise some sort of information service, which may result in bringing out a product which analyses, consolidates, evaluates and disseminates all the latest information.



CHECK YOUR PROGRESS

Q 1: Match the Following

a) Mathematical Theory of Information.	a) George Kingsely Zipf.
b) Psycho-biology of language: An introduction to dynamic philosophy	b) M. C. Yovits.
c) Bradfords Law of Information.	c) Shannon and Weaver.
d) Information is data of value to decision making	d) Samuel Clement Bradford.

Q 2: Find the True and False Statements.

a) Information is a processed data, organized and presented for some purposes.

b) Data are facts, figures, letters, symbols, words, charts & graphs that represent an idea, object or condition.

c) Knowledge can only reside in an organic brain.

d) Melvin J. Voigt categorized information need into current approach, everyday approach, and exhaustive approach.



1.11 LET US SUM UP

Information is the aggregation and assemblage of data in a comprehensible form recorded on paper or in some other medium and is capable of communication. Knowledge is the potential for action on information. The information, knowledge and wisdom in their totality constitute valuable human intellectual assets. The information at its origin, at the time of communication as a message and when it reaches the recipient it acquires some characteristics.

The meaning of information cycle relates to that unit of knowledge from where the information is generated and then transmitted to the users with the state of various processes. The whole process of information from its creation to its use is called the information cycle.

Information does not possess each and every property of other general resources or commodities but at the same time we also should not expect it to be. The people at large are favouring the view that information is a resource and a commodity.

New ideas are generated in each and every branch of human activity from time to time. Apart from new ideas, we give new interpretation to known ideas; we also borrow ideas from other disciplines and try to apply them in a new context. As a result, more and more information is produced in a variety of forms leading to information explosion.



1.12 FURTHER READINGS

1) Khanna, J. K. (1987). Library & society. Kurushetra: Res Puban.
2) P. S. G. Kumar (2002). A student's manual of library & information science (on the lines of the NET syllabus of UGC). Delhi: B.R. Publishing.
3) P. S. G. Kumar (2004). Information & Communication. Delhi: B. R. Publishing.
4) Tripathi, S. M., Lal, C. & K. Kumar (2000). Descriptive questions in library & information science. New Delhi: Ess Ess Publication.



1.13 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1:

a) Mathematical Theory of Information. a) Shannon and Weaver.

b) Psycho-biology of language: An

introduction to dynamic philosophy b) George Kingsely Zipf.

c) Bradfords Law of Information. c) Samuel Clement Bradford.

d) Information is data of value to decision making d) M. C. Yovits.

Ans to Q No 2:

a) True. b) True. c) True. d) True.



1.14 PROBABLE QUESTIONS

A) Short Answer Type Questions

a) Define information. \

b) Define information need.

c) Why is information not a resource?

B) Essay Type Questions

a) Define data, information and knowledge.

b) Describe the properties of information.

c) Describe the Information Transfer Cycle.

d) Describe Zipf's, Bradfords, and Lotka's laws of information.

e) What do you mean by information need? Describe the different types of information needs.Describe the role of information in different contexts.

f) "Information as a Resource and a Commodity". Put forward your views supporting this statement.

g) Describe the phenomenon of information exploration, and trace out the factors that are contributing towards information explosion.

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