"Education is to be able to do what you have never done before"

ALLICE FREEMAN PALNER

CHAPTER FOUR

INFORMATION SEEKING BEHAVIOUR

DATA AND INFORMATION.
INFORMATION DEFINED.
TYPES OF INFORMATION.
INFORMATION: AN INDISPENSIBLE RESOURCE.
INFORMATION SCIENCE, INFORMATION SYSTEM AND USERS.
INFORMATION SEEKING BEHAVIOUR.
AGENCIES OF INFORMATION USED BY THE ACADEMIC COMMUNITY.
CHAPTER FOUR

INFORMATION SEEKING BEHAVIOUR

Information is the product of the human brain in action. It may be abstract or concrete. When an engineer begins to think, a variety of images and sensations flash across his/her mind and his/her memory retains some piece of knowledge. This piece of knowledge is the engineering Information.

A close analysis of the variety of experiences gained by an engineer also reveals the relationship of these units of thought with associated ideas. Different engineers may derive different sets of experiences on or about the same units of thought, and each one's experiences on identical units of thought may remain isolated and prove less valuable, if both these individuals do not share their experiences, Vishwanathan, (1976)\textsuperscript{1}. The individual subjective knowledge of each person is transformed into objective knowledge by each individual's public expression via speech, writing, etc. on being shared. Objective knowledge is publicly observable by all and comes very near to the concept of information, Rowley, (1976)\textsuperscript{2}.

4.1 DATA AND INFORMATION:

The results of observation or measurement by human brain in action are called data. The indication or record of occurrence of a fact, or an event, or an attribute of something concrete or conceptual, are also called data. Any fact or all facts about something are known as data. In other words, the
representation of a fact or set of facts, about an entity, or a value or a set of values of the attribute of an entity, in a formalized manner suitable for communication, interpretation or processing by human and/or mechanical or computer means are designed as data, Kashyap, (1982)³.

Information is quite different from data. Whereas data are raw, unevaluated or unprocessed or meaningless messages, sometimes. Whereas information is organized or processed data which conveys significant or specific meaning about something. In other words, information is the knowledge obtained by processing the data or the meaning derived from data⁴. While referring to distinct concepts, the term 'data' and 'information' are used interchangeably, but this is incorrect. It is by handling or manipulating raw data or isolated items of facts and transforming these into meaningful data or facts, the information is generated.

4.2 INFORMATION DEFINED:

In spite of what has been said above, it is not easy to define the term "Information" precisely. It has many aspects by nature. According to the Mathematical Theory of Information, the amount of information in a message is related to the probability ratio of the message, Shannon and Weaver, (1949)⁵. 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. The Semantic Theory of Information, Bar-Hillel, (1970)⁶ on the other hand, suggests that
a prior knowledge may increase the amount of information in a message. The former theory views information from technical angle, in the context of communication engineering, and is concerned with the problem of accurately transmitting the symbols communicating the information. The latter theory is concerned with the conveying of the desired meanings through the transmitted symbols, Yu, (1970)\textsuperscript{7}.

An information scientist or a librarian has some interest in both these theories of information. But he is more concerned with behavioural problem, that is, with the effect of 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.

Keeping the above in view, information may be defined as data of value to decision-making, Whittemore, (1973)\textsuperscript{8}. Information is the data which can be transmitted between individuals, and each individual can make whatever use he can of it, Rowley (1976)\textsuperscript{9}. No decision is generally taken when there is uncertainty about the options. Information reduces this uncertainty and helps a person to arrive at a decision. The degree of uncertainty, however, varies from person to person depending on the time and place. Each person, as such, shall require different amount of information to arrive at a decision. Thus, "information can be quantified in term of its effect on the state of the decision-maker at a particular moment in time". The amount of information which affects the behaviour of a recipient and makes him to take some decision, however, varies from person
to person, from time to time, and from place to place.

Rajan, (1986)$^{10}$ says that “no universally accepted
definition of information has yet crystallized, perhaps it will
never be crystallized.” In view of this, the advice of Goffman,
(1970)$^{11}$ is that study should be made on the information related
phenomenon rather than information itself. Accordingly, Wersig
and Neveling (1975)$^{12}$ give the following six approaches to
information:

1. The structural approach: In this approach information is
viewed as structures of the world or static relations
between physical objects which may be perceived or not;

2. 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
information’ may erroneously be used for the term
‘knowledge’;

3. The message approach: The Mathematical Theory of
Communication uses this approach. It is concerned with the
transmission of symbols representing a message;

4. The meaning approach: In this approach the semantic contents
of a message are accepted as information;

5. The effect approach: This approach says that information
occurs only as a specific effect of a process; and

6. The process approach: According to this approach, the process
information occurs in the human mind when a problem and
useful data are brought together.

Taking into consideration the above approaches it may be
concluded that information is a social process and should be
defined in relation to information needs either as reduction of
uncertainty caused by a communication data or as data used for
reducing uncertainty.

131
Otten, (1974)\textsuperscript{13} gives the following three aspects of information after concluding that a single definition for this concept will not do:

1. Order of structure 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.

Brookes, (1981)\textsuperscript{14} says that knowledge is a sum of many bits of information, and when more information is added to the existing knowledge structure, it gets modified. His views are expressed by the following equation:

\[ K(S) + 1 = K(S + S) \]

When information \( 1 \) is added to the existing body of knowledge \( K(S) \), it results in modified knowledge \( K(S + S) \).

Bell, (1979) says, "information is news, facts, statistics, reports, legislation, tax-codes, judicial decisions, resolutions and the like, and it is quite obvious that we have had 'explosion' of these not only with the multiplication of organizations but because all countries and the diverse world politics and the world-wide economy come under our daily scrutiny in newspapers and television and in the pages of specialized magazines." \textsuperscript{15}
Machlup, (1983) has also defined information, differentiating it from knowledge at the same time. According to him:

(i) Information is piecemeal, fragmented, particular, whereas knowledge is structural, coherent and universal;

(ii) Information is timely, transitory, perhaps even ephemeral, whereas knowledge is of enduring significance;

(iii) 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 (though conceivably information may leave knowledge unchanged).  

4.3 TYPES OF INFORMATION:

Shera, (1972) categorises information into the following six types:

1. **Conceptual Information:** The ideas, theories, hypotheses 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 a product of the 'Literature Search';

3. **Procedural Information:** The methodology which enables the investigator to operate more effectively. Procedural information relates to the means by which the data of the 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 discipline or field of investigation to another may illuminate vast shadows of human ignorance;

4. **Stimulatory Information:** Man must be motivated and there are but two sources for such motivation, himself and his environment. Stimulatory information that is transmitted by direct 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. It is by nature fortuitous it submits unwilling to direction or compulsion...
5. **Policy Information:** This is the focus of the decision-making. Collective activity necessitates the definition and objective and purpose, the fixing of responsibility, the codification of rights and privileges, and the delineation of functions;

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

### 4.4 INFORMATION: AN INDISPENSABLE RESOURCE:

For socio-economic development, information is an indispensable resource. The supply of correct and precise information in time helps the policy-makers in making maximum use of the available resources as also in avoiding duplication of work. Similarly, a research and development programme can be accomplished successfully only if the required information becomes available as and when it is needed. Without proper and complete information no worthwhile decision can be taken. In fact, no progress is possible without the support of information, Prasher, (1986)\(^{18}\).

Since the progress of every type is linked with the availability of right information at right time, access to it as also its dissemination is of vital importance. There should be a free flow of information, and as for as possible, there should be no barriers restricting this free flow.

### 4.5 INFORMATION SCIENCE, INFORMATION SYSTEM, AND USERS:

#### 4.5.1 INFORMATION SCIENCE:

Information science is that discipline which investigates as to how to apply more effectively the objective knowledge that we have, Rowley, (1976)\(^{19}\). Its aim is to plan and organise
effective information service. It locates, procures, organizes information-bearing documents with a view to disseminating information contained in them. Its purpose is to help in the communication of information to those who need it as also to provide access to the needed information already available. Documentation lists, indices, abstracts, reviews, etc. are compiled to serve as the tools both for information communication and for accessing information. Documentation services, such as CAS, SDI, reprographic facilities, and translation services are there to promote the dissemination of recorded information easily and speedily. Information science also studies user's needs and plans information system capable of satisfying these needs.

4.5.2 INFORMATION SYSTEM:

An information system differs from a communication system. The latter may provide the transmission of information only i.e. transmitting a message from the communicator to the recipient. An information system, on the other hand, provides both the preservation and transmission of information. As Doyle (1975) has put it "an information system can be thought of as a communication system which provides for an unlimited amount of delay between receiver and sender, and which, therefore, must store the messages in some static medium, and which must also have the messages in a state of availability for whatever future receiver may present himself". This has been neatly presented in the Fig.2.
Any information system is of two-way process and as such has two parts-input and output. The input part consists of a continuous flow of new documents, which are analyzed as they are received; classified, and catalogued/indexed. These documents are merged or shelved in a systematic order on the shelves or in cabinet files. The index card (or cards) are filed in the index to keep it up-to-date. The index entries caters for all possible approaches of the users. The index is so constructed as to serve as an efficient retrieval tool. The output part consists of a user with query. He searches the index for the document (or documents) on his subject, matching the terms that describe his query to the terms describing the subject-contents of the documents in the index. The user can also go to the collection of documents or the file of documents directly to locate the document(s) answering his query. Otherwise the index will direct him to the document (or documents) dealing with his subject in the collection or in file.

It is not necessary that the documents should be available in a library or in an information centre where the information system is in operation. A user can match his query with the surrogates or the references of the indexing services-local, national or international - and finds out what all documents relate to his subject of query. These documents can be located, procured, and made available to him subsequently by his library. A well-planned and efficiently run information system ensures quick and easy communication of information, as also provides to every user quick and easy access to the information he needs.
4.5.3 USERS OF INFORMATION:

No information service worth its name can be planned and no worthwhile information system can be established unless the planners know fully about the users. No information can be communicated to a person who is not interested in it.

An author or a scientist, who produces or generates information and who is naturally very keen to communicate it to as wide an audience as possible, himself does not know who all are his users. Under the circumstances, the document containing information generated by him is to be added to the total stock of documents with the hope that all those who are interested in the information will be able to retrieve this document from the huge stock and have the required information.

In order to get a communicator as many recipients as possible, appropriate communication systems have come into being. In order to provide every user his information, suitable information system have been organized. The success of a communication system or an information system depends largely on the accurate knowledge about the user, his information needs, and his information-seeking behaviours.

‘Users’ can be divided into different categories on the basis of tasks assigned to them in a research organization. They may be the ‘planners’ or ‘decision-makers belonging to the top echelon of the hierarchy.’ The users may belong to the middle-range category responsible for the execution of the research projects or for the coordination of research activities. The
users may be the working scientists carrying out research activities under the guidance of a coordinator or a middle-range scientist.

In a college, the users may be either teachers, or research scholars, or postgraduate and undergraduate students. Similarly there can be different categories of users in other environments.

4.5.4 INFORMATION SYSTEMS:

Doyle sums up users' characteristics as follows: “Users are diverse. Users have conflicting traits and attitudes in pursuit of information. On the one hand, they are hungry enough for information to strive to do what they believe is necessary in satisfying their information needs and they express awareness of how much their environment fall short in supplying their information. But on the other hand, they display, perhaps inherently, human resistances in accommodating to information systems”. An information system taking these characteristics into consideration may be a better one. Carter, (1967) makes the following suggestions in this regard:

1. Since users in general, make least efforts in seeking the information they need, the information system should be easy to use;

2. Since there is resistance to change among users, the changes in the information system which directly affect the users should be evolutionary;

3. The information system should be so planned as to look after the diverse needs of users;
4. The information system should be designed to facilitate efficient searching by users. This is because users prefer their own searches;

5. Since professional and trade publications keep the users abreast with the latest development in their field, information system should provide easy access to the current professional and trade publications in users' own and related fields;

6. To avoid information gaps and duplication of work, provision for disseminating information about current research projects and unpublished reports may be made by the information system;

7. Since there is an expressed desire for better rather than more information, only the quality information service should be provided. Out-dated information and unused material may be weeded out. Competent and efficient staff will certainly be provided quality service;

8. Users should be made aware of the information system and its services so that maximum use is made of these. If feasible, formal education should be provided to the users for this;

9. To cater for the changing needs of users as also to improve the information system, there should be a provision of continuous research;

10. The information system should provide for easy access to all important foreign publications, preferably with English translations.

4.6 INFORMATION SEEKING BEHAVIOUR:

Apart from information retrieval there is virtually no other area of information science that has occasioned as much research effort and writing as user 'studies'\(^2^3\) for the development of any system or for modifications to be made in it, some feedback is required. This is only possible with the user studies. So also in the case of library and information system, user studies have gained their importance. For the assessment of the quality and quantity of the services and their
utility, user studies have become the main ingredients of the system. The psychology of the users, the behaviour in gathering information, information needs of the users, the utility of various information resources, analysis of the services based on the users' needs are among the various concepts covered in user studies.

User studies are being conducted on the behaviour of the user in seeking information, instead of the needs of the user. These studies are more useful to study the user, his/her psychology, the working condition, the impact of his/her position in the society etc. With this the user group is studied in a better way to modify the services and tools of the information system. According to Wilson (1981), information seeking behaviour results from the recognition of some need, perceived by the user. That behaviour may take several forms; the user may make demands from formal systems that are customarily defined as information systems, such as libraries, on-line services, information centres; or upon systems which may perform information functions in addition to a primary, non-information functions such as estate agents, offices or car sales agencies that give current information of their field viz., prices and models etc. The user also seeks information from other people which is otherwise called "information exchange". According to him the word 'exchange' is intended to draw attention to the element of reciprocity, recognised by Sociologists and Social Psychologists as a fundamental aspect of human interaction. In the process failure may be experienced with system as well as when seeking
information from others. Use of information according to him is, evaluation to discover its relationship to the user's need.\(^\text{24}\)

The study of information seeking behaviour can stand on its own as an area of applied research where the motive for the investigation is pragmatically related to system design and development. A different motivation is involved if we wish to understand why the information seeker behaves as he does. This is an area of basic research and although the resulting knowledge may have practical applications, there is no necessity that it should.\(^\text{25}\)

4.6.1 MODELS OF INFORMATION SEEKING BEHAVIOUR:

Back (1962)\(^\text{26}\), considered that scientists displayed two types of information seeking behaviour. Exploratory behaviour, used in keeping up to date or getting background information, involved obtaining repetitive information illustrating new aspects of the problem from a variety of sources. This information resulted in a commitment to a particular line of work. Searching behaviour consisted of specific directed reading and resulted in specific action, e.g. designing a study.

Similarly Krikelas (1983), in his model, defined two sorts of information behaviour. Information seeking was associated with immediate needs. Information gathering was associated with deferred needs. Information gathering could be directed, e.g. "keeping up with the literature" or non-directed. Krikelas's model was in the form of a flow chart showing the interrelationship of factors such as need creating environment, need, source preference, information giving and information gathering\(^\text{27}\).
Orr (1970), saw a need to view information behaviour within a broad conceptual framework including both communication activities and the environment. Orr (1970), developed a model which saw the scientist as an information processor with two inputs (observations and information sources), and three outputs (responding, requesting and promoting). The model also included variables such as personality, work setting and type of research.

Wilson et al. (1982), reviewed attempts since 1950 to model the behaviour of information users.

4.6.2 INFORMATION NEEDS DEFINITION:

The terms "information" and "information needs" require useful definition. The satisfaction of information needs, however, does relate such effects, in terms of the individual's receiving and processing of transmitted and previously only potential communication to his/her needs.

However, the concept of information need has proved to be an elusive one to define, isolate and to measure. Researchers have used the term in a variety of ways. Needs, demands and wants have been used interchangeably, although they may not be identical. Need is further complicated by the necessity to distinguish among expressed, unexpressed, or unfelt needs, the latter being the most difficult to identity, Rohde N.F. (1986)

Krikelas (1983) has defined it as the "recognition on the existence of uncertainty." Based on information seeking behaviour, needs have been categorised as immediate needs or
deferred needs. Faibisoff and Ely (1976) viewed the information need either shaped by activity, such as problem solving or decision making; or as latent, manifest through a passive reception of information which is stored as knowledge.

Information scientists have identified two types of needs, which are continually confused—substance or kinds of messages and the means or channels of delivery. Because needs are internals and vary with the individual and the situation, the object of most frequent study is user behaviour and expressed demands, the assumption being that needs are implied by demands and information seeking activities.

A difference may exist between what an individual may perceive as a need and the way it is expressed. This approach seems to indicate that formulation of an expression is influenced by some perception, which is a preconceived idea, about the source as much as the problem. We have, therefore, a problem of differentiating when a need is realised and how it is expressed. The latter can be studied empirically but the former is again an internalised process, Taylor (1968) 33.

Information need is thus seen as a subjective, relative concept existing only in the mind of the experiencing individual. It has been defined as the "recognition of the existence of uncertainty and described as something which prevents an individual from making progress in a difficult situation," Ford (1983) 34.
In the process of information searching, at 'initiation', a person first becomes aware of or lack of knowledge or understanding, feelings of uncertainty and apprehension. This is the stage showing the need for information, Kuhlthau (1991).

4.6.3 INFORMATION NEEDS OF THE INDIVIDUALS:

Information needs vary from individuals and their working conditions, the discipline in which they are working, the time etc.

Martyn (1974) says that different types of information needs of individuals may be identified based on the stage of project or activity. Two types of information needs have been identified which are substance or kinds of messages and the means or channels of delivery. The needs are internal and vary with the individual and the situation, the object of most frequent studies is user behaviour and/or expressed demands, the assumption being that needs are implied by demands and information seeking activities, Menzel (1966).

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

1. interdisciplinary information;
2. peripheral information;
3. speculative information; and
4. exceptions and inconsistencies.
The effective transfer of information across disciplinary boundaries is never an easy task, even with informal media viz., personal contacts, etc. Problems of formal information services in interdisciplinary areas are correspondingly greater. Pachevsky’s (1982) study based on the small survey showed that 14 out of 22 American scientists working in inter-disciplinary fields rated the information services available to them as unsatisfactory compared with only one out of 55 scientists working in an established discipline. The problems accounted for over scatter of publication in the primary literature, the jargon barrier between disciplines and discontinuance of subscription of inter-disciplinary journals by the libraries due to financial stringency.

Another point to emerge in the consideration of creativity is the value of peripheral or even irrelevant material, the information around the fringe that will lead to new ideas, Martin (1982).

Individual information needs of immediate nature are the product of situational conditions and are easier to recall. A decline in information need can be attributed to either a change in the situation, or the establishment of some information giving service which satisfies the need. Sometimes it so happens that the previous needs logically give rise to the present information needs. The nature of the problem has the impact on the information seeking behaviour of the individual.
Voigt (1961) observes that a scientist's use of information, whether from print or from other sources, arises from three different needs viz., (a) 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 which is called "current approach". (b) The need is the one that comes to the scientist in course of his work for some specific piece of information. This need is directly connected with research work or the problems at hand. It is called "every day approach". (c) The need comes less often but is equally important. This is the need to find and check through all the relevant information existing on a given subject. This requirement can be called the "exhaustive approach". This shows that different needs of the scientists at different levels make them adopt different approaches to gather the required information.

Rzasa and Moriarty (1970) made a study on the "types and needs of academic library users" to determine whether the faculty, graduate and undergraduate students were homogeneous with respect to their primary and secondary reasons for visiting the library and also with respect to the library materials used. The findings with respect to faculty showed that the main interest of them for using the library facilities were to do research for a publishable paper and to read for self-improvement. The second need being to find and read material required for a course i.e., for teaching. Scholarly journals and periodicals are the primary materials used by the faculty as well as students.
There are different approaches to satisfy the different needs. The need in each issue is to solve an issue. The nature of the problem is perceived to require different types of information so the seeking behaviour changes. This indicates that characteristic of the problem may be a more critical indicator of potential behaviour that various personal or work characteristics.

Individuals, indeed, want to reduce uncertainty, but they may just as well want information, instruction, release from a situation, companionship, reaffirmation of reality, of social support, Derin (1976)\(^43\). According to Ford (1983) the extent to which information seekers transfer the information into their own knowledge structures may reflect at least in part of the extent to which they really needed the information\(^44\).

4.6.4 FACTORS INFLUENCING INFORMATION NEEDS OF R.E.C.'S FACULTY:

Many factors other than the existence of a need will play a part on information-seeking. They are: the importance of satisfying the need, the penalty incurred by acting in the absence of full information, the availability of information sources and the costs of using them. There may be a time delay between the recognition of the need and the information seeking acts. In the case of affective needs, neither the need nor its satisfaction may be consciously recognised by the actor, whereas a cognitive need of fairly low salience may be satisfied by chance days, months or even years after it has been recognised. Sometimes it so happens that the availability of information may

The social situations i.e., the situations in which information is sought and used influence the attitude of information seeking. Lin and Garvey (1972) identified the type of work (e.g: researcher or teacher) as the most important factor influencing the information need. Whether the work is basic or applied and the discipline in which the person is working also are the important factors.

Crawford (1978) and Paisley (1968) add other factors called environmental factors such as social, political, economic and legal systems within which a person operates and interpersonal relationships as important as other factors.

Krikelas (1983) observed that for many issues a great deal of information required would already exist in the individual’s memory; only a small part of a person’s on-going needs would produce an outward behaviour that might identify as information seeking. The level of urgency and perceived importance of the problem would influence the pattern of information-seeking.

"The full range of human, personal needs is at the root of motivation towards information-seeking behaviour, it must also be recognised that these needs arise out of the roles an individual fills in social life. So far as specialized information systems are concerned, the most relevant of these roles is 'work-role', that is, the set of activities,
responsibilities etc., of an individual, usually in an organizational setting, in pursuit of earnings and other satisfaction, Wilson, (1981)⁵⁰.

Further, Wilson adds, that the principal generators of cognitive needs are the performance of particular tasks and the processes of planning and decision-making. The nature of the organization, coupled with the individual’s personality structure, will create affective needs such as the needs for achievement, for self-expression and self-actualization. Organizational level at which a role is performed and the 'climate' of the organization are the other factors.

Paisley (1968)⁵¹ accounts the following factors which are likely to condition information behaviour:

1. Available information sources;
2. Uses to which the information will be put;
3. Background, motivation, professional orientation and other individual characteristics of the users;
4. Social, political, economic and other systems that powerfully affect the user and his/her work; and
5. Consequences of information use, e.g., productivity.

Slater and Fisher (1969)⁵² attempted to ascertain the motivation for obtaining information. The results of the study showed 22 per cent of individuals' need was background information. 17 per cent motivated to keep up-to-date of their knowledge. Others' need for information about a process, method or technique was to carry on with a current project; to instruct, train or inform other; data equations, facts and figures for immediate use in calculations and new ideas and stimulation.
Summer, Edward G. et al. (1983) observed that personal, professional and psychological attributes play varying roles in predicting source use. Attitude appears to play a major role as do position and information dissemination habits. They found that educators tend not to differ in their view of desirable characteristics of information, but position and attitude will affect their opinions to varying degrees.

Among the REC faculty, the factors associated with information needs include: information required for day-to-day classroom work, for research work, for industry consultation work, to participate in seminars/conferences, for general awareness of the developments taking place in the concerned subject and for communicating new information.

For the present study, the following reasons are taken into consideration as the factors influencing the information needs among the REC’s faculty. They are for:

a) Class-room lecturing;
b) Research work;
c) Industrial communication work;
d) General awareness;
e) Participation in seminars/conferences etc.;
f) Meeting the needs of promotional opportunities;
g) Communicating new information out of curiosity and inquisitiveness;
h) Writing text-books etc.

The data pertaining to this aspect is shown in the analysis part of this study.
4.7 AGENCIES OF INFORMATION USED BY THE ACADEMIC COMMUNITY

The intensity of the need for information decides the acquiring method and agencies of information sources used. Information generation is a cyclic process, which includes three ingredients viz., information sources, information creator/generator and new information that is being generated. An information source is the fundamental unit in the life cycle of information production. It is fundamental because it cannot be broken down without destroying the information.

"If it is to be reused, even by its creator, the source must be verified, mechanisms of intellectual and physical access must be added, including storage facilities, and various legal, organizational, and economic conditions, if present, must be addressed. Meeting these requirements constitutes the institutionalization phase of the life cycle of an information source. The interdependent set of technical, organizational, socio-economic-legal activities, taken together as one phase of the life cycle, provides continuous access to information sources and results in the establishment of an information resource, Livitan and Karen B (1982)"54.

Using of information resources depends on the attitude of the seeker and the information needs of the user. Working conditions, the subject of the study and the nature of the information sought (nascent, retrospective etc.) have the impact on the use of information resources. For example, the information needs of a scholar of humanities vary with that of a
scientist. For him, the information source having retrospective coverage is more important. Works published decades ago are still definitive works for him. Whereas a scientist mostly depends on day-to-day developments, nascent information in the form of abstracts, reviews, articles, formulas etc., required for immediate use. Thus the types of information sources and the agencies of information sources play a key role in the cycle of information seeking behaviours. The use of information products and services inherently leads to the creation of new information and the start of a new cycle.

The information sources thus used to satisfy the needs of various persons are grouped into 1) formal information sources and 2) informal information sources.

4.7.1 SOURCES OF INFORMATION:

To know the trend of developments in the field and the results of previous experiments etc., the investigators make use of various information sources. These sources are grouped into formal information sources (documentary sources) and informal information sources (non-documentary sources).

The formal information sources are further divided into two groups based on the physical nature of document and information characteristics of the document. Formal sources include books, journals, reports, patents, abstracting and indexing journals, subject bibliographies, proceedings of conferences, surveys, etc.
The informal information sources include government departments, research organizations, learned professional societies, industries, colleges, universities, colleagues, corridor meetings at conferences, social gatherings, etc.

As already explained the use of information sources is influenced by the working conditions, subject of the study, nature of information sought, the attitude of the user and the intensity of the need one feels, etc.

4.7.2 ACQUIRING INFORMATION THROUGH FORMAL SOURCES:

There is a close relation between the activity in acquiring information and the type of need i.e., immediate need or deferred need, however, time plays a key-role here. It is said that activities associated with satisfying immediate needs are information-seeking behaviour and those associated with deferred needs will be defined as information-gathering behaviour. At the outset, it is difficult to study the user this way in acquiring information because information need is a subjective one, relative concept existing only in the mind of the experiencing individuals. The level of urgency and perceived importance of the problem generally influence the pattern of acquiring information.

In acquiring information, the individual adopts hierarchy of preferences, which represent some basic concept of minimum effort. Individuals prefer to get their information from a knowledgeable and perceptive source, which is known to the seeker. The next level would be to seek some one who works in an
institution that clearly labels the person as being knowledgeable and probably situation-perceptive. Going through impersonal source i.e., literature is a common practice. Among scientists, when individuals turn to external source, they strongly prefer human contact i.e., verbal communication.

Use of information is normally considered under two main headings- formal channels (written sources) and informal channels (usually oral). One of the major problems in making general statements about information usage by engineering teachers lies in the difficulty of inter-comparing the results of different users surveys. Four main approaches have been used in these studies:

i) questionnaire surveys,
ii) special diaries recording time spent in communication,
iii) personal interviews, and
iv) special observers participating with researchers.

The basic intention in each case is to estimate as quantitatively as possible the relative importance of the various communication channels for the group under examination, Meadows, A.J, (1974).55.

The American Institute of Physics published in 1970 a programme for a 'National Information System for Physics and Astronomy 1971-75'. This study made an attempt to quantify the relative importance of different information channels to physicists- archival literature, personal contacts, papers at meetings, non-archival literature, abstract journals and others.
In the same document comparison was made between methods of acquiring information among Physicists and Chemists. The method of following up citations in relevant papers ranked first and keeping up by reading current publication ranked second, American Institute of Physics\textsuperscript{56}.

Bernal (1948) made a study on various groups of scientists and engineers and found 5 to 15 journals being consulted by them per week. Similarly, the average number of papers read in detail varied from a low of 1.5 per week for a group of engineers to a high of 7.4 per week for scientists who were working for the Medical Research Council\textsuperscript{57}. The factor behind the reading of various journals may be due to the spread of information and the need of the individual to keep up with a particular subject.

Further Bernal's survey showed that the British Scientists used to scan the papers relating to adjacent fields of their speciality and this amounted to the quarter of their researching material and another quarter dealt with general science.

Acquiring information studies from the side of the place where the material read showed variety of behaviour of the individual. It depends on the type of employer involved i.e., college, university, industry, etc., and also on the type of scientist i.e., physicist, chemist or social scientist. Among physicists 75 per cent of the reading was done in their rooms at work, 15-20 percent at home and the remaining in the library. The chemists spent 50 per cent in their rooms, 30-35 per cent at home, Martin M.W, and Ackoff R.L\textsuperscript{58}. 

156
Meadows observes two main motives behind the reasons a scientist engages in reading:

i) to acquire or recover specific information, the need for which has already been recognised; and

ii) browsing, to discover new items of information hitherto unknown, Meadows, A.J (1974)\textsuperscript{59}.

The quality of the channel has no bearing on the frequency with which the source is used and that both frequency and priority of use are determined by accessibility. Rosenberg (1967)\textsuperscript{60} interviewed ninety six research and non-research personnel and asked them to rank eight information gathering methods on a 7-point scale according to ease of use and amount of information expected, and to indicate which method they would use to solve three hypothetical problems. The methods arranged in order of preference were:

1. Search personal library,
2. Search material in building where you work,
3. Visit a knowledgeable person nearby,
4. Telephone a knowledgeable person,
5. Use a library that is not within your organization,
6. Consult a reference librarian,
7. Write letter, and
8. Visit a knowledgeable person twenty miles away or more.

The study revealed the primary use of formal channels for information by ranking them first and second.
4.7.3 ACQUIRING INFORMATION THROUGH INFORMAL SOURCES:

As far as informal sources of information are concerned, private correspondence is still in wide use. Oral transmission of a particular piece of information usually takes a good deal longer than written communication. But "the beginner researcher listens to literature tips by subject specialists, but carries out his/her research independently digging out all sorts of library and documentary material with no objection to time-consuming and redundant work", Uytterschant, (1966) 61.

A survey of participants at a national meeting of the American Association for the Advancement of Science found the following reasons for attending the seminar,

i) to participate in programme,
ii) to acquire up-to-date in their own specialities,
iii) to learn the development in related specialities,
iv) to learn the development in unrelated specialities, and
v) to learn how science and technology can serve society.

In general, the information collected at the conferences is of nascent in origin. Hence, the scientists prefer to participate in meetings, and a will to travel thousands of miles for a few days of personal contact with other scientists.

Wood (1971) says that "a major reason for scientists using the informal communication network is that information passes through the network anything up to two years before it reaches formal publication. It would appear that the only effective way of keeping up-to-date with one's subject is to
develop a wide range of personal contacts, or in other words become part of what has been termed an invisible college the concept of which was first put forward by de Solla Price.

The informal system often provides the line between the scientist or engineer and the formal channel. It is found particularly true in the case of engineers, most of them prefer to refer a book or article by a colleague rather than to use formal methods as an abstracting or indexing journal, Wood and Hamilton.

In the process of collecting required information through formal or informal sources, the user depends on many agencies that provide the information sources.

4.7.4 AGENCIES OF INFORMATION SOURCES:

The information need, its kind, the channel of communication and the agency providing the source of information are interrelated. The agencies of information sources can be grouped into two viz., "Agencies of Formal Sources" and "Agencies of Informal sources".

Agencies of Formal Sources of information include:

1. Libraries: a) Academic libraries, b) Special Libraries, and c) Public libraries

2. Personal collections of books:
   a) Self, b) Relating to friend/colleague.

3. Information Centres:
   a) National information centres, b) International information centres.

159
Agencies of Informal sources of information include:

1. Communication among small groups, they are,
   a) Suggestions from colleagues/friends,
   b) Contacts with peers,
   c) Off-prints from authors,
   d) Journal clubs,
   e) Technological gatekeepers, and
   f) Corridor meetings at conferences etc.

2. Communication among big groups, they are:
   a) Seminars and conferences, and
   b) Invisible colleges (information exchange groups)

Having seen the motives and purposes of seeking Information and nature and types of information required, it is natural in this study to know the information-seeking behaviours of engineering faculty. Investigation of dependence and use of various channels or sources of information is an extension of the study of purpose of seeking information and the nature and type of information required by users. Information seeking is a purposive and adoptive process wherein there is no assurance of success for a search. In the process, several sources of information should be made to act synergistically to bring about the effective transmission and use of a message which needs a high degree of co-ordination among sources. Considerable research has been done about various sources of information used by scientists, engineers and technologists. The present study in engineering faculty has sought to know what sources are required and used; how use of different sources varied with various user-characteristics and how they are ranked or the preferred sources of information either for all purpose or for a specific task.
All these measures directly or indirectly attempted to find out the overall degree of dependence of engineering faculty on various information sources in the analysis/part of the study.

REFERENCES:

1. VISHWANATHAN (C.G).  
   Elements of Information Science.  
   New Delhi: Today and Tomorrow, 1976; pp.2-3

2. ROWLEY (J.E) and TUMER (C.M.D).  
   Dissemination of Information.  
   London: Andre Dentsch, 1976; p.17

3. KASHYAP (M.M).  
   Data processing and computer application in library.  
   Journal of Library and Information Science, V.7 (1); Jan., 1982; pp.62-83

4. Ibid.

5. SHANNON (C) and WEAVER (W).  
   Mathematical theory of communication.  

6. BAR-HILLEL (Y) and CAMAP(R).  
   Semantic Information.  
   IN: Saracavic T. Introduction to information Science.  

7. YU (A.S).  
   On the semantic characteristics of information.  
   IN: Saracavic T. Introduction to information Science.  

8. WHITTEMORE (B.C) and YOVITS (M.C).  
   A generalised conceptual development for the analysis of information.  
   V.24 (3); Jan. 1973; pp.221-31.

9. ROWLEY (J.E) and TUMER (C.W.D), op.cit.p.17.

10. RAJAN (T.N).  
    Boundary, turf and pitch of the field of information science and their implications for manpower development.  
11. GOFFMAN (W).
    Information Science, discipline and disappearance, 
    ASLIB Proceedings. V.22 (12); 1970; pp.589-96.

12. WERSIG (G) and NEVELING (V).
    Phenomena of interest to information science,
    Information Science. V.9 (4); 1975; pp.127-140.

13. OTTEN (K.W).
    Basis for a science of information,
    IN: Debous, A ed. Information Science, a search for 

14. BROOKES (B.C).
    Foundation of information science.
    Journal Information Science. V.2 (3-4); 1980; pp.125-33, 
    209-21, 269-75, V.3 (1); 1981; pp.3-12.

15. BELL (D).
    Social Frame work of information theory
    IN: Dertonzos, M.L and Mosses, J (Ed): The computer 
    age, a twenty Year view. Cambridge: MIT Press. 1979; 
    pp.163-211.

16. MACHLUP (F) and MANSFIELD (U).
    Study of information interdisciplinary messages.

17. SHERA (J.H).
    Foundation of education for librarianship.
    Newyork: Becker and Hayes, 1972; p.175.

18. PRASHER (R.G).
    Information communication: Language barrier and 
    translation services.
    Lucknow Librarian. V.18 (4); Dec. 1986; pp.131-43.

19. ROWLEY (J.E) and TUMER (C.W.D), op.cit.p.17.

20. DOYLE (L.B).
    Information Retrieval and processing.

21. DOYLE (L.B), Ibid.

22. CARTER (L.F) and Others.
    National documentation handling systems for science 

23. WILSON (T.D).
    On user studies and information Needs.
    Journal of Documentation. V.37 (1); Mar. 1981; p.3.

24. Ibid.
25. Ibid.
26 BACK (K.H).
The behaviour of scientists: communication and creativity, Sociological Inquiry. V.32 (1). pp.82-87.
27. KRIKELAS (J), op.cit.p.28.
28. ORR, op.cit.p.25.
29. WILSON (T. D) et al.
Models of the Information user progress and prospects in research.
30. ROHDE (N.F).
Information needs.
31. KRIKELAS (J).
32. FAIBISOFF (S.G) and ELY (D.P).
33. TAYLOR (Robert S).
34. FORD (N).
35. KUHLTHAU (Carol C).
Inside the search process: Information seeking from the user's perspective. Journal of the American Society for Information Science. V.42 (5); 1991; p.366.
36. MARTYN (J).
37. MENZEL (H).
38. BAWDEN (David).
Information systems and the stimulation of Creativity.

39. PACHEVSKY (T).
Problems of Information Services with Respect to Integration of Science.

40. MARTIN (P).
Innovative process and the online information channel.
IN: Stern, B.T. Ed.2:*Information and Innovation.*

41. VOIGT (Melvin J).
Scientist's Approach to information.

42. RZASA (Philip V) and MORTARY (John H).
The types and needs of Academic Library Users: A Case Study of 6,568 Responses.

43. Dervin (B).
Strategies for dealing with human information needs: Information or communication.

44. FORD, op.cit.p.209.

45. WILSON, op.cit.p.3.

46. LIN (N) and CARVEY (W.D).
Information needs and uses.

47. CRAWFORD (S).
Information needs and uses.

48. PAISLEY (W.J).
Information needs and uses.

49. KRIKELAS, op.cit.pp.5-20.

50. WILSON, op.cit.p.3.

52. SLATER (M) and FISHER (P).
Use made of Technical Libraries.

53. SUMMER (Edward, G) et al.
Effect of Personal, Professional and Psychological
Attributes, and Information seeking behaviour on the
use of Information Sources by Educators.
Journal of the American Society for Information Science,
V.34 (1); 1983; p.85.

54. LEVITAN (Karen B).
Information Resources as "Goods" in the Life cycle
of Information Production.
Journal of American Society for Information Science,

55. MEADOWS (A.J).
Communication in Science.

56. AMERICAN INSTITUTE OF PHYSICS.
Program for a National Information on System for Physics
and Astronomy, 1971-75.
Information Division, American Institute of Physics, 1970.

57. BERNAL (J.D).
Report on the Royal Society Scientific Information
Conference.
Royal Society, 1948.

58. MARTIN (M.W) and ACKOFF (R.L).
Dissemination and use of recorded scientific information.
Management Science, V.9, 1963; p.322.

59. MEADOWS, op.cit.pp.93-94.

60. ROSENBERG (V).
Factors affecting the preferences of industrial personnel
for information gathering methods.
Information Storage and Retrieval, V.3(3); 1967; pp.119-127.

61. UYTTERSCHANT (L.L).
Literature searching methods in Social Science Research.

62. WOOD (D.N).
Foreign Language problem facing scientists and
technologists in the United kingdom.
Report of recent survey. Journal of Documentation,

63. WOOD (D.N) and HAMILTON (D.R.L).
Information requirements of mechanical engineers