Chapter – II

Review of Literature
An examination of the body of research literature, which is the backbone to any research work, reveals the current trends and the future requirements in the subject of the concerned research project.

2.1. Information seeking behaviour:

2.1.1. Definitions:

Information seeking behaviour is defined as any activity of an individual that is undertaken to identify a message that satisfies a perceived need. In this context, information is viewed as any stimulus that reduces uncertainty and need is defined as a recognition of the existence of this uncertainty in the personal, or work-related life of an individual.

The above view of Krikelas is supported in Alkin's work in which information need is defined as "a function of extrinsic uncertainty produced by a perceived discrepancy between the individual's current level of certainty about important environmental objects and a criterion state he seeks to achieve".

More importantly, the act of using literature is a behaviour that, in fact, represent a variety of purposes. One can read, or scan, to get stimulating ideas, to obtain background data, to relax, or to achieve some other objective. The idea of making inferences about, the purpose of an act simply by observing the outward behaviour is unreliable, as has been demonstrated by researchers studying catalogue use and it is suspected that the same is applied to literature use.
The term information use, users, uses, channel, and source are all used in different ways, as are the concepts of information gathering behaviour.

2.1.2. Needs of Academicians:

There may be academicians engaged in teaching and research activities or they may be involved in research and development activities in an industrial setting.

Voigt says that "...scientists refer to information sources mainly in three circumstances".

- While getting current awareness of results both in their particular narrow field and the related disciplines
- In their day-to-day work, when they need some factual information figures, methods and designs and
- When embarking on a new problem or a project, as well as when completing it and writing about it - a retrospective search to identify as many published and unpublished sources on the subject as possible².

And also, Shcherban has identified seven stages when information is supplied for scientific and technical work. They are:

1) Over all familiarization with the problem, and problem statement. Drawing up a plan and the provisional terms for the solution of the problems of a primary and secondary importance. This stage requires a general acquaintance with information available on the subject.
ii) Gathering scientific knowledge about the subject of study. Retrospective searching of the broadest possible scope of literature without any pronounced critical approach.

iii) Co-ordination and interpretation of scientific data. A critical evaluation of the ideas and hypotheses of different authors. The relevance criteria for the information needed are specified and the amount of documents used is reduced.

iv) Statement of hypotheses and choice of a working hypothesis, which is the most important stage of research in technical sciences.

v) Proving the working hypothesis; the most important stage in basic research. The information used depends on the specifics of research; for instance, the proving of an assumption may require gathering factual data scattered in the literature.

vi) Statement of conclusions and recommendations, predictions and as well as generalizations are frequently made at this stage. Information is often used to shed light on precedence and priority aspects.

vii) Description of the research results. The information gathered and processed is, as a rule minutely documented.
In terms of information types, researchers and scientists would require:

- Scientific and technical information enabling learning, research, technical decisions and actions.
- Experimental information
- Know-why information
- Know-how information
- Know-who information

Information need is a composite concept of different types of requirements and approaches to information. A remarkable analysis of this composite concept was made by Voight. His study revealed that some persons could interact with the information system in different ways depending upon his purpose in relation to his work, general interest, amount of information already available to him and so on.

2.1.3. Approaches of Information:

Voight has identified three different approaches of information. Later on fourth type was added by other scientists in the field.

1) Exhaustive Approach: When a scientist/academician wants to take up a new area of investigation, he/she needs all the relevant literature on that subject. Such an approach is occasional and here dependence on document is very essential.
2) **Current Approach**: Every active worker has to keep abreast of current developments up to a fair degree not only in his specific field of work but also in the broader fields of interest or areas, because the current developments can substantively change the course of his present work. For this he browses through his favourite periodicals and going through abstracting and indexing journals etc. But all these without keeping in view any specific search for information. The very nature of this approach requires constant interaction with the information systems. Here the scientist/academician depends mainly on published literature.

8) **Everyday Approach**: This refers to the frequent need for information in the course of his investigations for specific piece of information such as data on boiling point of a substance, a method, a formula etc. The nature of information sought is very specific and a quick answer is usually expected. This is called everyday approach because of its frequency of approach compared to other approaches. Here dependence on informal means is generally observed.

4) **Catching up (or) Brushing up Approach**: A research worker or scientist may at times need to have a brief but a complete picture of the recent developments of a related field, in which he was not interested or which did not come with in the area of his main interest. As a result of this he is not quite content with the subject. This approach of information also occurs only occasionally.
To satisfy these different types of information needs the scientist depends both on formal channels and also informal channels.

2.1.4. Sources of Information:

There are great many sources of information available to the user. Below given figure illustrates the entire range of information sources. But problem faced by the user today is to know how to select the desired information that is of most relevant to his need. Thus a knowledge of information sources, their scope and limitations, their inherent characteristics and the ease or difficulty of consulting them is most essential.

Traditionally two kinds of sources of information have been identified:

(1) **Documentary Sources**: Primary, Secondary, and Tertiary sources and

(2) **Non-Documentary Sources**: Formal and Informal sources.
Sources of Information

Documentary Sources

Primary Sources
1. Periodicals
2. Research Monographs
3. Research Reports
4. Patents
5. Standards and Specifications
6. Theses/Dissertations
7. Proceedings & Symposium
8. Unpublished Sources

Secondary Sources
1. Periodicals
2. Indexes
3. Bibliographies
4. Indexing Periodicals
5. Abstracting Periodicals
6. Reviews
7. Treatises
8. Monographs & Textbooks
9. Dictionaries & Encyclopedias
10. Handbooks and Manuals
11. Translations
12. Library Catalogues

Tertiary Sources
1. Guides to the Literature
2. Directories & Yearbooks
3. Textbooks
4. Bibliography of Bibliographies

Non-Documentary Sources
Informal Channels
- e.g. Conversation with colleagues, participation in conferences, seminars, symposium etc.

Formal Channels
- e.g. Data centers, Inf. Centers, Learned & Professional societies, consultants, etc.

Fig 2.1: Sources of Information
2.1.4.1. **DOCUMENTARY SOURCES:**

2.1.4.1.1. **Primary Sources:**

This is original material which has not been filtered through interpretation, condensation or evaluation. This material has not been abstracted or indexed. They are the first and often the only published records of original research and development. A research producing new information can make it available to the particular community through the primary sources.

Other forms of primary source material may include new data or new understanding on previously known facts or ideas. These unorganized contributions appear almost exclusively in periodical literature, separate research reports, conference proceedings, standards, patents, dissertations, government bulletins, manufacturers, technical bulletins containing specific information about particular products or some other developments.

Primary sources are unorganized sources which are rather sometimes difficult to locate and use by themselves. The secondary sources help us to use them.

2.1.4.1.2. **Secondary Sources:**

All kinds of secondary publications depend on primary sources which are either compiled from or refer to primary sources of information. These contain information regarding primary or original information. Secondary source is basically a material which has been selected, modified, arranged and
organized according to some definite plan. They deal with the results of the analytical processing of information contained in the primary documents. They not only provide digested information but also serve as bibliographical key to primary sources of information. The primary sources are always followed by secondary sources.

Secondary sources include: periodicals, bibliographies, indexing and abstracting journals, dictionaries and encyclopaedias, handbooks, tables, formularies, reviews of progress, treatises, monographs, and textbooks, etc.

There are some other secondary information sources. The catalogues of libraries, state-of-the-art fall under this category.

2.1.4.1.3. Tertiary sources:

Tertiary sources of information contain information thrice removed from the primary sources. The primary function of tertiary sources of information is to aid the searcher of information in the use of primary and secondary sources of information. Most of these sources do not contain subject knowledge. Due to increase in literature, tertiary sources are becoming increasingly important. Out of various kinds of sources, tertiary sources are the last to appear.

Tertiary sources may include: bibliography of bibliographies, guides to the literature, list of research in progress, guides to libraries and sources of information, guide to organizations etc. Thus the oldest form being the bibliographies of bibliographies and the newest form directories of abstracting journals and on-line data bases.
2.1.4.2. Non-Documentary Sources:

Information is not always obtained from documentary sources. In some circumstances it is more helpful to put the user directly in touch with expert or specialist who can provide an immediate answer than to furnish documents or written summaries of information from which the user must extract what he wants to know. Sometimes it is helpful to refer to the inquirer to a forthcoming meeting, symposium or exhibition from which he is likely to gain knowledge that has a bearing on his problem. For these reasons, the knowledge about the interests and activities of experts working in related fields in various organisations is useful, not forgetting the people with specialised knowledge who are within the organisation served by the library. These non-documentary sources can be categorised into formal and informal.

2.1.4.2.1. Formal Sources:

a) Research establishments in government, industry and private organisations;

b) Learned and professional societies;

c) Universities, colleges or technological institutions;

d) Industrial concerns;

e) Specialised information centers;

f) Data centers

g) Trade associations and export promotion councils;
11) Public undertakings;

i) Consultants;

j) Information centers and referral centers;

k) Internet

2.1.4.2.2. Informal Sources:

a) Conversation with colleagues, visitors, participation in conferences, seminars, symposia etc.

b) International organisations such as WHO, UNISIST, UNIDO, OECD. Corridor meetings at conferences etc.

In searching for information a researcher usually starts with secondary sources and tertiary sources and ends the search with primary sources. With increasing amount of literature being produced, it is becoming almost impossible to use primary sources directly for searching of information. This shows the importance of secondary and tertiary sources.

2.1.5. Sources of Information used by Respondents:

For the present study the following sources of information used by respondents of three universities have been taken into account:-

- Personal collection
- University library/department library
- Other libraries
- Internet
- Information centers/professional research associations etc.

The analysed data pertaining to the above information is shown in the analysis part of this study.

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2.1.6. Services of Information Centers/Professional Research Associations

1) Current Awareness Service (CAS): It's rather difficult to define current awareness except to say that this is a mental + mechanical process according to the need of an individual and keep him/her abreast with the progress within a field. Ranganathan defined CAS as "Documentation periodical... listing the documents appearing during the period covered, and without being selected to suit the requirements of a particular reader or of a specific topic under investigation. This is of the nature of a general appetizer. It endeavours to keep the clientele informed promptly of all the nascent thought created in their fields of work and related fields".  

The other definition of Strauss and other as follows "........ establishment of a system for reviewing publications immediately upon receipt, selecting information pertinent to the programme of organisation served, and recording individual items to be brought to the attention of those persons whose work they are related to. It involves a combination of process including the selection of pertinent information from periodicals, books, pamphlets, patents, reports, in fact, from anything of serious content that is received."  

1.a.) Selective dissemination of Information (SDI) is basically a method of providing on a large scale a personal current awareness information service based on user interest/Project profile.
2) **Abstracting & Indexing Services**: For any kind of information services, abstracting and indexing journals are the basic access tools of libraries. Also these are most frequently used tools by scholars and faculty members, scientists etc. Abstracting services are the extension of indexing services, though basically both perform the same function of locating an item of information from a variety of sources. The purpose of developing and maintaining such services is to fill in the gaps that exist as a result of delayed publication and receipt in the library of the commercial services.

3) **Bibliographical & Documentation Services**: The bibliographical apparatus includes subject bibliographies, documentation list, monthly lists, union catalogues etc. Bibliographical services not only include subject bibliographies but also such services as "new arrivals" type with different names like "select list" or "recent additions", or "select books" etc.

4) **Interlibrary loan services and Resource Sharing**: In view of the speedy proliferation of literature in all branches of knowledge it has become difficult and not necessarily even desirable for any library to be self-sufficient in its document sources. The libraries are therefore, confronted with the question of resources sharing through cooperation and interlibrary loan services. Interlibrary lending is an activity where cooperation, at a high level is necessary because in it one library lends material to an individual through another library.
5) **Reprographic Services:** These services have become a common feature in modern libraries now-a-days. These have also assumed importance in the dissemination of information in resource sharing, and in keeping record for future use and reference. Photocopies of journal articles, chapters in books, reports, and other documentary sources can easily be done with the help of reprographic equipments. The sharing of resources of interlibrary lending have thus been facilitated and may even further strengthened.

6) **Translation services:** Translation services means to translate what is said in a foreign language or to extend in another language, systematically retaining the original sense, a definition which specifies neither written nor oral expression. Translation services are necessary if the relevant literature is in a language not known to the users.

7) **Databases:** An organisation of data files having information or reference material on a particular subject, or subjects. It is typically structured so that headings or keywords can be referenced easily, which permits efficient and simple access to – and retrieval of – records. The individual files are further structural into a hierarchy of records and fields.

In the present context, A database is a collection of related items of information or collections of records in machine readable form that are made available for search using a computer terminal. The records in the databases be normally related to the subject context. Databases are classified into two
groups – source and reference. Reference databases include bibliographic and referred databases which help to identify an article, book etc. or name and address of person or institution respectively e.g., chemical abstracts etc.

8) **On-line search Services:** The tremendous growth of information had resulted in a host of problems in the storage and transfer of information – the most affected being the users and the intermediaries. Developments in Information Technology offered solutions to many of the problems in harnessing information. Creation of On-line Information Systems and Services is a landmark in this path which facilities faster and effective access to information. It opened up a new era in the information transfer process from a very slow and conventional methods of accessing a limited range of information to an instantaneous, electronic access to a near exhaustive world literature.

On line services include supply of specific information, current and retrospective bibliographic information, SDI service, online document ordering and supply service, etc.⁰

2.2. **Information Generation:**

Information, a self-regenerative resource, is a key economic element. It is a socio-economic product. Its organised generation and its use are helpful in promoting socio-economic activities. Planners, policy-makers, R & D personnel, academicians, etc. realize that it is an important resource for their day-to-day activities and further they do realize that decisions are based on reliable, valid and timely information¹¹.

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

2.2.1. Modes of Information Generation:

Information is generated every moment and it is now a universal phenomenon. Human beings gain information through several sources. Sensory experience of every human being results in the awareness of certain information which may ultimately lead to the enhancement or modification of the individuals knowledge with experience of information human effort again will be to create new information. Thus, information generation is an ongoing cycle. An individual or group of individuals through observation, intuition, research, innovation and the like process may generate information.

The below diagram depicts the physical, natural process present in the symbolic space in various forms that are sensed, recognised, accepted/rejected, classified and interpreted for relevance in semantic and pragmatic terms by the human brain. These further, through reasoning and decision making result in more forms recognised as 'information”, after abstraction into experiential and expert knowledge\textsuperscript{12}. 

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2.2.2. Information Generation by the University Teachers:

The spark of a new idea as a base leads to information generation. Generation of information by a university teacher is achieved through (i) Teaching (ii) Research (iii) Publication (iv) Discussions.
Teaching: “However a teacher can never truly teach unless he is still learning himself”. Teaching is not to be viewed as a mechanical process. There is an element of high creativity in teaching. Because, to keep the students abreast of the latest developments through their lectures, they generally read more and more to gather latest information in their subject. At that time some new ideas generate in his mind, which lead to information generation while teaching.

Research: New knowledge is generated by research. Therefore, it is necessary that teachers keep themselves abreast of new developments in their respective fields. The university teachers generate information through supervising research works like M.Phil., Ph.D.s and Post Doctorals undertaking research projects individually or jointly.

Publications: The fervour to publish articles in periodicals and to participate in conferences, seminars, workshops, symposia etc. will also become a factor to create new ideas in faculties mind for generating information. The teacher of the present day, is responsible for the thought contents of the documents irrespective of its form, produces information in the form of books, monographs, research papers, articles, scripts for guest lectures, radio presentations, T.V. programmes etc.
Discussions: Discussions with professional colleagues, friends and peers in the subject fields and also other than subject experts, help a teacher get new ideas and plans for generating information.

2.3. INFORMATION TRANSFER:

The word 'Information transfer' coined by Weisman. He elaborates the services which are denoted by the terms documentation, information science, information storage and retrieval. Further, it also encompasses other aspects comprising dissemination and its media, extension services and reprographic services.

The information transfer implies communication of information among people who need it. The scientific community or creators of information shares it among the people and get it from them as well. The information transfer system is concerned with the unit of knowledge from the point of origination, leading to its dissemination to users after passing through a chain of process that transform it into a usable form\textsuperscript{13}.

Information Transfer can be defined as the process, in which the generated information, encoded in some form of communication medium is transmitted to the use point. Indeed, the value of information lies in its transfer. Unless it is successfully transferred from its generation point through its dissemination to destination, the value of information cannot be realized. Further, the value of information can be realized, if it is actively applied in decision making, research and developments, academic pursuits etc.
Information Transfer can be defined as the process, in which the generated information, encoded in some form of communication medium is transmitted to the use point. Indeed, the value of information lies in its transfer. Unless it is successfully transferred from its generation point through its dissemination to destination, the value of information cannot be realized. Further, the value of information can be realized, if it is actively applied in decision making, research and developments, academic pursuits etc.

The process of transmission of information from generation point to the use point is called 'information transfer'. Simply, it can be represented as in (Fig.1.4).

![Information Transfer Diagram](image)

**Fig. 2.3. Information transfer**

2.3.1. **Basic modes of Information Transfer:**

Study of the growth of information institution indicates three basic modes of information transfer. The modes are:

1. Disciplinary information transfer corresponding to the value of the pure science, academic and basic research. This is called Era-1; discipline - Oriented - Basic Ethics - Knowledge for Knowledge.
Information in this mode is generally disseminated through journals, monographs, seminars and meetings usually associated with academic and research institutions, learned societies, professional bodies etc.

(2) The second mode is Mission-information transfer corresponding to the value system of government-sponsored missions. Information transfer process is characterized by a need for co-ordinating and using knowledge simultaneously from a variety of disciplines. Information is disseminated through primary publications like technical reports, besides journals and traditional publications.

(3) The third mode of information transfer is problem-oriented system. Basic ethic of the mode is to solve societal problem. Information is regarded as an important factor and is utilized for solving societal problems such as economic well-being, environmental protection, agricultural productivity, public health care and disaster prevention or control.

Besides these, some new types of information institutions are emerging with a specific purpose to offer specialized quality service. They are information brokers, consultants and intermediaries who repackage information, collected from a variety of sources with validated and authentic data\textsuperscript{14}.

The information transfer cycle\textsuperscript{15} is diagrammatically shown in Fig.1.5.
Figure 2.4. The Information Transfer cycle
2.3.2. Role of Library/Information Center in Information Transfer

The primary purpose of libraries and information centers is to assist in the transfer of information and development of knowledge. Information transfer is an elaboration of the basic information cycle. First is identification stage. Then there is a need to select the most appropriate information to acquire. After acquisition, the organisation organizes the information in some manner. Upon completion of the organizing action comes the preparation of the information storage, which should mean the information can be easily retrieved. Users often need assistance to describe their needs in a manner that leads to locating and retrieving the desired information (interpretation). Finally users draw upon the desired information to aid them in their activities/ work (utilization), and disseminate the outcome of the work to the internal or external environment, or both. If the transfer process is to function properly, there must be procedures, policies and people in place to carry out the necessary operational steps\[16\].
2.3.3. Communication of Information:

Information is invaluable. It is an essential ingredient in everybody's life. Nothing could be done without information. The necessity and need of information has been increasing largely day by day. Its need is being felt more by the scientists, engineers, technologists, educationists, and etc., in their respective fields. Communication of Information is a new facet in the modern era. The concepts 'communication' and 'information' are interdependent. Without one, the other cannot exist and their relation is concomitant like that of smoke and fire wherein smoke cannot be found without a fire. So also, communication cannot be possible without information. Both go hand in hand to serve the common purpose i.e. 'information service'. 'communication' is a channel through which information passed or sent through.
Meaning and Definition of Communication:

The basic idea of communication is transfer of information.

The term 'communication' has been derived from the Latin verb 'communicare', which means 'to talk together, confer discourse and consult, one with another'. It means the 'sharing of ideas and feelings in a mood of mutuality'.

According to Dewey, "communication is a process of sharing experience till it becomes a common possession. It modifies the disposition of both the parties who partake in it".

*The Oxford Dictionary* defines "communication as the imparting, conveying or exchanging of ideas and knowledge whether by speech, writing or signs".

*Columbia Encyclopaedia* defines it as "the transfer of the thoughts and messages as contrasted with the transportation of goods and persons".

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

Smith, views every communication, act as transmission of information, consisting of discriminative stimuli, from a source to a recipient.

Shannon and Weaver define that the word communication can be used in a broad sense to include all the procedures by which are mind may affect another. This of course, involves not only written and oral speech, but also music, the pictorial arts, the theatre, the ballet, and in fact all human behaviour.
2.3.4. Seven essentials in communication:

Communication is nothing but an attempt to share our information with others. Once human being began recording information it became spreading far and wide and also it gave scope for the generation of more and more information. In this vast, continuous, outburst of information era the communicator should remember that seven C’s in written or spoken communication. They are:

1) Candid
2) Clear
3) Complete
4) Concise
5) Concrete
6) Correct
7) Courteous.

2.3.5. Channels of Communication:

Communication of information takes place through various channels. These channels of communication vary considerably in effectiveness and in range of Audience reached. The channels of communications are normally considered under two main headings 1) Formal Channels and 2) Informal Channels.
2.3.5.1. Formal Channels:

Communication of information embraces all relevant means of communication including non-documentary forms. It is necessary for information professionals to develop much fully than at present for facilitating non-documentary communications. The forms of communication which link information resources to an individual are mentioned below:

(a) Documentary Forms:

i) Personal: e.g. correspondence: external and internal

ii) Published: usually printed: e.g. journals, books, specifications, catalogues, data compilations and graphs etc.

iii) Unpublished or semi published: usually reports, theses, circulars etc.

(b) Visual Forms:

i) Visual aids to written communication e.g. microforms, microfilms etc.

ii) On-line information through computer terminals.

2.3.5.2. Informal Channels:

The large and effective part played by oral communication and personal contacts is within the organised information services. Personal contact at individual or small group levels is most effective, in idea creation and in development concepts. Meetings, conferences and exhibitions are useful for spreading ideas and facilitating contacts, includes (a) Invisible Colleges and (b) Technological Gatekeepers.
(a) Invisible Colleges: Desolla Price has termed such group of elite researchers as "invisible colleges". An invisible college comprises most well known and respected researchers who know one another and communicate often. Visibility is a measure of the extent to which the members of the scientific communication acquainted with scientists work, the forms of which are:

i) Oral Forms:

   - One person to one person. E.g. a talk face-to-face or by phone.

   - One person to several. E.g. a group or committee meeting.

   - One person to many e.g. a speech at meeting

   - Several persons to several. E.g. group discussions.

ii) Audio-Visual Forms:

   - Exhibitions

   - Demonstrations

   - Personal observations (e.g. tour of works, seen by chance)

   - T.V. purposeful, deliberately watched public showing

   - Films-special or public showing

   - Visual aids to oral communication
(b) Technological Gatekeepers: Allen observes that information is typically introduced into Research organisation via a small number of key individuals whom he labeled 'the technological gate-keepers'. These people differ from their fellows in being oriented towards the use of literature and, indeed of information sources in general. Not only do they read much more vividly than their colleagues but also have a considerably large range of acquaintance among technologists outside their own organisation. Thus, they acquire information from variety of sources, extract the relevant material and pass it on in a suitable way to their own colleagues.

Fig. 2.6. Channels of Communication from Generator to Users
2.3.6. Different channels used by university teachers:

According to Hommadi, "The goals of university should be concerned with the research activities leading to the growth of new knowledge and communication of knowledge to enhance its value."

i) Through Teaching: University teachers seek and cultivate up to date information through books, journals, internet etc., and interpret their new ideas in their classroom teaching. Now a days, the combination of research along with teaching introduces a breath of fresh air into the subject being taught.

ii) Through Research: The value of university is evaluated through its research activities. The university teacher takes research projects independently and/or jointly with his colleagues. The financial assistance is given by the UGC, professional organisations, state and central governments and other funding organisations.

In addition to this, university teachers supervise the M.Phil. and Ph.D. research programmes. It's a joint research to the scholar and teacher.

Through the above, i.e. research projects, M.Phil. and Ph.D. programmes, the university teacher generates new information and communicates in the form of research reports and dissertations. Again, this information generates new information. It's a chain system.

Doing research and guiding research scholars are the major contributions of the university teachers to the flow of information.
iii) Through Extension Activities: Extension is now regarded as an important activity of the university educational system. The university teacher should develop rapport with the society. This knowledge should contribute to improving the quality of the common man/society. The universities are implementing extension programmes like literacy programmes, continuing education programmes, population education programmes etc. In the society there exists a gap between have's and have not's. The gap exists in different areas, like material, information, culture, resource utilization etc. In order to meet these challenges the university teachers keep themselves up dated with requisite education and training. Thus, they involve in the social changes, identify the problem areas and provide specific required information for solutions.

These extension activities, the third dimension of the university, keep the university teachers with up-to-date information and skills in their respective subjects which in turn can be utilized for the development of the society.

iv) Through Publications:

> Books and Monographs: The teachers write books independently and also jointly with colleagues in their respective and interested fields. The teachers are also contributing parts of a book or some chapters and some are, also, with their expertise, editing some works.
Articles in Journals: Writing articles and publishing them in journals keep the teachers up to date in current developments in their subjects.

Seminar / Conference Papers: These are the informal way to communicate the information. In conferences and seminars the teachers share their new ideas and new thoughts with peers and other colleagues in their subjects and make discussions to improve their subject knowledge.

The total flow of information that consists (i) information seeking behaviour (ii) information generation and (iii) information dissemination/transfer is diagrammatically presented in the next page:
2.3.7. Constraints for free flow of information:

- **Lack of Time:** The teacher plays multi-roles in his life. They involve simultaneously in teaching, research, research guidance, and family works etc. Due to these activities the teacher may not have time to concentrate more on the process of flow of information.

- **Lack of Information Sources:** Information is an essential raw material for university teachers. It is inevitable to provide the right information to the right user at the right time in the right form. Due to some constraints, like in adequate finance etc, some university libraries are failing in their duty in providing information sources, which have impact on participation of a University teacher in flow of information.

- **Lack of Finance:** The development of higher education is dependent on the availability of financial resources and the method by which they are provided to universities.

  The universities are largely financed by the central and the state governments (about 4%) and the remaining portion is financed from fees, endowments, and philanthropic contributions.

  These funds are insufficient to allocate to all departments to meet their requirements in the university. Hence, the finance is a major constraint to the teachers to seek information, which in turn shows effect on their teaching, research and other activities.
Lack of encouragement from colleagues, parent and professional bodies: There should be co-ordination and co-operation in all activities among the university teachers.

Lack of congenial environment: Either in the department or on the campus, if the environment disturbs the peace of mind of teachers, they cannot do teaching, research and other activities effectively. Appreciation and Support act as tonic for the development of a teacher to contribute more for flow of information.

Encouragement from the parent and professional bodies is inevitable to concentrate more on their work. The below given motivating factors develop the skills and help to up date the subject of the teacher. They are:

- Promotions in appropriate time
- Financial assistance in appropriate conditions
- Administrative support in all academic works in time
- Recognition of the research works through the awards, prizes etc.
- Encouragement to group research works etc.

Encouragement from above circles by universities and professional bodies inspire the teachers to do more research work and it leads to generate more new information.
Lack of information infrastructure: The sustainable infrastructure facilities i.e. department library, computer lab etc. are needed in each and every department. The department environment can direct/drive the teachers and the students to research and subject activities if well facilitated. Healthy atmosphere in the department plays a key role in motivating the teachers work properly and effectively.

Domestic Problems: Problems relating to individual, family, social, health and age have affected the contribution of teachers in the flow of information.

The related data received from the questionnaires, of the above constraints is provided and analysed in the analysis part this study.

2.4. Earlier studies

Some of the significant studies that were conducted are divided into the following four categories.

1. Studies on Information needs and uses.

2. Studies on Information seeking behaviour

3. Studies on Information transfer

4. Studies on Information generation and flow
2.4.1. Studies on Information needs and uses:

Mengel (1960) listed four obstacles to comparability among the information needs and user studies. They are: "diverse and ill-defined populations, diverse units of observations and bases of competition, diverse classification of communication channels and paucity of analysis in depth."

American Psychological Association (APA) (1965) conducted two studies in relation to information needs and use of information systems by persons belonging to social science disciplines. One study was an attempt to learn about the scientists information-gathering behaviour and utilisation of various information media. The study was designed to "show the degree to which information exchange activities are determined by personality and other personal factors such as administrative responsibility and illustrate the manner in which an academic environment encourages and facilitates the interchange of scientific information."

The second study gave the comparative account of two environments in psychology between research scholars working in university and US National Institute of Mental Health, Maryland. A questionnaire was used to obtain background information about position, responsibilities and the length of association with the organisation and the degree of active participation in national and local conferences. The results indicated that different types and amounts of communication characterised the various stages in the progress of research.
Mengel (1966) has suggested three-way classification of empirical studies about information needs and uses. When approached from the point of view of the scientist or technologist, these are studies of scientist communication behaviour, when approached from the point of view of any communication medium, they are use studies when approached from the point of view of the science communication system, they are studies in the flow of information among scientists and technologists.

Mengel (1967) conducted an exploratory study for the US National Science Foundation to find out different types of information needs of scientists and to examine the means and occasions of scientific information exchange among scientists. Further, he also investigated the characteristics of scientists specially, his institution and his outlook and how these influence information gathering habits.

He also conducted similar study by interviewing Biochemists, Zoologists and Chemists of prominent American Universities and investigated their present involvement in professional activities and their opinion on the usefulness of various channels. The study was mainly intended to define problems, categories, and procedures for systematic investigation. The study reveals the importance of interpersonal sources for seeking the scientists up-to-date information. Information obtained through published and unpublished sources; or, accidently also proved to be important to current projects. Apart from major contributions of Mengel's investigation to an understanding of scientists information gathering behavioural aspects, other
researchers have also used some of his areas as the basis for their investigations but they have not provided definitive answers to all of the questions posed.

Rao and Purkayasta (1967) studied the information needs of various clientele. The publications issued by SIB (R & D Organisation, Ministry of Defence) were described. Efforts being made to improve R & D publications by R & D Labs/Establishments and SIB to bring out publication of scientific merit to serve the identified needs of users had been stressed.

Paisley (1968) also commented on user studies and wrote, “the most unpredictable and justified complaint against user studies has been defective methodology ...... authors have expressed concern over the fields failure to adopt the sound methods of its, own best work.”

Most of the information use studies lack underlying theory and sound conceptualization. Paisley (1968) in his review article on information needs and uses in science and technology stated that, “the study of information need/use has matured methodologically (in most projects, most of the time), but we now urgently need theories of information – processing – behaviour that will generate positions concerning channels selection; amount of seeking, effects on productivity of information, quality, quantity, currency and diversity, the role of motivational and personality factors are urgently needed.”
Stevenson (1980) had informal discussions with his academic colleagues. Mainly on:

- To set the scene and consider the information backgrounds of academic community.

Concentrate only on research courses

- Uses of information by university scientists\(^{34}\).

Bottle and Swinburne (1982) compared the information use and transfer between a group of eleven British and a group of fourteen French Scientists working in the same field i.e. the Physiology and Biochemistry from 1958 to 1980. From this study it appears that scientists whose native language is not English use English language literature as much as do native speakers for obtaining information, and increasingly for disseminating their own results. The difference in membership of scientific societies, and attitude to such societies, probably reflects a difference in national tradition and temperament\(^{35}\).

Ibrahim (1997), studied the information needs of the lecturers in faculties of science and technology at the Edo State University, Sity Ekpoma, in relation to the university library collection. He examined the information requirements of the lecturers in faculties of science and technology and determined to what extent the university library satisfied the information needs of the lecturers in faculties of science and technology. He noted that
most of the respondents (83.3%) gather information from libraries than colleagues, from conferences etc. They were conscious of the importance of the library in the dissemination of information. Forty three per cent of them seek information to satisfy their teaching information needs, 36.5% research needs, while 20.6% for preparing manuscripts for publications. But, respondents were not satisfied with library collection.36

Maheswarappa and Havanur (1998) studied about the use of information sources versus personal attributes of Biological Scientists in a university environment. Some of the important findings of the study were reprints, preprints, abstracting and indexing journals, primary periodicals, research reports and subject bibliographies, monographs/textbooks were the most frequently used sources of information. Government publications were rarely used, while standards, patents, private files, trade catalogues, geographical sources, audio-visual sources, guides to subject literature were never used by the majority of Biological Scientists in a university environment and on the basis of statistical tests concluded that the personal attributes of Biological Scientists such as designation, experience and nature of research in a university environment had bearing on the use of information sources. While qualification, sex, age and nature of work had no bearing on the use of information sources. The findings of the study had implications for deciding the sources of information for collection development in university libraries in India.37
2.4.2. Studies on Information Seeking Behaviour:

Allen (1966) found major differences between scientists and engineers in their use of information channels. He noted that both groups tend towards the “principle of least effort” when seeking information. Scientists tend to rely more heavily on written rather than oral sources of information while for technologists the reverse is true.

White, (1975) conducted a survey of academic economists using questionnaire method. The study indicated that their information-gathering behaviour varies as they progress through research projects. The study also mentioned that certain behavioural patterns were associated with each of three research stages. Behaviour was affected directly or indirectly by the type of task performed in the stage, the information sought to complete the task, the ability of the information system to transmit the information, the researchers growth about his research topic, and his expanding ability to perceive for relevant information to the topic or question being studied. Communication behaviour variables considered to determine the patterns were the method and specific channel through which information is received, purposiveness in seeking information, the occupation, institutional affiliation and geographical location of the information source, the researcher’s prior contact with the source; and the recommended information source. These findings were related to the need for providing specialized library services to academic researchers.
Van Styvendael (1977) studied the pattern of users interaction with information sources in science, technology and social sciences at the Antwerp State university Center. The results showed, that the main sources of references to periodical literature were citations at the end of articles in journals and books, the increasing role of the current awareness type of publication in assisting in the selection of relevant articles, and decreased use of conventional abstract journals respectively.

Raja Gopal (1989) conducted a study with questionnaire found that the various types of information needs of medical specialists of the Madras city, the different information services offered by medical research institutions, various types of information systems and services used by medical specialists and the ways and methods adopted by medical specialists for information seeking etc. The major findings of the study were that there were no apparent differences evident in the general usage of the information sources with regard to gender parameter. Medical specialists with varying service-lengths were equally alert in seeking information through formal as well as informal sources. Seniors in the medical profession (irrespective of gender) were less enthusiastic to information gathering as compared to junior specialists. The years of professional experience of medical specialists had no role with regard to nature or tendencies toward book collections, as a channel to improve information bank. Variations in conferences (or workshops or seminars) attendances were not explainable by reasons of belonging to different specialisation.
Jagga Rao and Kanakachary (1992) explore the information seeking behaviour of the humanities scholars in the form of a literature survey. Most of the literature referred to belonged to the studies conducted outside India. They found that the information seeking behaviour of the humanities scholars was different. The literature search and scanning was wider and vast in the field of humanities. The search strategy of the humanities scholars was quite different from the field of social sciences and sciences. The humanists were document centred and library oriented. The obsolescence of the value of the books was very less in this field. The usefulness of original documents was more in case of humanities research. The humanities research requires more books and more library services and facilities. Interviews and personal discussions with the living original authors or contemporaries scholars may be genealogical. The humanities research did not across the geographical boundaries.

Sasikala (1994) conducted a study to know the information seeking behaviour of managers working in 20 industrial organizations of Andhra Pradesh using a questionnaire. Some differences were found in their information seeking behaviour among the senior, middle and junior managers. The frequency of visits to the library decreased with the increase in the status of managers. The variations did exist among three levels managers regarding their purpose of visited to the library. Junior managers visited library most frequently then the other two levels for reading and borrowing. The middle managers were visited mainly for reference sources.
and senior managers needed specific piece of information. A highest percentage (80%) of managers at all the three levels made effort to seek information from other sources before visiting the library. The purpose of seeking information was same among the three levels of managers, viz. acquiring latest knowledge in their subject field. The senior and middle managers used information for solve related problems was more than the junior managers.

Kenungo (1997) made an attempt to investigate the methods of seeking information by the women researchers in the disciplines of History and political Science in the University of Delhi and Jawaharlal Nehru University. The study attempted to make a comparative analysis of the methods adopted by the researcher in finding, accessing and acquiring information. Being empirical in nature, the study had been conducted in the form of a “user survey” using questionnaire and interview methods. The findings of the study were:

- The main purpose of seeking information by women researchers was for writing either M.Phil or a Ph.D. thesis.
- Almost 90% of respondents undertook field-trips for acquiring information.
- Respondents indicate the necessity of foreign-trips for non-availability of materials in the country, which were indispensable for research. And also expressed that major problem to make foreign-trips for their research purpose was due to lack of financial assistance.
- Majority of the respondents expressed that conferences, seminars, lectures were also an important source for gathering information.

- Respondents disclosed that they were able to keep up with the advances in the concerned fields through journals followed by discussions with co-researchers, consulting review articles, publishers catalogue, browsing bookshops etc.\(^4\).

Prasad and Manorama (1998) studied the similarities and differences in the information seeking behaviour of Physical Scientists and Social Scientists in Banaras Hindu University, Varanasi. Findings of the study were the Physical Scientists and Social Scientists did more teaching than research work. The Physical and Social Scientists used both formal and informal channels of information. The primary journals were used by both groups of scientists. For Social Scientists books and monographs had a lot of significance. The Physical Scientists touched with latest developments through current issues of periodicals, abstracting and indexing periodicals whereas Social Scientists took part in conferences and seminars to keep themselves up to date. Majority of the respondents were not satisfied with the information sources and services offered by the libraries which they attended. The findings provide significant insight into the similarities and differences in the information seeking behaviour of the Physical Scientists and Social Scientists in India.\(^4\)
Shivalli (2000) concentrated on the role of LIS in the promotion of women teachers reading habits. She found that 60% of respondents visited public libraries and 45.7% of them visited Academic Libraries in Goa. The reasons for visiting libraries as revealed by respondents were quite interesting. Fifty seven per cent had indicated that the good services had attracted them to visit the libraries. More than 45% of respondents had stated that better facilities were available in libraries. And also mentioned education was possible through libraries, which had been confirmed by 42.8% of the respondents. Most of the respondents stated that books were the major sources of information made available in the library. And also revealed that 68.5% of the respondents got affected in their reading habits by the non-availability of the reading materials. The suggestions were made for developing the healthy reading habits among the women teachers.46

Usha Devi (2001) examined the information needs and information seeking behaviour of physical education teachers in India. Results revealed that many of these teachers perceived the need to know the latest development in their own field of specialization and also the latest changes in rules and regulations of games. The library had been identified as the most heavily used information source along with other sources like Radio, T.V. etc., however library did not fulfill its role in meeting the information needs of physical education teachers. Recommendations were made on the basis of the findings47.
2.4.3. Studies on Information Transfer:

Ranganathan (1960) analysed the scientific output of India on the basis of language and subject. He brought out the distribution of publications in the various sciences, applied as well as fundamental. Presented the results of librametric study. Recommended the use of modern library techniques designed in India to overcome the obvious difficulties. He urged the library professionals to undertake librametric studies to bring out the subject-year and language-year correlation.

Raghavendra and Karnath (1966) in their article entitled “Dissemination of current scientific and Technical information in the AEET” described the method of effective dissemination of the information contained in the report literature to the scientists by the publication of a current awareness list. They emphasized the need for a systematic approach through job analysis to exercise proper control over workflow procedure. In order to render efficient documentation service and proper co-ordination, the importance of scientific approach was pointed out. At last it was remarked that practices also economise the cost fact or involved in the documentation work and ensure the best use of available resources.

Rogers and Shoemaker (1971) had synthesized the findings of approximately, 1200 empirical reports from 18 or more disciplines on the diffusion and adoption of innovations. Any examination of this body of research would reveal a close relationship to research originating in the field of mass communications, information science and library science - on the general flow of information whether about new ideas or not.
Nelamoghan (1973), in his paper “Technology Transfer: A System Analysis Approach to the study of its features” enumerated the objectives, components, organization, constraints, environment, adoption, and development features of technology transfer system and discussed with illustrative examples from published papers. Three models – Clark and Guba, Castasia, and Everett Rogers – of the technology diffusion process were presented. The factors influencing the diffusion of technology from one country to another, from one enterprise to another in one and the same country, and from one person to another person to another within a group or an institution were mentioned. The psychological, educational, historical, political, economical, sociological, technological know-how and the differences in their scientific and technological development and information richness were important factors to be taken into account in designing a technology transfer system. The recommendations of Castasia regarding technology transfer and national policy on science and technology in Asian countries in the perspective of the over all national development of these countries was quoted.

The wide range of topics discussed in the area of scientific transfer, the book “Scientific Information Transfer: The Editor’s Role”, appeals not only to editors, publishers and librarians, but also to the informed public and to research scientists as authors and users who are involved in the communication of new knowledge on scientific and technical developments and ideas.
Sudhakara Rao and Subramaniyam (1980) presented the results of a survey carried out with a sample of 51 small scale industrial units situated in and around the twin cities of Hyderabad and Secunderabad for identifying (i) role of information and information activities in small scale industries (ii) role of various agencies in the industrial information transfer (iii) specific information services of products which they require for creating an awareness among them about the information activities of the country and also for eliciting their suggestions.

Anil Kumar (1980) presented the results of a study based on the coverage in the Volumes 76 (1973) and 78 (1975) of Physics Abstracts with regard to scattering of the contributions of the Indian Physicists in foreign periodicals. The tables depicted the country-wise dispersion of foreign periodicals reporting the Indian contributions; and the rank order of such periodicals. His study revealed that there had been growing tendency on the part of Indian Physicists to publish their contributions in foreign periodicals.

Bhavani (1982) in her article “Publication of Activities of Indian Scientists: A Survey” reported the findings of a survey conducted among the Indian Scientists in relation to their publishing activities, and publications trends of Indian journals. The parameters considered were: Number of papers published in Indian and Foreign periodicals, number of papers pending for publication in the last 3 years, number of rejected/ withdrawn, time being etc. and also presented the findings regarding the preference of journals by the scientists for publishing their research papers.
Basak and Bihari Das (1983) prepared a rank list of periodicals on the basis of the contributions of Indian Mathematicians that was prepared from the issues of Mathematical Reviews Volumes 57 and 58, 1977. The study revealed the publishing trend of the Indian Mathematicians in different countries journals; and it also provided some guidelines of journal selection policy. The data of Mathematical Reviews 1977 had been compared with those of Mathematical Reviews 1965 to show the changing trend of Indian Mathematicians to publish their contributions in foreign periodicals. How to determine the cut-off point in the rank list from the acquisition points of view had been discussed.

Prasher (1987) in his article "Information and its Communication" explained the terms information, communication, channels of communication and described the role of different promoting communication of information and barriers of communication. And pointed out that for establishing efficient information communication system, it was important to understand user. He explained that term information and differentiated it from data and also defined the term communication and discussed its implications. He dealt with various theories of information- Mathematical, semantic and behavioural - and brought out how information scientist was concerned with these. He discussed information as an indispensable resource and dealt with the components of information communication system and the channels of communication. He described the role of
agencies promoting communication of information – Author, Libraries, Universities, Government, Learned societies, Industrial houses, Book Trade, Manufacturers, Mass Media and explained the barriers in the communication of information. He stressed that better presentation helps communication.  

Sharda and Devaki (1990) analysed the articles abstracted in Linguistics and Language Behaviour Abstracts (LLBA) Vol.11 to 21, 1977-87 to identify the authorship pattern, topics covered in linguistics and related fields, geographical distribution of authors, chronological distribution, most preferred periodicals of linguists etc. They brought to light the research output of the linguists of Indian origin through articles published in journals at the international level during the 10 year period, highlighting both the area of interest and the neglected areas in linguistics requiring study and development. Additionally, underlines the academic interest of the linguists and the journals most preferred by them for the benefit of the information scientist to enable them to fulfill the information needs of the concerned academic circles.

Subramanian (1990), studied the field of Indian Scientific Research, that is a period of transformation shifting the subject oriented research to mission oriented research and to cater to the information needs of specialists in science and technology. There had been steep development in the organisation of mission oriented National Information centers since 1970’s under NISSAT programme. He also highlighted the concept of
Crystallography and the information needs of scientists. This paper also
gave details about National Information Centre for Crystallography (NICRY)
services, publications and NICRY database. He concludes by giving
suggestions on the basis of National workshop reports of NICRY, for future
development activities.

Bhatt, Sushma Gupta and Srivastava (1998) highlighted the key role
being played by several information agencies for the dissemination of
information and knowledge in their article “Dissemination of Knowledge and
information in the post Industrial society: Contributions of various
agencies”. The study revealed that their role became more vital and
important especially when they function in a democratic society where self
awareness towards human rights was pre-requisite to strengthen the society
in the over all perspective. This article attempts to highlight the key role
being played by several information agencies for the dissemination of
information and knowledge. They mentioned about agencies for
dissemination of information and knowledge like authors, book-trade,
government, semi-government agencies, trade and industry, university, mass
communication includes press, broadcasting (radio and T.V.), libraries,
information and documentation centres. Their role become more vital and
important especially when they function in a democratic society where self
awareness towards human rights was pre-requisite to strengthen the society
in the over all perspective.
Humayoon Kabir (2000) analysed the sample data from the issues of CAB abstracts in respect of Indian Scientist's contributions published in foreign periodicals. He identified the core foreign periodicals in agriculture having Indian contribution and the foreign countries publishing the contributions. The data reveals that Indian Agricultural Scientists had contributed considerable number of articles in foreign journals and their number was increasing. Since, publication in a foreign journal would mean a wider reach, and more visible, more Indian Agricultural Scientists preferred to publish in foreign journals. The analysis of the study shows that International Rice Research News Letter (Philippines) publishes the maximum number of contributions. Another conclusion was that most of the Indian Agricultural Scientists prefer to publish their articles in the journals, which were being published from U.S.A.61.

4.4.4. Studies on Information Generation and flow:

Paisley (1966) reviewed the research literature on the flow of the behavioural science information but concluded that there was no such literature to review except American Psychological Association (APA) studies. He reviewed 33 significant studies completed between 1948-65 on the flow of science information. He stated that information-gathering and disseminating behaviour of the scientists did not seem to be affected greatly by their specific fields of research, whereas other factors in their research environments and in their professional backgrounds do seem to be crucial. It can be inferred that information flows to and from behavioural scientists much the same way that it flows to and from physical scientists.
The study of information needs and the use of information systems or channels of communication by groups and individuals had been a segment of communication research efforts in several disciplines. The diffusion and adoption of innovations, defined as the disposal and acceptance of ideas perceived to be new among the members of a social system over a time, had been the subject for investigation by researchers in such disciplines as rural sociology, medicine, anthropology, education, mass communication and psychology.

The International Communication Agency of the United States (1979) visualised new revolution taking place in library technology and decided to organise a seminar on the "Role of the Library in communication process and Information flow in India" and made Indian libraries and Information specialists aware of that new revolution taking place in traditional library service and also provided a forum for them to discuss its problems and impact on the library services in the country. The International Communication Agency made it possible for the American Center Library, New Delhi and the Department of Library Science, Banaras Hindu University to co-sponsor such a seminar in Varanasi from 26-28 September, 1979.

Gopinath (1981) discussed in his article "Data generation in Science and Technology" the process of generation of data in science and technology. He identified (i) the cause for data generation; (ii) the types of data generated, (iii) the procedures of data generation. He discussed in detail the
procedures for generation of experimental data. He also identified the role of critical variable in data generation and correlation. The data generation was projected as an endless cycle.

Durvasababu (1994), conducted a study on the information needs, information generation, factors influenced information generation among university teachers in Sri Venkateswara University, Tirupati. He found out that in information generation, Professors are more consistent than readers and lecturers and data on cadre – wise generation of information of a person was not forth coming. Further, he found that the service group of 11-20 years had a lot of bearing for better information generation.

It is evident from the above review of literature that only a few studies have been carried out on information needs, seeking behaviour, generation and transfer separately. Hence, the present work is aimed to study the total information flow among the three University teachers (Sri Venkateswara University, Andhra University and Osmania University). Attempts have been made to know the carrier advancement programmes, Information seeking behaviour methods, Information generation and transfer methods of University teachers. Finally to make recommendations to improve the flow of information among university teachers.
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