

A Review of Research on Information Seeking Behaviour of Agricultural Scientists: International Perspectives

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Abstract

Information seeking behaviour is an essential component in the designing and developing of need based information centres for meeting the information requirements of users. The undertaken study is an output of doctorate research in which a comprehensive review research scanned in international context in the field of agricultural sciences. The study covers various facets related to information seeking behaviour, findings and their conceptual meanings. It includes about sixty five researches undertaken by foreign researchers in the agriculture sector. The findings of the studies are organised into various categories i.e., theories of information seeking; information needs; users characteristics; information browsing; information seeking; and information seeking behaviour.

1. INTRODUCTION

Literature search plays a very important role in research activities, as it forms the very first step of research pursuit. A through review of related literature is very essential in conducting a new research. The main functions of review of literature are to determine that work both theoretical and empirical, which has been done before, should assist in delineation of problem of area. It provides a basis for conceptual framework, insights into methods and procedures, suggests operational definitions of major concepts and also provides a basis for interpretations of findings. The study of related literature implies locating, reading, and evaluating reports of research as well as reports of casual observation and opinion that are related to the planned research project. In any worthwhile study, the researcher must have an adequate knowledge with in the work that has already been done or going on in the area of his/her proposed research. The

literature search must be conducted in a systematic way to achieve optimum results. Otherwise the search may lead to the wastage of labour and time and poor retrieval of relevant information.

According to Best and Kahn,¹ "Since effective research is based upon past knowledge, review of related literature helps to eliminate the duplication of what has been done and provide useful hypothesis and helpful suggestions for significant investigation. It is valuable guide to defining problem, recognising the significance, suggesting and premising data gather devices, appropriate study of design and source of data. This also helps to sharpen the understanding the existing knowledge in the problem and provide background for research project. Hence review of related literature forms an inevitable part of any research study" Further, the remark made by Van Dale² in this context is worth noting. "The review of educational research gives you an excellent

overview of the work that has been done in the field and helps to keep up with recent developments. It helps to move further in the right direction”.

The first basic user study in the broader sense was undertaken by Menzel³ and defined information seeking behaviour from three angles:

- (i) When approached from the point of view of the scientist or technologists, these are studies of scientists’ communication behaviour; and
- (ii) When approached from the point of view of any communication medium, they are use studies; and
- (iii) When approached from the science communication system, they are studies in the flow of information among scientists and technologists.

Hence, the terminology depends much on the approach and the angle from which one sees.

It may be noted that in the area of information seeking behaviour the psychologists, the sociologists and the behavioural scientists have made significant contributions to the area of research in addition to library and information science professionals. Further, there are very wide variations in the scope of user-studies. These studies touch upon many peripheral areas of library and information science research such as bibliometric studies, citation studies, content analysis, and user studies. It is very difficult to make an accurate estimate of total studies world over in the agriculture sector. However, this chapter contains a review of relevant literature, which attempts to identify, discover and synthesize material concerning to the various aspect of information seeking behaviour studies. Information seeking behaviour is an area of active interest among library/information professionals worldwide.

The study of information seeking behaviour can be dated back to the late 1940s. Since that time a large number of studies have been carried out particularly in the developed countries on the various aspects of information seeking behaviour, in

the field of social sciences, humanities and science and technology. A number of reviews and bibliographies cover various aspects of information seeking behaviour conducted prior to 1972. The significant works are those by Menzel⁴, Davis & Bailey⁵, Barnes⁶, Paisley⁷, Coove⁸, Elman⁹. However, not many studies have attempted to investigate specifically and precisely the information seeking behaviour of agricultural scientists comprehensively. The different aspects of this information seeking behaviour have been barely touched, not much has been done so far in the case of India. In order to serve agriculture scientists better and designing and developing the need based information systems and its surrogates. Therefore it is an urgent need to focus on the information seeking behaviour of the agriculture scientists covering all facets of their information seeking behaviour. For the purpose of a clear understanding the various concepts related to information seeking behaviour of agriculture scientists and life scientists in general. The review literature findings have been organized following categories:

1. Theories of information seeking behaviour;
2. Information needs;
3. Users characteristics;
4. Information browsing;
5. Information seeking; and
6. Information seeking behaviour.

1.1 Theories of Information Seeking Behaviour

The concept of information needs has been coined by an American information scientist Robert Taylor¹⁰ in 1962 and is beautifully discussed in his work entitled ‘The process of asking questions’ published in the Journal of American Society of Information Science (JASIS) now know as Journal of American Society of Information Science and Technology (JASIST).

Menzel¹¹ interprets the results of several recent studies of the total information seeking activity of scientists and technologists in terms of complementary relationship between

an extremely flexible and many-sided interpersonal communication system, on the one hand, and a formal communication system, on the other hand. The formal system is able to compete with the informal system with respect to only a few of the many information needs of the individual. Among the information needs identified are: 'promptness of acquisition of certain information, selective dissemination of communications, screening and evaluation of communications, indication of implications, retention of unscholarly but subtly important details in digest, and rapid feedback'. Newly initiated and proposed activities such as information analysis centres and selective dissemination of information are seen as moves to formalize and improve upon functions long served by information communications.

Using the reasoning from cybernetic theory, Deutsch¹² explained the historical development of science, and goes to the predict that cultural movement toward symbiosis of the laboratory and computer augmented library becoming increasingly rich in quantitative data commencing on this paper. Mesarovic¹³ accepts the general desirability of cybernetic models, but asserts that they are not at present sufficiently complex and precise to given great credence as predictive tools.

Sutcliffe and Ennis¹⁴ made a study towards a cognitive theory of information retrieval. They have proved that the cognitive model of information seeking illustrates the information seeking activity as beginning when the information seeker encounters an external task information problem.

1.2 Information Needs

The information need (or need for information is a factual situation in which, there exists an inseparable interconnection with 'information' and 'need'. the information originates and is generated because there exists a need or an interest. The content of information is of primary concern. The basic objectives of studying information needs and use may be:

- (i) the explanation of observed phenomena of information use or expressed need;
- (ii) the prediction of instances of information use and
- (iii) the control, and thereby improvement of the utilization of information manipulation of essentials conditions.¹⁵

Rubinstein and Schultz¹⁶ studied the information needs of biomedical researchers by observing patterns of repeated use of the BIOSIS information from a remote data terminal located at the Walter Reed Army Institute of Research (WRAIR), USA. Entries to the system from WRAIR were studies over a three period (1967). Reuse by WRAIR personnel exceeded predictions based on statistical extrapolation of early use rates, indicating growing acceptance of the BIOSIS service. From statistics of intervals between uses of the service by the user, it was possible to calculate a "normal task interval" of 2-4 months between requirements for search of broad segments of the formal literature.

Paisley¹⁷ has investigated and suggested a concentric conceptual framework for user research, which is a widely accepted framework. In the concentric conceptual framework he places the information users at the centre of ten systems, namely, cultural system, political system, membership groups (the professional organization or society of which the user is a member), reference group, invisible college, formal organization (in which the user works, etc), working team, one's head/ mind, legal and economic system and a formal information system each forming concentric cycles around the user. Markee¹⁸ while conducted a study on 'where is the library researcher' he emphasized the need of user research in the parent organization and stated that a 'review of library literature revealed that the amount of library research being done by librarian at his institution is not his professional responsibilities. He further suggested that library research should begin and continue right in the parent institution, as this bottom-upward approach can only provide a solid foundation for national information systems of developed and

developing countries'. Atkin¹⁹ has beautifully defined the term "information need" that '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 that he seeks to achieve'.

In a study conducted by Atherton²⁰ findings indicated that accurate and up-to-date knowledge about users and their information behaviour is one of the essential ingredients for designing an information system. Belkin and Wilson²¹⁻²² have also advocated the importance of information needs and utility. They stated that it becomes increasingly important that the success of information centres is more likely to be achieved through adjusting the services to meet the specific needs of an individual rather than trying to adapt the individual user to match the wholesale output of an information system. For McGarry²³ need is the basic concept of information studies but it is difficult to define it precisely and accurately. However, it implies lack of something which if given would enhanced our welfare or make easier the attainment of whatever objectives we may have in mind. The concept needs can be known through the various terms such as want (a state or fact of being without or having an insufficient, absence or deficiency of necessities), desire (an unsatisfied longing or craving), demand (to require, asking for what is due or asking for something), and requirement (a need, a thing needed, necessary condition).

Leuplot²⁴ pointed out that the information requirements are more or less adequate reflection of the information need and the need to satisfy it. Information needs and information requirements are mutually interdependent and the requirement is the reflection of the objectively existing information need. Further the relation between information need and information requirement is to be seen in the light of the fact for satisfying the information needs. It is necessary to meet the information requirements corresponding to that information need. Yates²⁵ has divided the

information needs into four basic segments. Empirical knowledge encompassing field such as science and technology, which is ultimately necessary for human survival. Personal human experience is the quest for personal identity that is the most basic pursuit of the enquiring individual, to satisfy this need, use can made of the other people's experience through literature. Corporate human experience that has several dimensions it can be extended in space in such disciplines as sociology and geography or extended in time as in history, and Diversion the search from an escape from the monotony, physical and mental exhaustion, frustration, confusion, conflict, failure and disappointment of the working. Further he also suggested that the individual's information requirement may change as a result of sociological and economic factors and amongst the many predictions made about the remainder of this century there are recurring themes of this nature.

Sam²⁶ conducted a study to know the satisfaction of information needs of the agricultural policy makers and managers in Ghana, and the adequacy of library collection available to them. He evaluated the results of the study in relation to characteristics of the respondents. It was revealed from the study that in terms of the quality, quantity, and availability the lending, periodicals and reference collections of the respondents were fairly adequate. A study conducted by Anwar and Eisenchitz²⁷ on the information needs and information seeking behaviour of Malaysian agricultural scientists have revealed that research scientists spend 16% of their office time on reading the literature. The literature searching as compared with 9.3% spent by academicians, it also revealed that scientists preferred using primary sources of information particularly journals, and research reviews reports. Dulle²⁸ conducted a survey to assess the information needs and requirements of the agricultural research workers in Tanzania. The finding of the study indicates that resources in the libraries and information centres are inadequate and does not meet the needs of agricultural workers. The study further

suggested that the agricultural information services rendered by the libraries and information centres should be improvised up to the level the scientists need.

1.3 Users Characteristics

In order to maximize the impact of library services and maximum use of library resources it is essential to LIS Professionals that they should know about their users properly so that they can deliver content based information services. The user characteristics are an important component of the communication systems in any information system are for their use. The user characteristics are innumerable and could be clustered in different groups in various ways.

Among the pioneering information workers, Rosenbloom and Wolek²⁹ pointed out the users characteristics factors such as experience, seniority, educational level, professional activity and orientation, are all potentially related to information seeking behaviour. Line³⁰ argues that users can be considered as individuals or as groups or communities. According to him, the individual characteristics, which are associated with information use and needs, include the following: age, experience in research or job, background, seniority, etc. The psychological dimensions of individual characteristics include: persistence, thoroughness, orderliness, motivation, independence, breadth approach and information threshold. Slater and Fisher³¹ mentions three clusters of factors which are: (i) psychological factors; (ii) effectiveness of available services; and (iii) characteristics of user and his environment. Whereas Vickery³² suggests that institutional environment and work activity have major impact of information seeking behaviour. Ellis and Haugan³³ have reported on the information seeking patterns of engineers and industrial research scientists. Their description is embedded within a detailed account of different project types and project phases in their findings, they identify eight major information seeking activities or characteristics that are: surveying, chaining, monitoring, browsing, distinguishing, filtering, extracting and revelling.

1.4 Information Browsing

Marchionini³⁴ conducted research on browsing and observed that there seems to be agreement on three general types of browsing that may be differentiated by the object of search (the information needed) and by the systematicity of tactics used. Direct browsing- occurs when browsing is systematic, focussed and directly by a specific object or target examples, include scanning a list of known items and verifying information such as dates or other attributes; Semi directed browsing- occurs when browsing is predicted or generally purposeful in this browsing approach, the target is less definite and browsing is less systematic, an example is entering in a single general term into a database and casually examining the retrieved records; and Undirected browsing- occurs when there is no real goal and very little focus, examples include flipping through a magazine and channel surfing.

Wilson³⁵ in a study of the information seeking behaviour in multidisciplinary subjects been identified four basic categories of information seeking and acquisition i.e., Passive attention such as listening to the radio or watching television programmes, where there may be no information seeking intended, but where information acquisition may take place nevertheless; Passive search which seems like a contradiction in terms, but signifies those occasions when one type of search (or other behaviour) results in the acquisition of information that happen to be relevant to the individual; Active search which is the type of research most commonly thought of in the information science literature, where an individual actively seek information; and Ongoing search where active searching has already established the basic framework of ideas, beliefs, values or whatsoever, but where occasional counting search is carried out to update or expand one's framework.

1.5 Information Seeking

Information seeking is a human process that requires adaptive and reflective control over the afferent and efferent actions of the

information seeker. Information seeking is a dynamic and changeable process despite its formal problem solving attributes. It depends on the situation, but also large extent on the individual performing it. Information seeking greatly influence of personality (personality is a pattern of characteristics thoughts, feelings, and behaviour that distinguishes one person from other) In the study of information seeking behaviour, the discovery of people's strategies, expectations, attitudes, and anxieties promotes the relationships as they live and work with other information users. Information seekers should begin with finding out what is stopping progress, creating an information gap/vacuum. An important aspect of sense making as a process in the struggle of people to understand a problem that drives them to seek meaning for in many situations and many circumstances they are content to take no such action.

Kuhlthau³⁶ focussed on information search process, which emphasizes feelings, thoughts, and understanding of a situation that they need to resolve task, problem, or topic. This particular action led to the action of people as they seek the meaning of useful research in providing a frame work for improving information search. Kuhlthau³⁷ & Chatman³⁸ are concerned with the ways the worlds information seeking" term has been used by the people in their research work. Such researchers present conceptions of process, learning and social relations that reflect the focus and interest of their research work. Kuhlthau³⁹. In understanding the pattern of people information behaviours, the variety, uncertainty and complexity of the information needed by the seekers must be known

According to Marchionini, Gary⁴⁰ 'information seeking as a process in which humans engage to purposefully change their state of knowledge. The process is inherently interactive as information seekers direct attention on adapt to stimuli, reflect on progress, and evaluate the efficacy of knowledge base of the information seeker. Information seeking is thus a cybernetic process in which knowledge state is changed

through inputs, purposive outputs, and feedback

Oladele⁴¹ (<http://jsai.or.jp/afita/afita-conf/2002/part1/p137.pdf>) conducted a study on 'information seeking and utilization among agricultural researchers in Nigeria'. The study demonstrates the level of awareness and the use of agricultural information sources among researchers in Nigeria. The empirical findings have described the researchers' scenario as that of being informational deprived, when researchers do not have enough information to take a wise decision as against the researchers' being as informational over loaded, which implies a situation where researchers have too much information and are unable to pick out the right bits. The policy implication of the findings have such that to improve the performance of agricultural researchers, the provision of information sources as well as the facilities to enhance their use is very important in the research institutes. Specific training needs of the researchers to seek for appropriate information from different sources should also be identified as a skill-gap

1. 6 Information Seeking Behaviour

Information seeking is a human process that requires adaptive and reflective control over the afferent and efferent actions of the information seeker. Information seeking behaviour (ISB) resulted from the recognition of some needs, perceived by the user, who as a consequence makes demand upon on formal system such as libraries and information centres, or some other person in order to satisfied the perceived information need. The information seeking behaviour essentially refers to locate discrete knowledge elements. It is concerned with the interactive utilization of the three basic resources namely, people, information and system. Further in order, to satisfy the information needs, the user actively undergoes the information seeking process. The attempt of the user in obtaining the needed information results from the recognition of some needs, perceived by the user.

The most significant studies on the information seeking behaviour of the scientists have been undertaken by Columbia University, Bureau of Applied Social Research⁴² on scientists Bowden and Wood⁴³⁻⁴⁴ on Physician, and Chen⁴⁵ on engineers.

Blaxter⁴⁶ in his work 'the individual and information problem' published in the Nature reported that the modern scientist derived half of their awareness of current issues of the journals from scanning of review abstract publications and the remaining quarter from scanning paper titles such as Current Contents.

Packer⁴⁷ in a research study investigated the methods used by chemists and chemical engineers in Canadian universities to study current awareness. He found that 60% of the subjects experts used the formal methods of communication.

Krikelas⁴⁸ conducted a study on information seeking behaviour, patterns and concepts. He investigated that individual information seekers has its own personal hierarchy of the types of information sources they prefer. A joint research has been conducted by

Lacy and Busch⁴⁹ in order to determine the informal scientific communication among the public sector agricultural researchers with the objective that the formal and informal channels constitute the two mutually dependent elements of the communication, importance of the informal channels is often ignored. They have found that informal scientific communication regarding research was infrequent and primarily limited to contact the scientists in one's own department, scientist's communication with scientists outside their department, clients, and extension staff was limited to less than once a month.

Olsen⁵⁰ investigated the information gathering habits of agricultural scientists at Cornell University, USA. The study revealed that personal contact and individual own private files were found significant in keeping informed to users of current research and

literature. It is also reported that 35% of the faculty spent 10% and 32% spent 5% of their research time in the library.

Vickery & Vickery⁵¹ have reported that for gathering the needed information, the information seeker go through a wide selection of well-understood tools and strategies to gather the needed information.

Ellis's⁵² in his proposed 'Changing behaviour model of information retrieval system design' describes the process of following citation connection between information sources that information seekers to building and maintaining an awareness of available information sources. He found that the information seeker in building and monitoring the awareness of developments, as well as gaining an overview of a new area the both formal and informal methods.

Marchionini & Dwiggins⁵³ have conducted a study on ongoing investigation of information seeking behaviour of end users in electronic environments, a comparison was made of those users having expertise in a topic area and those with expertise in on-line searching. It was found that computer scientists and on-line search specialists conducted assigned searches in a HyperCard database on the topic of hypertext. Both groups of experts were able to conduct successful searches and out performed a novice control group. Marchionini and Dwiggins further indicated that the search specialists took slightly less time than the domain experts, modified queries by adding terms found in the text, and tended to focus on query formulation whereas the domain experts focussed on the text and used their domain knowledge for further question answering.

The findings of the study as conducted by Kuhlthau⁵⁴ pointed out that the whole information seeking process consists of six stages:

1. Initiation- when a person becomes aware of lack of knowledge or understanding;
2. Selection- at this stage the task is to identify and select the general area to be

- investigated or the approach to be pursued;
3. Exploration- the task is to investigate information on the problem in order to extend personal understanding;
 4. Formulation- this is the turning of the whole process, when feelings of uncertainty diminish and confidence begins to increase the task is to be form a focus from the information encountered in exploration;
 5. Collection- the task is to gather information pertinent to the focussed problem; and
 6. Presentation- the task is to complete the research and resolve the problem.

Oladokun⁵⁵ conducted a survey to assess the information needs and seeking behaviour of women agricultural scientist and teachers in agriculture in Oyo State of Nigeria. The study revealed that information needs of the women working in agriculture sector are satisfied through the informal channels of information rather than formal channel of information. The study also recommended improvising the existing information service rendered by the library of the Oyo State of Nigeria for women working in the agriculture sector.

Ellis⁵⁶, Eliss, et al⁵⁷, and Eliss and Haugan⁵⁸ have been proposed and elaborated a general model of information seeking behaviour based on the studies of the information seeking patterns of social scientists, research physicists and chemists, and engineers and research scientists in an industrial firm. The basic model as proposed by these researchers on the basis of this study have been identified six categories of information seeking activities i.e., starting, chaining, browsing, differentiating, monitoring and extracting.

Erdelez⁵⁹ has conducted a survey study entitled 'Information encountering: A conceptual framework for accidental information discovery' to determine the information seeking behaviour of personnel on different context. He reported that accidental information discovery has generally been seen in two distinct models,

that is browsing behaviour and environmental scanning. Browsing generally describes that 'don't know what-I-want-behaviour'. It can be seen as a semi-directed or semi-structured form of information seeking where the information seekers scan a collection of information sources, having no particular information seeking goal in their mind. The second model of accidental information discovery is environmental scanning. Environmental scanning can be seen as a type of information acquisition that involves various information activities needed to keep abreast of new information, changes or developments in specific domain of knowledge. Erdelez also pointed out, that accidental information discovery is important to information seeking because it represents a major way for information seekers to find information within complex environments, and it also represents a major way of information seekers to maintain a awareness of potentially useful information sources. Study by

Sbeba⁶⁰ discusses agricultural information seeking behaviour and use patterns among the African farmers and extension workers. Study suggests for establishment of agricultural advisory board comprising both librarians and extension workers to make extensive use of non-book material as a means to overcome the handicap of illiteracy among farmers.

Weintraub⁶¹ conducted a comparative search study of four leading databases in agriculture sciences to know the information search strategies of agriculture scientists namely, AGRICOLA, CAB International, Social Science Index and Alternative Press Index. Results indicated that the scope and subject parameters of a database influence the type of information found. Librarians have a role to play in facilitating the flow of information by providing, interpreting and explaining the information options.

Malmsjo⁶² reviews the factors related to the environment and situation influencing users' information seeking behaviour and the various models and equations reported in the literature to describe this activity in a

quantitative manner. Overall, the aim is to examine the degree to which these models of information seeking behaviour can be of use in designing practical information systems.

Liao⁶³ conducted a study on information seeking behaviour of agricultural researchers as teachers in Taiwan. He investigated that the critical ways for the teachers to get needed literature and the use pattern of information sources is primarily the primary sources of information.

Robert & Dennis⁶⁴ conducted a study on 'information seeking behaviour of the informal sector entrepreneurs working in Uganda' The demographic and business characteristics of these entrepreneurs are highlighted and empirically tested with regard to their information needs. This study has largely employed qualitative research methodologies, such as the critical incidence technique for interviews with 602 informal sector entrepreneurs from a variety of trades. Observations of the entrepreneurs work environments and historical methods were also employed. The results suggest that modern/ exotic models of information transfer based on textual media and ICT exhibit less impact on the entrepreneurs information needs and use at macro levels because of poverty, illiteracy and poor information infrastructure. It is however noted that most 'elite' models share a platform with information behaviour of entrepreneurs at the micro levels. The study concludes that an appropriate model for information behaviour for the information poor community must be grounded on oral traditions and indigenous knowledge and be sensitive to poverty, infrastructure and illiteracy. Recognition is also made of the need for information repackaging and the use of appropriate media for information provision.

Heinstrom⁶⁵ conducted a study on 'Fast surfing, broad scanning and deep diving: The influence of personality and study approach on students' information seeking behaviour'. The study is based on the five dimensions of personality (i.e., neuroticism; extroversion; openness to experience; agreeableness; and conscientiousness). The study finds that the

personality characteristics of a information seeker greatly influence the information seeking behaviour of seeker.

CONCLUSION

After scanning through various studies on information theories, information use patterns, information needs, information browsing, and information seeking behaviour of agriculture scientists important inferences can be drawn. It is found from the study that agriculture as a discipline and a critical sector for national economy and major sources of livelihood for the people of developing countries particularly India not study comprehensively. The present review study, which covers significant studies on information seeking behaviour of agricultural scientist conducted all over, the world certainly helped to narrow and to more clearly delineate the research plan, in conducting research on information seeking behaviour of agricultural scientist in Indian environment. Similarly, these reviews also helped in determining the degree of information needs and information seeking behaviour of agricultural scientists that have already been undertaken outside the India. The present study certainly will go a long way to serve as a base for future research studies in the agriculture sector on information seeking behaviour and also help in designing and developing the need based agriculture information systems/centres for meeting the information requirement of agriculture scientists.

REFERENCES

1. Best, John W. & Kahn, James V. Research in education. Prentice- Hall, New Delhi. 1986. pp. 39-40.
2. Van Dalen, D.B. & Myer, W.J. Understanding educational research. Prentice Hall, New Delhi. 1963. pp. 31.
3. Menzel, Herbert. Information needs and uses. *In Annual Review of Information Science and Technology (ARIST): Vol. 1, edited by Carlos A Cuadra.* Interscience Publishers, USA. 1996. pp. 41-69.
4. Menzel, Herbert. Information needs of current scientific research. *Library Quarterly*, 1964, **34**(1), 4-19.

5. Davis, R.A. & Bailey, C.A. Bibliography of library use studies. Drexel Institute of Technology, California, USA. 1964.
6. Barnes, R.C. Information use studies: Part 2: Comparison of some recent survey. *Journal of Documentation*, 1965, **21**(3), 169-76.
7. Paisley, W.J. Information needs and uses. *In Annual Review of Information Science and Technology (ARIST): Vol 3, edited by Carlos A Cuadra*. John Wiley, New York. 1968. pp. 1-30.
8. Coover, Robert W. User needs and their effect on information centre administration: A review 1953-1966. *Special Libraries*, 1969, **59**(3), 446-55.
9. Elman, Stanley. Special libraries: The users point of view. *Special Libraries*, 1971, **62**(9), 340-42.
10. Taylor, Robert. The process of asking question. *Journal of the American Society of Information Science*, 1962, **13**, 391-96.
11. Menzel, Herbert. Information communication in science: Its advantages and its formal analogues. *In The foundation of access to knowledge, edited by Edward B Montgomery*, Syracuse University, Syracuse, New York. 1968. pp. 153-163.
12. Deutsch, Karl W. Knowledge in the growth of civilizations: Cybernetics approach to the history of human thoughts. *In The foundation of access to knowledge, edited by Edward B Montgomery*, Syracuse University, Syracuse, New York. 1968. pp. 37-58.
13. Mesarovic, Mihajlod M. Response to Karl W. Deutsch. *In The foundation of access to knowledge, edited by Edward B Montgomery*. Syracuse University, Syracuse, New York. 1968. pp. 64-66.
14. Sutcliffe, A & Ennis, M. Towards a cognitive theory of information retrieval. *Interacting with Computers*, 1998, **10**(3), 4-12.
15. Parsad, H.N. Information needs and users. Indian Bibliographic Centre, Varanasi. 1992. pp. 23.
16. Rubinstein, Richard I. & Schultz, Louise. Evaluation of usage of a custom biological literature search service: A three-year study. *In American Society for Information Science: Vol. 5. ASIS*, Columbus, Ohio. 1968. pp. 317-22
17. Paisley, William J. Information needs and uses. *In Annual Review of Information Science and Technology (ARIST): Vol.3, edited by Carlos A. Cuadra*, John Wiley, New York. 1968. pp. 1-30.
18. Markee, Katherine M. Where is the library researcher?. *In Quantitative methods in librarianship: Standards, research, management, edited by Braden Hoadley Irene & S. Clark Alice*, Greenwood Press, Ohio State University, USA. 1972. pp. 119-121.
19. Atkin, Charles. Instrumental utilities and information seeking. *In New models for mass communication research, edited by P Clarke*. Sage, Beverly Hill, USA. 1973. pp. 205-42.
20. Atherton, Pauline. Views of the communication networks of scientific and technical information. *International Forum on Information and Documentation*, 1975, **1**(1), 10-12.
21. Belkin, N. Anomalous states of knowledge as the basis of information retrieval. *Canadian Journal of Information Science*, 1980, **5**, 133-43.
22. Wilson, T.D. On uses studies and information needs. *Journal of Documentation*, 1981, **37**(1), 3-15.
23. McGarry, K.J. The changing context of information. Clive Bingley, London. 1981. pp 34.
24. Leuplot, M. The information need: Its structure and its implementation. *International Forum on Information and Documentation*, 1983, **8**(13), 3-7.
25. Yates, B. Information needs of human beings. *International Forum on Information and Documentation*, 1984, **9**(1), 23-28.
26. Sam, J. Adequacy of document collection and the satisfaction of information needs of agricultural policy makers and managers in Ghana. *International Information, Communication and Education*, 1996, **15**(2), 176-85

27. Anwar, M.A. & Eisenchitz, T.S. Information needs and information seeking behaviour of agricultural scientists in Malaysia. *Library and Information Science Research*, 2000, **22**(2), 145-63.
28. Dulle, F.W. & *et al.* Researcher's perspective on agricultural libraries as information sources in Tanzania. *Library Review*, 2001, **50**(3-4), 187-92.
29. Line, Maurice. Information requirements in social sciences: Some preliminary considerations. *Journal of Librarianship*, 1969, **1**(1), 9.
30. Rosenbloom, R.S. & Wolek, F.W. Technology information and organization in industrial R&D. Harvard School of Business Administration, Boston. 1967. pp. 26.
31. Vickery, B.C. Information systems. Butterworths, London. 1975. pp. 45.
32. Slater, M. & Fisher, P. Use of technical libraries. Aslib, London. 1969.
33. Ellis, D. & Haugan, M. Modeling the information seeking patterns of engineers and research scientists in an industrial environment. *Journal of Documentation*, 1997, **53**(4), 384-403.
34. Marchionini, Gary M. Information seeking in electronic environment. Cambridge University Press, Cambridge, UK. 1997. pp. 106.
35. Wilson, T.D. Information behaviour: An interdisciplinary perspective. *Information Processing and Management*, 1997, **33**(4), 551-72.
36. Kuhlthau, C.C. Inside the search process: Information seeking from the user perspective. *Journal of the American Society for Information Science (JASIS)*, 1991, **42**, 361 -71.
37. Kuhlthau, C.C. A principle of uncertainty for information seeking. *Journal of Documentation*, 1993, **49**(4), 2.
38. Kuhlthau, C.C. A principle of uncertainty for information seeking. *Journal of Documentation*, 1993, **49**(4), 339-35.
39. Kuhlthau, C.C. Teaching the library search process. Metuchen. 1994. Scarecrow Press, N.J. pp. 213.
40. Marchionini, Gary. Information seeking process. *Annual Review of Information Science and Technology (ARIST)*, 1997, **32**, 97-98.
41. Oladele, Idowu O.I. Information Seeking and Utilization among Agricultural Researchers in Nigeria. <http://jsai.or.jp/afita/afita-conf/2002/part1/p137.pdf> dated 20.02.2006
42. Columbia University, Bureau of Applied Social Research. The flow of information among scientists: Problems, opportunities and research questions. Columbia University, New York. 1958.
43. Bowden, C.L. & Bowden, V.M. Survey of information sources used by psychiatrists. *Bulletin of the Medical Library Association*, 1971, **59**, 603-08.
44. Wood, G.C. Serving the information needs of physicians: New England. *Journal of Medicine*, 1972, **286**(16), 603-04.
45. Chen, Ching-Chin. How do scientists meet their information needs? *Special Libraries*, 1974, **65**(3), 272-80.
46. Blaxter, K.L. The individual and information problem. *Nature*, 1973, **246**, 335-39.
47. Packer, H. Methods used by chemists and chemical engineers in Canadian Universities to maintain current awareness with special reference to use of SDI systems. A Ph. D dissertation submitted in the Department of Information Studies, University of Maryland. 1975.
48. Krikelas, J. Information seeking behaviour: Patterns and concepts. *Drexel Library Quarterly*, 1983, **19**(5), 10-14.
49. Lacy, William B. & Busch, Lawrence. Informal scientific communication in the agricultural sciences. *Information Processing and Management*, 1983, **19**, 193-202.
50. Olsen, J.K. & *et al.* Appropriate public services for agricultural research faculty: Final report from the public services research projects. Association of the Research Libraries, Cornell University, USA. 1985.

51. Vickery, B.C. & Vickery, A. Information science in theory and practice. Butterworth, London. 1987.
52. Ellis, David. A behavioural model for information retrieval system design. *Journal of Information Science*, 1989, **15**(4-5), 237-47.
53. Marchionini, Gary & Dwiggins, Sandra. Efforts of search and subject expertise on information seeking in a hypertext environment. In Information in the year 2000: From research to applications. Proceedings of the 53rd annual meeting of the American society for information science, *edited by* Diane Henderson, American Society of Information Science, Medford, New Jersey. 1990. 129-42.
54. Kuhlthau, C.C. A principle of uncertainty for information seeking. *Journal of Documentation*, 1993, **49**(4), 339-35.
55. Oladokun, S.O. An empirical study of information needs of women in agriculture on Oyo State of Nigeria. *Quarterly Bulletin of the International Association of Agricultural Information Specialists*, 1994, **39**(4), 319-323.
56. Ellis, David. Modelling the information seeking patterns of engineers and research scientists in an industrial environment. *Journal of Documentation*, 1977, **33**(4), 384-403.
57. Ellis, David & *et al.* A comparison of the information seeking patterns of researchers in the physical and social sciences. *Journal of Documentation*, 1993, **49**(4), 356-69.
58. Ellis, David & Haugan, Merete. Modeling the information seeking patterns of engineers and research scientists in an industrial environment. *Journal of Documentation*, 1997, **53**(4), 384-403.
59. Erdelez, S. Information encountering: A conceptual framework for accidental information discovery. In International Conference on research on information needs, seeking and use in different contexts, *edited by* Graham, Taylor, Library Association, London. 1997. pp. 230-38.
60. Sbeba, M.K. Using the library for problem solving in African agriculture. *Information Development*, 1997, **13**(3), 132-34.
61. Weintraub, I. Holistic literature searching for a holistic agriculture. *Quarterly Bulletin of International Association of Agricultural Information Specialists*, 1997, **42**(1), 10-15.
62. Malmsjo, A. Information seeking behaviour and development of information systems. A contextual view. In Information seeking in context: Proceedings of the international conference on research in information needs, seeking and use in different contexts, *edited by* Pertti Vakkari Reijo & Brenda Dervin, 14-16 August 1996, Tampere, Finland. Taylor Graham, London. 1997. pp. 222-35.
63. Liao, Y.M. Information seeking behaviour of agricultural researchers. *Journal of Education Media and Library Science*, 1998, **36**(2), 225-70.
64. Robert, Ikoja-Odongo & Dennis, N. Ocholla. Information seeking behaviour of the informal sector entrepreneurs: The Uganda experience. *Libri*, 2004, **54**, 54-66.
65. Heinström, Jannica. Fast surfing, broad scanning and deep diving: The influence of personality and study approach on students' information seeking behaviour. *Journal of Documentation*, 2005, **61**(2), 228-47.

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