Human Information Behavior

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Abstract

This paper provides a history and overview of the field of human information behavior, including recent advances in the field and multidisciplinary perspectives.

Keywords: human information behavior, information seeking, research, user studies.

Introduction

Until recently the computer science and information systems communities have equated 'information requirements' of users with the way users behave in relation to the systems available. In other words, investigations into information requirements were concerned almost entirely with how a user navigated a given system and what he or she could do with the data (rather than information) made available by information systems.

This is now beginning to change as ethnographic methods are introduced into the requirements definition stage of systems design, and Beyer and Holtzblatt (1998) have shown the benefits. However, even when such methods are employed, the designers appear to be asking, "How is this person using the system?" rather than seeking to determine what the individual's (or the organization's) information needs may be and how information seeking behavior relates to other, task-oriented behavior. In fact, a concern with what information is needed has been the province not of information systems as a discipline, but of information science and, before that, librarianship.

To these fields we can add consumer behavior research, marketing, psychology, health communication research, and a number of other disciplines that take the user as the focus of interest, rather than the system. The aim of this paper is to review some of this research and to point to findings that enable the system designer to put the design process in the wider context of the user in the organization.

Some Definitions

Some definitions are needed before we go further. In this paper, four terms are used: information behavior, information seeking behavior, information searching behavior and information use behavior. They are defined as follows:

> ***Information Behavior*** *is the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking, and information use. Thus, it includes face-to-face communication with others, as well as the passive reception of information as in, for example, watching TV advertisements, without any intention to act on the information given.*

> ***Information Seeking Behavior*** *is the purposive seeking for information as a consequence of a need to satisfy some goal. In the course of seeking, the individual may interact with manual information systems (such as a newspaper or a library), or with computer-based systems (such as the World Wide Web).*

> ***Information Searching Behavior*** *is the 'micro-level' of behavior employed by the searcher in interacting with information systems of all kinds. It consists of all the interactions with the system, whether at the level of human computer interaction (for example, use of the mouse and clicks on links) or at the intellectual level (for example, adopting a Boolean search strategy or determining the criteria for deciding which of two books selected from adjacent places on a library shelf is most useful), which will also involve mental acts, such as judging the relevance of data or information retrieved.*

Information Use Behavior *consists of the physical and mental acts involved in incorporating the information found into the person's existing knowledge base. It may involve, therefore, physical acts such as marking sections in a text to note their importance or significance, as well as mental acts that involve, for example, comparison of new information with existing knowledge.*

In all of the above definitions *data* is subsumed under information, that is, data may or may not be information depending upon the state of understanding of the information user. A datum such as "hbar=h/2pi = 6.58*10^-25 GeV s = 1.05*10^-34 J s" does not *inform* me because I have no framework of understanding in which to incorporate the datum.

In all of this, the term *knowledge* is avoided, on the grounds that knowledge is knowable only to the knower. It cannot be transmitted – only *information* about the knowledge I have can be recorded and accessed by another person, and that information can only ever be an incomplete surrogate for the knowledge. Hence, *knowledge management systems* are nothing of the kind – they are, at best, information systems, just as information systems in the past used to be nothing but data-processing systems – and, in some cases, still are.

This paper is concerned mainly with ***information seeking behavior***.

Origins of Human Information Seeking Behavior Research

The origins of human information seeking behavior are found in work on the users of libraries and in readership studies in general. The post-war increase in the amount of scientific literature which was either newly published or recently released from war-time restrictions led, in 1948, to the Royal Society Scientific Information Conference (1948), which marks the beginning of the modern study of human information seeking behavior. However, the subject goes rather further back in time.

For example, *The Library Survey* (McDiarmid, 1940) referred to various kinds of surveys dating back to 1916 (Ayres & McKinnie, 1916) and with a spate of studies in the 1920s and 1930s. These studies were about library use and, in general, they were concerned less with the needs that led people to the library as a source of information and more with issues such as the social class make-up of the clientele.

It would be true to say, however, that the Royal Society Conference was the real beginning of a concern with understanding how people used information in relation to their work and, particularly, how they used it in science and technology. The significance of 1948 as a start date is evident, for example, in

a study led by Menzel at the University of Columbia (Menzel, et al., 1960), in which all of the references are from 1948 onwards.

Another reviewer of the field, Paisley, dated his review (Paisley, 1960) from 1948 and, in a 1948 paper, Urquhart (1948) in reporting on a study of publications borrowed from the Science Museum Library remarked that, "No earlier survey of this type has been traced." The Royal Society conference was followed up ten years later by the International Conference on Scientific Information (1958), held in Washington, D.C. A significant number of papers were devoted to, *"Literature and Reference Needs of Scientists: Knowledge now available and methods of ascertaining requirements."*

The studies reported, as virtually all to this date, are concerned not so much with human aspects of information use, but with the use of information sources and systems, and included studies of medical scientists (Herner, 1958), forest scientists (Spurr, 1958), and, a feature of the time, a number relating to scientists in the atomic energy industry and associated research units (Hogg & Rowland Smith, 1958; Fishenden, 1958; Herner & Herner, 1958) The noted scientist, J.D. Bernal, Professor of Physics at Birkbeck College, ended his paper (Bernal, 1958) with a statement that is worth recalling:

> "...a knowledge of the requirements of the different users of scientific information and the uses to which they wish to put the information they secure should be the ultimate determining factor in the designing of methods of storage and retrieval of scientific information."

A concern with scientists and their use of information continued to be the main focus of work for many years and, in this era before the application of the computer to information storage and retrieval, focused mainly on document use. Fairly typical of the range of studies was a survey carried out in 1965 on behalf of the U.K.'s Advisory Council on Scientific Policy (Anon. 1965). The sample of 6,194 scientists produced a 48.77% response rate.

Although the text refers to "information-seeking and -using" rather than information needs, I would describe it as a system study covering the use of sources, especially abstracts, patents, reviews, journal papers, library use, and the use of abstracting journals. The over-riding interest was in trying to determine how information sources could be made more useful to scientists, and how scientists could be persuaded to make better use of such sources.

Study of Information 'Needs' and Information Behavior

The mainly document-focused studies of the period between 1948 and, say, 1965, were followed by attempts to explore information needs. One of the most rigorous of these was a major study carried out in 1972-73 in Baltimore, U.S.A. into the information needs of ordinary citizens (Warner, et al., 1973). In terms of overall research design and development of the research instrument, this study stands as a bench-mark for large-scale investigations of this kind. The study addressed the following issues:

1. What are the information needs of the urban community?
2. How are these information needs presently satisfied?
3. Could institutional forms be devised to better satisfy these needs (i.e., more effectively and economically from the public's viewpoint)?

A conceptual model developed by Dervin linked the urban resident to information needs, information solutions to problems, and information sources, and identified the psychological, intellectual, institutional, and societal barriers to the satisfaction of needs. Studies of this kind, however, ran into the problem of defining the concept of "information need," and Wilson (Wilson, 1981) suggested that "information need" was not a fundamental need such as the need for shelter or the need for sustenance, but, rather a secondary order need which arose out of the desire to satisfy the primary needs.

Twenty years earlier, Mote sought to characterize users in an attempt to understand their differences in information use (Mote, 1962). He identified three groups of scientists at Shell Research Ltd. according to the character of the discipline within which they worked:

(1) those working in fields with well-developed underlying principles, well organized literature, and well-defined "width" of subject (e.g., organic chemistry);

(2) those concerned with a wider subject area with less well-organized information (e.g., an organic chemist who is now concerned with both the physics and the chemistry of lubricants); and

(3) an "exaggerated form" of (2), a scientist who covers more subjects, with problems involving greater variation, and almost non-existent organization of the literature.

The hypothesis was formed that there would be increasing need for information through the three groups, with a maximum for group (3). Researchers were identified and assigned to the subject types, their enquiry records were checked, and support for the hypothesis was found. Mote concluded that library and information services might be planned accordingly - self-service libraries for category (1) users and more intensive, information-worker support for categories (2) and (3).

Transferring these ideas to today's world, we might equally well hypothesize that category (1) persons are likely to be effective independent users of Internet search engines and on-line search systems, while categories (2) and (3) are likely to continue to need the services of a skilled intermediary.

In the late 1980s, Palmer (1991) used semi-structured, in-depth interviews to probe personality, discipline and organizational structure as related to the information behavior of biochemists, entomologists and statisticians working in agricultural research. Discipline, work role, time spent in the subject field, and organization were the most important determinants of the extent of information behavior, as measured by document and information service use, and there were some indications of male/female differences. The disciplinary differences, partly related to characteristics such as those identified by Mote, included the fact that statisticians were mainly non-seekers of information, because they rarely needed it for problem solving.

Entomologists, on the other hand, although they did not engage in regular information seeking from formal sources, tended to maintain personal files and used personal networks to collect information. Finally, the most regular information seekers were the biochemists, who put regular routines in place to make sure that nothing relevant escaped.

Focus on the Person

Although Mote's work at Shell Research was an early example of work that focused on the information user, rather than the information system, most work until the early mid-1970s was concerned with *system use* rather than *user behavior*. The papers referred to from the 1958 Washington conference were typical of then and of the later period. There was little beyond a catalogue of types of information sources (journals, abstracts, patents, standards, etc.) used by scientists and engineers – what they were used *for* was not explored.

Since the 1980s there has been a shift towards a "person-centred" approach, rather than a "system-centred" approach. This has been accompanied by a switch from quantitative methods to qualitative methods. Several investigators are associated with this change and the names of Ellis, Dervin, Kuhlthau, and Wilson are regularly associated with both shifts. Wilson's work on the INISS Project (Information needs in local authority social services departments) (Wilson & Streatfield, 1977; Wilson, et al., 1979; Streatfield & Wilson, 1982) employed observation and semi-structured questionnaires and the investigative phase were followed by the evaluated implementation of a number of innovations in social services departments.

Wilson's experience of information seeking in this very practical context led him to develop a model of information seek-

ing behavior that is prompted by the individual's physiological, cognitive and effective needs (Wilson, 1981). He goes on to note that the context of any one of these needs may be the person him- or herself, or the role demands of the person's work or life, or the environments (political, economic, technological, etc.) within which that life or work takes place. He then suggests that the barriers that impede the search for information will arise out of the same set of contexts.

Dervin developed the *sense-making* approach, which is implemented in terms of four constituent elements - a *situation* in time and space, which defines the context in which information problems arise; a *gap,* which identifies the difference between the contextual situation and the desired situation (e.g. uncertainty); an *outcome*, that is, the consequences of the sense-making process, and a *bridge*, that is, some means of closing the gap between situation and outcome (Dervin, 1983).

These elements are presented in terms of a triangle: *situation, gap/bridge,* and *outcome*. Dervin defines her approach not simply as a model or a method but as "*...a set of assumptions, a theoretic perspective, a methodological approach, a set of research methods, and a practice."*

Ellis employed qualitative interviewing in identifying common characteristics of information behavior of researchers first in the social sciences, then in the physical sciences and, most recently, in engineering. He found that his set of characteristics applied, with some slight expansion in the last study, to all of these disciplines. (Ellis, 1987; Ellis, Cox et al., 1993; Ellis & Haugan, 1997) His characteristics are:

Starting: the means employed by the user to begin seeking information, for example, asking some knowledgeable colleague;

Chaining: following footnotes and citations in known material or "forward" chaining from known items through citation indexes;

Browsing: "semi-directed or semi-structured searching;"

Differentiating: using known differences in information sources as a way of filtering the amount of information obtained;

Monitoring: keeping up-to-date or current awareness searching;

Extracting: selectively identifying relevant material in an information source;

Verifying: checking the accuracy of information;

Ending: which may be defined as "tying up loose ends" through a final search.

Kuhlthau (1994) evolved a process stage model of information seeking behavior based, initially, on a study of high-school students. The stages of the model are Initiation, Selection, Exploration, Formulation, Collection and Presentation and each stage is said to be associated with certain feelings and with specific activities.

As an example, the *Initiation* phase of the process is said to be characterized by feelings of uncertainty, vague and general thoughts about the problem area, and is associated with seeking background information: the "appropriate task" at this point is simply to "recognize" a need for information. The remaining appropriate tasks are: Identify - fix the general topic of the search; Investigate - search for information on that general topic; Formulate - focus on a more specific area with in the topic; Collect - gather relevant information on the focus; and Complete - end the information search.

Multidisciplinary Perspectives

Information science is not the only discipline to be concerned with the user and use of information. Mention has been made earlier of the role of the user requirements phase in the design of computer-based systems, but other disciplines also have an interest from different perspectives. For example, psychological studies of *personality* have dealt with information processing and cognition.

For example, a "need for cognition" test has been devised by Cacioppo, Petty & Kao (1984) to measure a general trait related to an individual's motivation to engage in cognitive acts. Verplanken et al., (1992) have used a Dutch version of this instrument to explore the relationships between need for cognition (NC) and the amount of effort expended on external information searching. They comment:

> "More specifically, we hypothesized that high NC individuals expend more effort and search more information than low NC individuals."

Given the definition of "need for cognition", I think it would have been surprising if no such relationship had been found, but the hypothesis was confirmed in a laboratory test (a test closely related to marketing in that it concerned information relating to a product).

Marketing studies frequently involve a consideration of information needs. For example, Timko and Loyns (1989) explored the need for economic information by grain farmers in Manitoba, setting out 24 categories of grain market information, from "Federal regulations on grain" to "Grain price forecasts". A conceptual framework was developed, which related

macro- and micro-economic information to farm management decision-making and the results showed that whether macro- or micro-economic information was needed depended upon the market in which the producer was operating.

In organization theory, O'Reilly (1983), a prominent researcher in organizational communication, set out the "contextual and individual variables affecting the use of information by organizational decision makers." These included variables such as: communication networks, roles, information availability (quantity, quality, saliency, content, form and credibility), and individual information processing variables (perceptual set, criteria used, and processing style).

Finally, health care research explores the efficacy of channels of communication with both healthy persons and those who are experiencing some ailment – particular attention has been given to people suffering life-threatening illnesses and sophisticated models based upon innate predisposition to explore information or reject it have been evolved. As set out by Krohne (1993) these are: attention or orientation towards the threat (which is called vigilance, sensitisation, and monitoring by Miller & Mangan (1983) and avoidance, or turning attention away from the threat (which is called repression or blunting by Miller and Mangan). Thus, attention and avoidance are psychological traits of the individual that predispose the person towards searching for more information in a stressful situation, or towards avoiding information acquisition.

Conclusion: New Models

It appears that the study of human information behavior is now a well-defined area of research within information sci-ence, and research is beginning to show the benefits of accumulated knowledge. The papers delivered at the Second Information Seeking in Context Conference in 1998 (1998) show a remarkable degree of cohesion in cross-citation and in the models and methods used to explore behavior.

New topics emerged, such as collaborative information seeking, the role of information-seeking behavior in teams, and information-seeking and the World Wide Web. The range of contexts within which information behavior is now studied shows that the field has expanded well beyond a concern for the literature and information service needs of scientists. There was also a move, in that conference towards a closer association between research into information seeking and research into information searching, as defined above, which, until recently, tended to be carried on as separate activities, with information searching research being closely associated with information retrieval.

Finally, some degree of integration of different models is now taking place. Wilson (Wilson, 1999) has proposed a problem-solving model as a way of integrating the research in the field and has also proposed a global model of the field (Wilson, 1997). The former perceives information seeking, searching and use as associated with the different stages of a goal-directed problem-solving process, the stages being: problem recognition, problem definition, problem resolution, and (where needed) solution statement. He suggests that both Kuhlthau's stages and Ellis's characteristics can be related to this model. The global model (Figure 1) of the field is, perhaps, worth showing here as it brings together some of the ideas that have been presented in this paper.

© T.D. Wilson 1996   Figure 1. Wilson´s 1996 model of information behavior
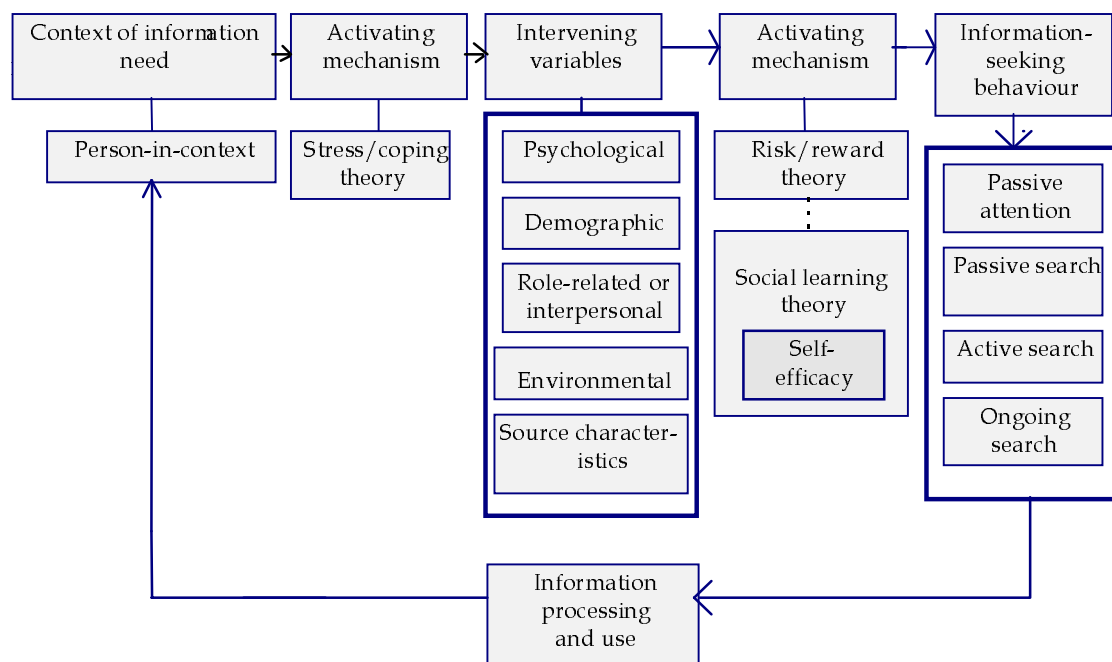
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