



Information Seeking Behavior in Web Environment: A Survey of Science and Technology Research Scholars' Behavior

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Abstract:

Human being is assumed as the most intelligent animal among the animal kingdoms. He struggles hard to make his life easy by gaining knowledge through various methods like observations, experiments etc. In this process he makes use of available information by applying different methods. The information seeking behavior of academic Science and Technology Research Scholars are being transformed by the availability of electronic resources for searching, retrieving, and reading scholarly materials. Information seeking behavior refers to the way, people search for and utilize information. This study adopts qualitative as well as quantitative approach to information-seeking behavior, using the questionnaire method as the primary tool for data collection. The process follows by asking the questionnaire in such a way that it reflects David Elli's six stage model of information seeking behavior and try to prove how far this model satisfies the researchers seeking behavior in web environment with new web-based techniques. This study focusses on the survey of respondents in different fields of Science and Technology. This survey shows a relative and moderate behavior pattern of information seeking by the research scholars in the field of science and technology. The sole objective of this study is to detect the latest information seeking behavior of science and technology researchers with developed tools and techniques used in web environments.

Key words: Information seeking behavior, Information behavior, Information searching behavior, Information use behavior

Introduction:

The shift from the physical environment to web environment has impact the general notion of seeking information among people. People generally want to have that information which they need. Years ago, they rely on books and printed journals as well as department or academic libraries. But with the advent and progress in computer and networking technology the information they want is consolidated, factual and with fast deliverables. So in web environment students and researchers always go for actual, potential and other information sometimes randomly, sometimes with known approaches, sometimes being directed by others. Some of them may be called tech savvy, digital

natives; some may be very orthodox in their approach. But whatever their topic of interest may be, whatever their search strategy and approaches may be, they follow a structured way of seeking information. This behavior is measured and modeled by several stalwarts among them David Ellis proposed the grounded theory of information behavior where the information seeking pattern is measured through qualitative analysis.

Information Seeking Behavior

Information seeking behavior refers to the way people search for and utilize information. In 2000, Wilson described information behavior as the totality of human behavior in relation to sources and channels of information, including both active and passive information-seeking, and information use. He described information seeking behavior as purposive seeking of information because of a need to satisfy some goal. Information seeking behavior is the micro-level of behavior employed by the searcher in interacting with information systems of all kinds, be it between the seeker and the system, or the pure method of creating and following up on a search.

Information seeking is a conscious effort to acquire information response to a need or gap in your knowledge. *Information behavior* encompasses information seeking as well as the totality of other *unintentional* or *passive* behaviors (such as glimpsing or encountering information), as well as purposive behaviors that do not involve seeking, such as actively *avoiding* information.

Case (2008, p. 8) defines information seeking as “a conscious effort to acquire information in response to a need or gap in your knowledge”.

Here are some related definitions:

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 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.

Literature Review

Ellis (1987, 1989) proposed a six-step behavioral model of information seeking for academic social scientists: starting, chaining, browsing, differentiating, monitoring and extracting. This article in particular focuses mainly on the information retrieval system of researchers and maps this seeking behavior with model-based analysis. This six-staged model was further developed in Ellis' later article (Ellis et al., 1993) which was meant for the information seeking behavior of physical science and social science researchers. This was an eight staged model where two new stages are included, verifying and ending with other six stages. Ellis' model was modified and extended later by Meho and Tibbo (2003). Their study shows the incorporation of ten-staged model: starting, chaining, browsing, monitoring, accessing, differentiating, extracting, verifying, networking, and information managing.

These model-based approaches are applied in the information seeking behavior in web environment context. Chun Wei Choo et al. (1998) attempted to track the information seeking behavior of managers and IT specialists in web

environment using the practical implications of David Ellis' six-staged model of information seeking. Xuemei Ge (2010) in his article explained how electronic information resources affect the information seeking behavior in the digital age. He tried to discover how technology contributed to the information seeking process and explored the applicability of Ellis' model in digital information seeking environment.

Methodology

We adopt qualitative as well as quantitative approach to information-seeking behavior, using the questionnaire method as the primary tool for data collection. We visit the research scholars and ask for their response to fill the questionnaire and rate the relative choices.

We create the questionnaire in such a way that it reflects David Elli's six stage model of information seeking behavior and try to prove how far this model satisfies the researchers seeking behavior in web environments with new web-based techniques.

David Ellis investigated the behavior of researchers in the physical and social sciences and engineers and research scientist through semi-structured interviews using a grounded theory approach, with a focus on describing the activities rather than a process.

These initial investigations produced six key activities within the information seeking process:

- Starting (activities that form the information search)
- Chaining (backwards or forwards - following references in initial information sources)
- Browsing (semi-directed search)
- Differentiating (filtering and selecting sources based on judgments of quality and relevance)
- Monitoring (keeping track of developments in an area)
- Extracting (systematic extraction of material of interest from sources)

Later studies by Ellis (focusing on academic researchers in other disciplines) resulted in the addition of two more activities.

- Verifying (checking accuracy)
- Ending (a final search, checking all material covered)

Discussion

This survey starts with the survey of respondents in different fields of Science and Technology. From the questionnaire we can analyze the following facts.

1. The distribution of respondents on gender basis, domicile basis, based on subject they study and type of their scholarship.

The survey shows that there are a lot of factors that influence the respondents' information seeking behavior. Most of the respondents are male researchers and they belong to urban region. It indicates that the behavior of seeking web information and web-based information are predominant to those male researchers who are in urban domicile.

Table 1:
Distribution of respondents
as per gender and domicile

Domicile	Gender		Total
	M	F	
Rural	9	2	11
Urban	22	11	33
Total	31	13	44

The mainstream of the respondents are traced into two broad category—Applied Science and Technology and Pure Science. All over 63% of respondents are from the Pure Science background. Again, there is a huge difference in the male and female respondents' subject stream. Only 18% of female researchers are from Applied Science and Technology background. A different remark we can make from Table 3 that most of the research scholars are sponsored research scholar having Pure Science background. Over 92% respondents are from this category. Therefore we can say that the information seeking behavior in web environment is best practiced among those sponsored research scholars who have studied subjects related to Pure Science than Applied Science and Technology.

Table 2:
Distribution of respondents as per
gender and subject

Gender	Subject	
	Applied Science and Technology	Pure Science
M	13	18
F	3	10
total	16	28

Table 3:
Distribution of respondents as per subject
and type of scholar

Type of Scholar	Subject	
	Applied Science and Technology	Pure Science
Private	7	2
Sponsored	9	26
Total	16	28

Now we can proceed to discuss our main topic of interest. Here we judged the pattern of information seeking behavior of a research scholar through different questions which have a theoretical base. The questionnaire is made in such a way that it acts as a mirror to reveal the six staged model of Ellis.

2. Starting research with different sources:

Starting is here suggested that how a researcher starts his research on any current topic. We classify here different sources into four basic types, i.e., Human Sources, online research database, references and bibliographies and Thesis and Dissertations. The following table shows our sample collection.

Different sources		0-4	5-7	8-10
111	Discussing with friends & colleagues	11	20	13
112	Discussing with sub experts & teachers	2	11	31
113	Discussing with sub librarians	38	4	2
121	Web of Science	3	14	27
122	JSTORS	33	5	6
123	Scopus	8	17	19
124	MEDLINE	36	3	5
131	Chemical Abstract Service (CAS)	30	5	9
132	Physical abstract (PA)	31	6	7
133	Index Medicas	34	3	7
134	Biological Abstract (BA)	38	5	1

14	Thesis & Dissertation	21	13	10
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Any kind of seeking behavior of information starts with some simple predicaments. The starting is marked by the question of finding a topic from a starting point. It may be manual or web based. The survey shows that 70% respondents feel confident to start their seeking of information with discussing with teachers and subject experts in their related fields. While in web environment 61% respondents use Web of science to start their research based information seeking.

3. Criteria for selection of sources:

Once the researchers start finding their information, they deal with the quality of that information considering some criterion for the actual and authentic information in web. This chaining process helps to consolidate their focus on the research topic related information. Present survey shows that most of them do not go for author's reputation in the web rather follow the novelty and utility of the topic and peer reviewed source of information. It indicates that 61% respondents are very much aware of the web based information they browse for. It defines further their use digital nativity or web literacy.

Different criteria for selection of sources	0-4	5-7	8-10
21 Author's reputation	21	11	12
22 Availability of the documents	17	11	16
23 Novelty of topic	8	9	27
24 Utility	11	6	27
25 Recommendations by colleagues, reviews or editors	11	16	17
26 Material published in indexed/referred journals	7	10	27

4. Tools which are regularly browsed and monitored:

Most of the respondents (approx. 77%) prefer to use *recently published issues of journals*. For *Indexes and abstracts* and *references and citations* approximately 52% and 53% respondents give their preferences respectively. On the other hand, 93% respondents think that *Card Catalog of the library* is not so important for browsing and monitoring the resources. For *online Catalog of the library* this number is 61% and for *Bibliographies* this number is 52%. So we can say that the recent trend of browsing latest resources is to go for the recently published issues of the journals for the research scholars.

Tools	0-4	5-7	8-10
31 Card catalog of the library	41	2	1
32 Online catalog of the library	27	11	6
33 Recently published issues of journals	2	8	34
34 Indexes and abstracts	11	10	23
35 References and citations	4	15	25
36 Bibliographies	23	13	8

5. Formal Channels for being up to date:

Differentiating is the choice of web materials and information as well as various websites and portals. However, we created here two different channels of information from where they can get their relevant information—formal channels and informal channels. The present survey shows that about 86% respondents are using and preferring journal article and books to keep themselves up to date. About 36% respondents prefer Conferences and Citations and References. On the other hand only 2% of respondent follow the gray literature and about 20% respondents follow Book review.

Formal Channels		0-4	5-7	8-10
411	Conferences	10	18	16
412	Journal articles and books	1	5	38
413	Gray literature	35	8	1
414	Indexes and Abstracts	14	17	13
415	Book reviews	22	13	9
416 Citations and References		13	15	16

6. Informal channels for being up to date:

For being up to date through using informal channels, the most obvious way is to get in touch with friends and colleagues. About 41% respondents think that discussing with friends and colleagues is the best of be updated about any information. About 36% respondents think that e-mail is the best informal channel to be updated. Surprisingly, 45% respondents think that social networking sites and about 63% for news broadcastings are not so important for being updated in their field of research.

Informal Channels		0-4	5-7	8-10
421	Friends and Colleagues	4	22	18
422	E-mails	8	20	16
423	Social networking sites	20	14	10
424	Web alerts	14	20	10
425	News broadcastings	28	13	3

It indicates a vital phenomenon in the world of information science, i.e., both the digital and virtual way information seeking, and the traditional reading habits of books and journals goes hand in hand. This seeking behavior enriches a researcher in the best possible way in the field of their research.

7. Alerting service and Web feeds:

From a simple survey of respondents' awareness of alerting service or web feeds we find that 32 respondents know and use the different alerting services, while the rest does not use the web alerts. Out of these 12 respondents only two are able to measure the importance of web alert services.

Web Feeds		0-4	5-7	8-10
61	RSS feeds	26	13	5
62	Atom feeds	40	2	2
63	Email Alerts	15	20	9
64	Bulletin board System	40	2	2
65	iCalendar	40	3	1

Using web feeds or using alerting services is very rare for the respondents' research purposes. The survey shows that only 20% of total respondent think that email alert is highly effective monitored tool for knowing news and feeds related their sought information. 41% respondents use RSS feeds and think it to be a great monitoring tool. But a major percentage of researchers only have heard of RSS feeds without knowing the utility of the RSS feeds. Surprisingly, a very few researchers know or hear about ATOM feeds which is very helpful in getting latest and recent information feeds for science and technology all over the world. The frequencies of using the web feeds by the respondents are as follows:

Frequency	Regular (71)	Most of the times (72)	Sometimes (73)	Rare (74)
No. of Respondents	9	17	7	3

The purpose of questioning the frequency of feed readers describes the web literacy and information sharing culture among the researchers. 59% respondents use and monitor the web feeds either in regular basis or most of the time. But their seeking behavior is limited to email alerts and RSS feed. They are not so confident about using Bulletin Board System or Atom feeds.

8. Online feed reader:

To keep pace with recent world activity of scientific and technological research, it is very important to track and access the web-based resources and these have to be regularly monitored. Therefore, a mechanism should be taken into measure so that researchers can get important related news and alerts. This news is called web feed in web environment. Questioning about the acknowledgment of online feed readers is thus essential. There are various web aggregators or feed readers who regularly monitor the important related feeds for researchers as per their choice.

The present survey shows that the researchers are aware of the web feed readers. But they serendipitously search for web feeds and are not regularly monitoring their feed accounts. Therefore, they use feed aggregators like Google reader or My Yahoo, though there is a number of well-known feed readers in the field of science and technology like “Bloglines”, “News 360” or “Feedspot” or “Pulse”.

	Aggregators	Respondents
91	Bloglines	8
92	Feedly	8
93	Google Reader	25
94	News 360	2
95	Pulse	3
96	My Yahoo!	21
97	Feedspot	6

Apart from these listed aggregators there are some other options appeared in the survey which the respondents are monitoring. Two respondents use “Google Scholars”, and one respondent uses “Sci-Finder”. But “Google Scholars” is not an online feed reader. However, the frequencies of monitoring the web feed readers by the respondents are as follows:

Frequency	Regular (A1)	Most of the times (A2)	Sometimes (A3)	Rare (A4)
No. of Respondents	6	6	5	6

The study reveals that a small part of respondents uses the web feed aggregators as well as feed readers. Only 52% respondents’ response for knowing and using, whether regularly or rarely, the online feed aggregators.

9. Member of online Forum or Professional Network:

The respondents are asked to answer whether they are members of any online science and technology forum or any professional networking site. This question is important to test the extracting stage of David Ellis’ model of information seeking behavior. Simply extracting is related to accessing of web information and material from a web-based databases. But we incorporate the extracting stage not for the material but for the extracting of shared information within a group or community which is virtually present in the web environment. And social networking sites are the right address for this purpose. We want to make the extracting stage more information seeking and

sharing prone rather than material accessing. Within such research forum, information is not generally violated, and users have a great seeking behavioral status. **Research Gate** is such an online research forum where respondents extract their seeking information into authentic and consolidated information. Over 55% respondents use **ResearchGate** for sharing their ideas and thoughts and are benefited by the professionals and experts.

Online Forum		Respondents
Science Forum. Net	B1	7
The Science Forum	B2	5
ResearchGate	B3	24
Mendeley	B4	5
indianscience.in	B5	3
Social Science Research Network (SSRN)	B6	2

Therefore, we can say that those researchers who are more active in such research forums are very methodical in using recent information extracted from the world of research and development activities all over the world.

Conclusion:

This survey shows a relative and moderate behavior pattern of information seeking by the research scholars in the field of science and technology. They are more focused on the consolidated information which is only related to their research area. The usage of different web portals and web mechanism make them technologically sound and web literate. But this number is few. Most of the researchers belong to urban domicile who use web feeds and web forums. The information sharing activity among them is very high.

The sole objective of compiling model-based questionnaire is to detect the latest information seeking behavior of science and technology researchers with developed tools and techniques used in web environments. Earlier researches on that particular topic showed only the usage of internet and web accessible material by the researchers in a very layman level. The present study reveals the trend of web usage in such a way that the researchers themselves can be connected, interested and prone to be more web savvy in their information seeking activities.

The methodology to use David Ellis' basic six staged model, instead of Meho and Tibbo's modified and developed ten-staged model, is very much provided the basic logical base of information seeking. Though the present context of web usage advocates for the accessing of information and material, and information management, Ellis' model solely shows the basic behaviors related to information seeking. It also provides a seeking mechanism to users that they can begin any six processes at any time of information seeking phenomenon. These six stages are not step by step process; rather a constructive behavior in researchers mind. Though the sample population is narrowly defined, the constructed model based approach is potentially applicable to a greater range of sample populations, as well the findings of this survey elicit more behavioral pattern of information seeking among the researchers.

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