Prior knowledge and information-seeking behavior of PhD and MA students

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ABSTRACT

Information seeking and its dimensions have been analyzed and measured in different disciplines and contexts and the relationships to other variables, such as gender, task, knowledge, personality, experience, and expertise, have been measured by researchers and have yielded helpful results. In this study, the relationships between information-seeking behavior and prior knowledge of graduate (MA and PhD) students at Tehran University were tested and analyzed. Results show positive and strong relationships between these two variables. Moreover, some dimensions of information-seeking behavior and some aspects of prior knowledge (expertise, familiarity, and past experience) had positive and significant relationships.

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1. Introduction

Understanding the information-seeking process and developing information systems and their supporting strategies are basic goals of information science (Marchionini, 1997). Searching, retrieving, and applying information are at the center of library and information science (LIS) research. Information-seeking behavior has been found to have significant relationships to task (task complexity, type of sources, and so on; Bystrom, 2000; Kim, 2001), discipline and research process (Ocholla, 1999), uncertainty (Wilson, Ford, Ellis, Foster, & Spink, 2002), cognitive style (Ford, 2000; Ford, Wilson, Foster, Ellis, & Spink, 2002; Ingwersen, 1982; Kuhlthau, 1993), knowledge of individuals (Radecki & Jaccard, 1995), and individual differences (Ford, Miller, & Moss, 2001). Another aspect of information seeking that is commonly studied, and which is the focus of this study, is prior knowledge.

2. Problem statement

While prior knowledge has been readily accepted by researchers as a variable worthy of study, the components or dimensions that comprise the prior knowledge construct have been interpreted differently. Alba and Hutchinson (1987), for example, argue that it is a multidimensional construct composed of familiarity and expertise, while others suggest it is unidimensional and measured through familiarity (Johnson & Russo, 1984; Rao & Monroe, 1988), expertise (Bettman & Sujan, 1987; Mitchell & Dacin, 1996), or product experience (Brucks, 1985; Punj & Staelin, 1983; Wright & Lynch, 1995).

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In this research, the accumulation of these three dimensions—familiarity, expertise, and past experience—is viewed as prior knowledge. They are defined as follows:

- Familiarity: "A construct that is directly related to the amount of time [which individuals spend in] processing information about a [product or service], regardless of the type or content of the processing that was involved" (Baker, Hutchinson, Moore, & Nedungadi, 1986, p. 637). Familiarity is also described as awareness or perception of the product (or service) and does not essentially come from actual experience (Srull, 1983).
- Expertise: "The ability to perform product-related tasks successfully" (Alba & Hutchinson, 1987, p. 411) or "the ability to solve problems analytically" (Sujan, 1985, p. 32).
- Past experience: Previous use of the product (Marks & Olson, 1981; Moore & Lehmann, 1980) or experience applying a service or information source.

Although there have been many studies of prior knowledge and information search in different fields, few have examined these specific variables in the community of graduate students, especially MA and PhD students (in this case, at Tehran University). These students are deeply involved in information-seeking processes because they need to prepare theses and dissertations for graduation. A focus on this group can help explain the information-seeking behavior of students who need information. Deeper understanding of the relationship between information seeking and prior knowledge in this type of setting could contribute to improvement of information systems design, especially in the design of customized interfaces.

3. Literature review

Many aspects of the role of prior knowledge in information seeking have been studied in many disciples (see, for example, Bettman,

1986), and prior knowledge has been readily accepted by researchers as a variable in information seeking (Amadieu, Tricot, & Mariné, 2009; Amadieu, van Gog, Paas, Tricot, & Mariné, 2009; Last, O'Donnell, & Kelly, 2001; Mishra & Yadav, 2006; Müller-Kalthoff & Möller, 2003; Potelle & Rouet, 2003). Belkin, Brooks, and Oddy (1982) described the constructive process of information seeking in terms of the anomalous state of knowledge (ASK) hypothesis. Prior knowledge has been studied as a determinant of information-seeking behavior (Alba & Marmorstein, 1987; Baker et al., 1986; Jacoby, Chestnut, & Fisher, 1978; Marks & Olson, 1981; Monroe, 1976; Park, Mothersbaugh, & Feick, 1994; Rao & Sieben, 1992). Researchers have taken different approaches to exploring prior knowledge and influencing factors in information seeking, and such studies vary in context, samples, variables, and measures. As might be expected, they have also resulted in dissimilar findings. Table 1 summarizes the findings of key studies of the role of prior knowledge.

Alba and Hutchinson (1987) maintain that individuals who have little prior knowledge do more extensive information searching than those with higher levels of prior knowledge, since they do not have standards for evaluating information. However, researchers have also questioned whether the relationship between prior knowledge and information search is in fact positive and linear (Jacoby et al., 1978); negative, which means the greater the prior knowledge, the less successful the search (Simonson, Huber, & Payne, 1988); or in an inverted U effect (Johnson & Russo, 1984), which means that the relationships of these variables are not linear, and increase and decrease at different stages of the search process. Kerstetter and Cho (2004), among others, have found positive significant relationships between prior knowledge and the search behavior of special groups of users, and the present study examines whether the same holds with this special group, graduate students.

4. Research design

Three hypotheses provided the framework for data analysis.

Hypothesis 1. There is a positive significant relationship between the prior knowledge and information-seeking behavior of MA and PhD students.

Hypothesis 2. There are significant positive relationships between prior knowledge dimensions (expertise, familiarity, and past experience) and information-seeking behavior dimensions (relevance judgment, creating new ideas, and effort to search information).

Hypothesis 3. There are significant difference between the prior knowledge and information-seeking behavior of students and different levels of education (MA/PhD), as well as between men and women.

The population of this study was graduate (MA and PhD) students at Tehran University, in which more than 2000 graduate students were enrolled at the time. The Cochran (1963) was used to determine a representative sample of the student population, which was calculated to be 150 students. The total population was divided into 11 clusters, and a sample of each cluster was taken. Using random-cluster sampling, a cluster was selected that included the departments of social sciences, psychology, physics, electrical engineering, and management (Table 2 shows demographic data for the sample).

5. Procedures

30 questionnaires were distributed in each of the five departments. These departments were not analyzed separately, as only the cumulated

Table 1
Findings of studies on prior knowledge and information-seeking behavior, in chronological order.

Author(s)	Topic	Findings
Guthrie (1988)	Locating information items in documents	There is a large variance (68%) in the time subjects take to locate the information needed to answer a complex question by children.
Symons & Pressley (1989)	Prior knowledge, text exploration and information pulling out	Students' content knowledge is correlated with efficient textbook search. Students who spent time in a given course searched a text on the course topic more quickly and with better results than students who were not enrolled.
Byrnes and Guthrie (1992)	Conceptual vs. procedural knowledge and textbook search	Conceptual knowledge facilitates the search process only when the subjects are given the standard text.
Rao and Sieben (1992)	Influence of prior knowledge on price satisfactoriness and the type of information	Increase in prior knowledge led to increase in limits of the acceptable price range.
Symons and Pressley (1993)	Impact of prior knowledge on locating information in textbooks	Narrowing search queries (prior knowledge) was associated with a greater likelihood of answer.
Rouet (1994)	Question answering and using hypertext	Prior knowledge of a domain might be a perquisite to successful complex search.
Radecki and Jaccard (1995)	Impact of perceived knowledge on information search behavior	There is a low correlation between actual and perceived knowledge. There is a negative relationship between perceived knowledge and information search behavior.
Mitchell and Dacin (1996)	Consumers' ability to predict correct choices in purchasing and consuming information products	There is a positive relationship between prior knowledge and information search. Informed individuals were better aware of problems of consuming/purchasing information goods.
Rouet (2003)	Influence of task specificity and prior knowledge on search strategies of students	Discipline expertise has a limited influence on search strategies of students. Search strategies are correlated within question types and participants.
Gursoy and McCleary (2004)	Effect of prior knowledge on information search behavior of travelers	Expertise dimension is a function of familiarity. Both familiarity and expertise affect travelers' information search behavior. The influence of familiarity and expertise on internal and external search is opposed.
Kerstetter and Cho (2004)	Relationships between prior knowledge, source credibility, and information search behavior	Prior knowledge is a multidimensional construct. Source credibility is the strongest predictor of type of information source used by users.
Surber and Schroeder (2007)	Effect of prior domain knowledge and headings on processing of informative text	Prior knowledge has no effect on attention to high/supporting information. Low prior knowledge results in less amount of time reading each word by subjects.
Khosrowjerdi (2008)	Epistemology and information-seeking behavior	The greater the organization of knowledge of information-seekers at initial levels of search, the better the relevance judgments by them at final steps.
Amadieu, Tricot, and Mariné (2009)	Prior knowledge of teachers in browsing electronic document	The greater the prior knowledge, the better the reading sequences in network environment.
Hyldegard (2009)	Testing Kuhlthau's information search process (ISP) in a group-based system	Relevant information is searched before pertinent.
Khosrowjerdi, Oloomi, Naghshineh, and Mohseni (2009)	Relationships between personality traits and information-seeking behavior of students	A negative relationship was observed between extraversion and confirming previous knowledge.

Table 2
Demographic data.

		Frequency	Percent
Degree	MA student	87	65
	PhD student	48	35
Gender	Men	62	46
	Women	73	54
Total		135	100

Table 4
Expertise dimension and information-seeking behavior dimensions.

		Relevance judgment	Generating new ideas	Time as a barrier	Effort to search information	Confirming previous knowledge
Expertise	r	0.81	0.73	−0.35	0.69	−0.75

Note: N = 135; *p* < .001.

results were considered for this research. Two questionnaires were developed (see Appendix A, online). The first was the information search behavior questionnaire (ISBQ), which included 17 statements. These statements were designed so that the analysis revealed five dimensions: relevance judgment, confirming previous knowledge, generating new ideas, effort to search, and time as a barrier to search and access to information. A number of statements (1, 3, 6) in this questionnaire were inspired by Heinström (2000). The second questionnaire was the prior knowledge questionnaire (PKQ), which included 10 statements. The statements were ranked on a Likert scale ranging from 1 (completely disagree) to 5 (completely agree). After analyzing the questionnaire, three dimensions were derived for prior knowledge: expertise, past experience, and familiarity. Some PKQ statements (4, 7, 8, and 9) were inspired by Gursoy and McCleary (2004) and Kerstetter and Cho (2004).

5.1. Reliability and validity

To measure the reliability and validity of noted scales, a pilot study was conducted with 30 students. Cronbach's α (alpha) was calculated to test the reliability of the instrument. Cronbach's α was 0.79 for ISBQ and 0.83 for PKQ, which indicates a fairly high reliability. Validity was assessed using feedback solicited from experts and faculty members in the LIS and education fields.

6. Findings

The first hypothesis (positive significant relationship between prior knowledge and information-seeking behavior of MA and PhD students) was tested using the Pearson correlation coefficient because there were intervals between the research variables and statements were rated on a five-point Likert scale. The results (Table 3) show a strong and positive relationship between prior knowledge and information-seeking behavior of students. This suggests that prior knowledge is correlated with easier (faster and more related) searching. Significant relationships were also found (Table 4) between expertise (prior knowledge dimension) and relevance judgment, generating new ideas, time as a barrier, effort, and confirming previous knowledge. These dimensions of prior knowledge appear to be correlated with information-seeking behavior dimensions.

Table 5 shows the results of exploring the relationships between the past experience dimension and information-seeking behavior dimensions. There were significant relationships between students' past experience in source usage and relevance judgment, ability to devise new ideas, time as a barrier, effort to search information, and confirmation of previous knowledge. This suggests that when the past experience of an information-seeker increases, the seeker's

relevance judgment of searched materials increases as well. In addition, the more past experience people had, the more new ideas they had and the more effort they put into searching for new information related to their subject domains. Furthermore, more past experience indicated less time pressure and also less of a need to confirm previous knowledge.

Table 6 shows the results of applying the Pearson correlation test to the relationships between the familiarity dimension and information-seeking dimensions. There were significant relationships between students' familiarity in using search tools or databases and relevance judgment, ability to devise new ideas, time as a barrier, effort to search information, and confirmation of previous knowledge. These results imply that when familiarity with information sources and scientific databases rise, new idea creation, relevance judgment, and effort to search information increase as well. It should be noted that the information searching process was continued when students found relevant information and were motivated.

A t-test showed no significant differences in means between groups of men and women and PhD/MA students, so the third hypothesis was not confirmed. Although it would be expected that PhD students are likely to have more prior knowledge and consequently be better information seekers, this did not turn out to be the case.

7. Discussion

The results of testing the first hypothesis show a strong and positive relationship between graduate students' prior knowledge and information-seeking behavior. This result supports the studies such as those by Jacoby et al. (1978), Alba and Marmorstein (1987); Baker et al. (1986); Marks and Olson (1981); Monroe (1976); Park et al. (1994); and Rao and Sieben (1992). In recent research, only Simonson et al. (1988) contradict this finding.

In testing the second hypotheses, significant relationships were found between all dimensions of the prior-knowledge variable and dimensions of the information-seeking variable. These relationships were generally positive, except for negative correlations between expertise, familiarity, and past experience with time as a barrier and confirming previous knowledge. These results confirm those of Mitchell and Dacin (1996) and Rouet (1994). Mitchell and Dacin found that individuals who have more prior knowledge search less. People who are expert in using and navigating information sources and databases take less time to search, and their point of view with regard to time spent is motivational not inhibitory. Rouet observed that prior knowledge of a field might be a precondition to fulfilling a complex search task successfully.

Table 5
Past experience and information-seeking behavior dimensions.

		Relevance judgment	Generating new ideas	Time as a barrier	Effort to search information	Confirming previous knowledge
Past experience	r	0.78	0.72	−0.80	0.56	−0.47

Note: N = 135; *p* < .001.

Table 3
Prior knowledge and information-seeking behavior.

		Information-seeking behavior
Prior knowledge	r	0.87

Note: N = 135; *p* < .001.

Table 6
Past experience and information-seeking behavior dimensions.

		Relevance judgment	Generating new Ideas	Time as a barrier	Effort to search information	Confirming previous knowledge
Familiarity	r	0.65	0.64	− 0.54	0.67	− 0.39

Note: N = 135; *p* < .001.

There was a significant negative relationship between prior knowledge dimensions and time as a barrier. This implies that an information seeker who is familiar with an information system will need less time to seek information; previous experience with an information source or product also reduces access time.

8. Conclusion

Since significant relationships between students' prior knowledge and information-seeking behavior were confirmed, researchers should consider repeating this study in other contexts, universities, and grade levels in order to gain a comprehensive model that includes prior knowledge as an influencing factor in the information-seeking process, in addition to other cognitive, psychological, and social factors. It would be useful to look simultaneously at other variables such as critical thinking, epistemological beliefs, personality traits, and so on to determine hierarchies of influence of these variables on the information-seeking process.

An increase in prior knowledge appears to reduce access time to relevant information. The value of better knowledge about this and other relationships between prior knowledge and information-seeking would be to contribute to user interface design, and the possibility for at least semi-individualized interaction. For example, systems could be designed to query users about prior use, familiarity, and other components of prior knowledge, and then least then present them with predesigned interfaces specific to a set of users with that prior knowledge. Leveraging understanding of the various components of prior knowledge in this way could enhance the user experience and increase an individual's likelihood of success in information seeking.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10. 1016/j.lisr.2010.04.008.

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