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Introduction to information seeking behavior—A review of literature and field practice directions

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Abstract

The article tries to discover the major authors in the field of information seeking behavior via social network analysis. It is to be accomplished through a literature review and also by focusing on a graphic map showing the seven most productive coauthors in this field. Based on these seven authors' work, five probable research directions about information seeking behavior are discerned and presented.

Full Text

Preamble

Introduction to Information Seeking Behavior: A Review of Literature and Field Practice Directions

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Abstract
This article attempts to identify the major authors in the field of information seeking behavior through social network analysis. This is accomplished via a literature review focusing on a graphic map showing the seven most productive co-authors in this field. Based on these authors' work, five probable research directions for information seeking behavior are identified and presented.

Keywords
Social network analysis, Library and information science database, Information seeking behavior, User behavior

1 Introduction

As important reference resources for library services, library information systems, library workflows, and library websites, the study of information seeking

behavior represents one of the main research areas in library science.

In the physical library building, when a person uses library services or communicates with staff, a series of encounters occurs: media→technology and computers→access→contact with information→borrowing items→returning items→independent learning→paying fines, suggestion box systems, library layout→librarians' professional expertise→cataloging, indexing, classification, rules and regulations[1-3].

However, the Internet has become increasingly important for both educators and students to obtain useful information. Models of readers' information seeking behavior must therefore consider not only their behavior within the library building but also the broader information environment in their living and working surroundings.

This approach accounts for the rapid development of the information environment, in which learners inhabit an interactive communication village of shared knowledge creation. These unprecedented challenges introduce a new model for understanding readers' information seeking behavior and necessitate structural changes in library workflows, website design, and entire library automation systems.

Consequently, discussing information seeking behavior in the information age requires combining elements from currently established different models. The major goal of this project is to identify and explore new research directions in the field of information seeking behavior. The approach involves conducting both a social network analysis of co-author relationships in the field and research on those key authors' considerations for online information seeking behavior. This paper presents one part of this project, using Ucinet (free social network analysis software) to analyze journal articles from LISA (Library and Information Science Abstracts database).

2 Research Design, Assumptions and Major Issues

The research design employs social network analysis to map co-author relationships. As key authors occupy major positions in the social network, their work suggests probable directions for information seeking behavior research in the information age. The assumptions guiding this project are:

1. The journal articles included in LISA represent the most relevant works and research papers in the field of information seeking behavior;
2. The map of co-author relationships represents the scholarly community and its mutual relationships in this subject field;
3. Key positions within this social network are held by the most prominent authors;
4. The works of these key authors represent the most important knowledge about online information seeking behavior.

To project probable future research directions on information seeking behavior,

the first step is to identify key authors in the field by analyzing researchers' social network relationships. The second step is to examine their published works and identify their contributions to this topic.

In accordance with the project' s stated goals and research design, this study addresses three core issues:

1. What do the social network relationships among these authors look like?
2. Who are the major players within the social network?
3. What are the directions of research on information seeking behavior?

Both Question 1 and Question 2 are addressed in the "Results" section, while Question 3 is presented in the "Discussion" section. The conclusion summarizes practical directions, study limitations, and future research.

3 Research Method and Process

The research method is social network analysis, a type of data mining approach. The process consists of four steps: data collection, data clearance, data analysis, and graphic interpretation.

First step: Data collection involves retrieving articles from LISA by searching with the keywords "information seeking." A total of 1,889 items were downloaded from the database on September 1, 2008.

Second step: Data clearance involves writing a computer program (using the JAVA platform) to transform data formats. The ".txt" format used in the LISA database was converted into another ".txt" format that can be processed by Ucinet.

Third step: Data analysis uses Ucinet to calculate each author' s number of publications, their cooperative relationships, and co-author connections.

Fourth step: Graphic interpretation presents a map including network nodes (authors) and network lines (cooperative relationships). By simplifying the social network relationship map, the final graph more directly and clearly shows key authors' locations and relationship strength.

Using these four steps, the research results are presented in two graphs: one showing the complete map of co-author relationships, and the other showing a simplified map of key authors' strength (number of published articles) and influence (social relationship network).

4 Result

Based on the above process, two maps of social network relationships in the research field of information seeking behavior are presented below.

The first map is shown in Fig. 1 [Figure 1: see original paper], which answers the first research question about what the social network relationships among

authors look like. It reveals three main groups (in the middle of the graph) and many other occasional authors (on the left side of the picture). For better understanding of the key authors, their work teams, and their social relationship networks, Fig. 2 [Figure 2: see original paper] was developed as a simplification based on Fig. 1.

Fig. 2 [Figure 2: see original paper] answers the second research question about who the major players are within the social network. This map shows their power and influence.

5 Discussion

Based on analysis of Fig. 1 and Fig. 2, seven key authors were selected to represent the current mainstream in the field of online information seeking behavior:

1. **Amanda Spink**, who studies information systems and log analysis;
2. **Reijo Savolainen**, who uses everyday life theory in sociology as the basis for research;
3. **David Nicolas**, whose research area is log analysis and E-Scholars, and who has devised his own model;
4. **T. D. Wilson**, well-known for studying information behavior models in information seeking;
5. **David Ellis**, who primarily studies other authors' models;
6. **Carol C. Kuhlthau**, famous for the Information Search Process Model;
7. **Gary Marchionini**, whose research focuses on information seeking in electronic environments.

Amanda Spink leads the foremost research team in online information seeking behavior. As a prolific scholar, Spink's work encompasses many aspects: human information behavior (information seeking and use)[4], information needs and information retrieval systems[5], evaluation of medical information systems[6–7], theoretical frameworks for information science based on information seeking behavior[8], cognitive styles in information seeking[9], sexual information seeking on Web search engines[10], multimedia collections on Web searching[11] (based on search engines, cognitive psychology, and human behavior), multitasking Web search[12–14], measurement of user behavior in retrieval systems or search engines[15–17], Web search[18–20], Web log analysis[21–22], mobile data access systems[23], and user-selected behaviors[24–27].

Spink collaborates widely with other experts. From the perspective of information retrieval systems, she cooperates with different experts on research involving search engines, user behavior, Web searching, medical information, and cognitive psychology. After collaborating with C. C. Kuhlthau since 1991[28], whose work over the past 20 years has progressively deepened through empirical research, Spink shifted her research directions to keep pace with the evolving information environment, focusing on new issues and factors.

Reijo Savolainen is the second most prominent author. He uses the everyday

life approach from sociology as the basis for researching information seeking behavior[29–33]. Additionally, Savolainen has established models of information retrieval including a Web user-generated model[34], a social cognitive model[35], spatial factors of information seeking[36], academic capital and information seeking careers (librarian professional ability)[37], and time as a context for information seeking[38]. His latest Schematic Model of Information Seeking Process[38] takes time as the main variable, indicating that: (1) time is the basic variable for scenes or frameworks of information seeking; (2) time is a necessary condition for accessing information; and (3) time is the measurement standard of the information seeking process.

David Nicolas leads the third research team. From 1987 (when information seeking articles increased) to 2005, Nicolas' work examined educational applications[39] and systematic observation of user behavior[40]. His recent articles relate to log analysis[41–43] and scholars in virtual environments[44–45]. Nicolas collaborated with P. Williams and P. Huntington on E-Scholar.

T. D. Wilson leads the fourth team. After cooperative work on cognitive-oriented information behavior, Wilson continued studying information seeking for many years[46]. Compared to Peter Ingwersen, whose work focuses on cognitive research of information seeking[47], Wilson' s research examines different ways of information seeking behavior[47–48] and is often compared with Kuhlthau' s model[49–50]. The fundamental difference is that Wilson considers issues from the perspective of users' information needs, retrieval, and usage (reading), whereas Kuhlthau examines the relationship between users' behavior and their mental states during the information seeking process. In other words, Prof. Kuhlthau focused on users' /readers' feelings, while Prof. Wilson' s primary concern was efficiency. Wilson combined research from West Germany and Britain[51], while Kuhlthau developed her model from five empirical investigations in universities[52]. Wilson communicated with Reijo Savolainen on information use and retrieval[53] in 1997 and participated in an investigative project with David Ellis in 2000–2002[54]. Wilson' s research includes user learning[55], user studies[56], and uncertainty[57] to resolve practical user problems[58–59].

David Ellis leads the fifth team. Ellis developed models of information seeking across various subjects, including comparisons between physical and social sciences[60], medical practice[61], industrial environments[62], and academic researchers[63]. While other scholars create models for research purposes, Ellis' research focuses on how to use these models. His collaborative work increased after 2000. Rather than building a small research team like David Nicolas, Ellis collaborated with more prolific scholars[64–66], such as T. D. Wilson, N. Ford, A. Foster, and A. Spink, demonstrating more active academic communication.

Carol C. Kuhlthau leads the sixth team. Kuhlthau proposed the famous six steps of information searching: task initiation, topic selection, refocus exploration, focus formulation, information gathering, and search closure. Her study also included two concepts: uncertainty and intervention. Since the model is

clear and flexible, numerous theories and investigations were established based on her work. For example, Burdick[67] found that females could achieve emphatic points more easily than males during focus formulation, though it remains unclear whether gender differences affect the final results of information retrieval. In another doctoral dissertation[68], the author contended that graduate students show more anxiety in the first and third steps of Kuhlthau' s model when searching for information. Jones[54] directly used Kuhlthau' s model as a template to design in-depth interviews studying nurses' behavior when searching for medical information on the Web. In Esmaeel' s[69] doctoral dissertation, the author used Kuhlthau' s model to design his empirical research framework and found that 41% of respondents considered themselves always in the "information gathering" step (the fifth step). Kyunghye Kim created an information seeking model that included Kuhlthau' s model[70]. Additionally, Susan[71], Naseer[72], and Abdulmohsin[73] all referenced Kuhlthau' s model in their research.

Gary Marchionini leads the seventh team. Marchionini' s Process Model of Information Seeking[74] describes the process from problem recognition to solution in eight detailed steps: (1) recognize and accept an information problem; (2) define and understand the problem; (3) choose a search system; (4) formulate a query; (5) execute search; (6) examine search results; (7) extract information; and (8) reflect, iterate, and stop. The information seeking process is systematic. Currently, Marchionini maintains an active team whose research has evolved from information seeking behavior to exploring search engine intelligence.

Table 1 compares these seven authors and their research groups, showing their directions and main contributions.

Table 1. Main Models and Their Applications

Authors and their group	Main model	Application aspects
Amanda Spink	Web search	Log analysis
Reijo Savolainen	Information seeking process	Information society
David Nicolas	User behavior	End user' s behavior
T.D. Wilson	Information needs	Information retrieval system
David Ellis	Information behavior	Application and comparing
Carol C. Kuhlthau	Information search	User education
Gary Marchionini	Process of Information seeking	Search engine

By combining the contributions of these seven authors and elements of their models, five probable research directions are identified:

1. **Virtual communities** are changing the process of information seeking behavior daily. Unlike past research on libraries or information consultation departments, defining user groups has become increasingly difficult. This means identification must shift from single users and their retrieval purposes to identifying many users and their collective characteristics and behaviors.

2. In the Web-based information environment, there is close proximity between the two actions of execution and evaluation that Norman proposed for HCI (human-computer interaction) in 1986[75]. Because information resources are not single sources on the Web, users can choose among more alternatives than ever before, leading to interactions between execution and evaluation. The information retrieval process may consist of numerous short processes.

3. Although information retrieval may not follow a sophisticated system formula, it involves a series of simple, repetitive retrieval steps. Dynamic communication between users and computers is not one-way but represents interaction among many users and many computers. Information seeking behavior includes not only users' psychological and social factors but also personal learning processes, cultural and language influences, information technology changes, organizational culture and atmosphere, information access skills, critical thinking, imagination, ambition, and creativity. Traditional library services must face these new challenges and impacts resulting from new information technologies.

4. While task-oriented information seeking behavior still exists, there are more non-commissioned activities and informal information retrieval functions. Such phenomena include not only users' information needs, retrieval skills, and usage purposes but also unique personal approaches like surfing, browsing, searching, and bookmarking. Information retrieval has evolved from a one-way, closed style to a two-way, open-ended style. Discussion of individual information needs may extend to group needs, and a user' s retrieval approach simultaneously influences their information needs and usage.

5. In the future, non-linear and dynamic models of information retrieval—from starting point to any endpoint in between—cannot be ignored or excluded from research. As information technology adoption increases in scope and extent, social and organizational factors become increasingly important. The minute is becoming the most important unit of measurement in Web-based information service environments, and any information retrieval model should factor in the time variable.

6 Conclusion

In the information age, researchers examining information seeking needs must consider more elements than ever before. Opportunities for interactive communication between educators and students are now much greater. Questions about how people communicate and what social software will be helpful for information seeking are currently prominent topics in library and information science.

Summarizing the seven key authors' contributions is a practical way to identify valuable elements of current information seeking behavior models. It is

hoped that this work will help develop more research possibilities to understand how information seeking behavior might evolve in the future. The impact of information technologies does not mean previous models should be ignored but rather reminds researchers to optimize models based on previously established foundations. This is why we have discussed in detail the five identified general directions.

However, the major works presented here do not necessarily cover all relevant contributions to this field. Data were collected only from LISA, and only a few key authors and their works were selected using one data mining technique. Additionally, retrieving articles using only the words "information seeking" risks missing important and relevant articles. These represent limitations of this paper, indicating the need for more in-depth future study.

Despite these limitations, we believe new research designs in this area can be reasonably formulated by considering the five general directions and distinctive elements from the carefully selected works discussed above.

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