



INTERNATIONAL JOURNAL OF APPLIED TECHNOLOGIES IN LIBRARY AND INFORMATION MANAGEMENT

Manuscript Number: JATLIM - 01.01/4/2015-001

International Journal of Applied Technologies in Library and Information Management 1 (1) 1-001 - 006
© 2015 CREW - Colleagues of Researchers, Educators & Writers

Information Search and Retrieval: A Comparative Study of Three Models

Marvelous N.B. Nwajei

Department of Library &
Information Science,
Federal Polytechnic, Oko
favour501@gmail.com

Beatrice C. Emenari

Alex Ekwueme Library,
Federal Polytechnic, Oko
okwuchi2010@gamil.com

Abstract

The paper starts with definitions of key terminologies followed by an overview of the historical context of each search process model. Also figures illustrating theoretical framework is shown. Explanations of the diagrams are given for fuller understanding of the three Information Search Process (ISP) models portraying the varying behaviours of searchers and the techniques involved in handling their information needs. Kuhlthau's model of the ISP, Vakkari's theory of the task-based Information Retrieval (IR) process, and Ingwersen and Jarvelin's cognitive model were examined. The implication of ISP for information services and systems is explained.

Keywords: *Information search process, information retrieval, ISP models, seeking behaviour*

1.0 Introduction

The emergence of the Internet has created millions of end-users who search for information themselves. Information searching can be defined as user's purposive behaviours in finding relevant or useful information in their interactions with information retrieval systems. Despite their different foci, information searching can also be used as synonymous for information retrieval, information seeking, and information access (Chu, 2003). While information-seeking refers to purposive behaviour involving user's interactions with either manual or computer-based information system in order to satisfy their information goals, information-searching refers to the microlevel of behaviour when interacting with different types of information systems. *Information Retrieval* (IR) is also a broad concept similar to information seeking, but is more limited to users' interactions with computer-based information systems. Since research on information-seeking and IR has contributed significantly to research on

information searching, some of the associated works are also reflected.

Information searching can be characterized at different levels including tactics/moves, strategies, usage patterns, and models. Tactics or moves are the micro-level behaviours that users exhibit in their search process. Specifically, a tactic is a move that advances the search process. Searching strategies are a combination of tactics or moves. *Search models* are illustrations of patterns of information searching and the search process. Some of the models also identify the factors that influence the search process. Users and online IR systems are partners in the information search process (ISP).

This work discusses Kuhlthau's Model of the Information Search Process and Vakkari's Theory of the Task-based Information Retrieval Process in order to identify their differences and similarities. The information search process (ISP) presents a view of information seeking from the user's perspective in six stages: task initiation,

selection, exploration, focus formulation, collection, and presentation. The six-stage model of the ISP incorporates three realms of experience: the affective (feelings), the cognitive (thoughts), and the physical (action) common to each stage. Affective aspects, such as uncertainty and confusion can influence relevance judgments as much as cognitive aspects, such as personal knowledge and information content. Increased uncertainty in the exploration stage of the ISP indicates a zone of intervention for intermediaries and system designers.

2.0 Kuhlthau's Model of the Information Search Process

The model of the ISP describes user's experience in the process of information seeking as a series of thoughts, feelings, and actions. Thoughts that begin as uncertain, vague, and ambiguous become clearer, more focused, and specific as the search process progress. Feelings of anxiety and doubt become more confident and certain. Through their actions, people seek information relevant to the general topic in the beginning stages of the search process and pertinent to the focused topic toward closure. Formulation of a focus or a personal perspective of the topic is a pivotal point in the search process. At that point, feelings shift from uncertain to confident, thoughts change from vague to more clear and interest increases. The model was verified in longitudinal case studies and large-scale studies of diverse samples of library users. Further studies have examined the implementation of a process approach in education contexts and investigated the ISP in the workplace (Kuhlthau, 1999).

2.1 Characteristics of Kuhlthau's Model of the Information Search Process

The ISP describes common experiences in the process of information seeking for a complex task that has a discrete beginning and ending and that requires considerable construction

and learning to be accomplished (Kuhlthau 2004). The model reveals a search process in which a person is seeking meaning in the course of seeking information. From the user's perspective the primary objective of information seeking is to accomplish the task that initiated the search, not merely the collection of information as an end in itself. The ISP presents seeking information as a means to accomplish a goal. The model of the ISP is articulated in a holistic view of information seeking from the user's perspective in six stages as follows:

1. *Initiation* – when a person first becomes aware of a lack of knowledge or understanding and feelings of uncertainty and apprehension are common.
2. *Selection* – when a general area, topic, or problem is identified and initial uncertainty often gives way to a brief sense of optimism and a readiness to begin the search.
3. *Exploration* – when inconsistent, incompatible information is encountered and uncertainty, confusion, and doubt frequently increase and people find themselves “in the dip” of confidence.
4. *Formation* – when a focused perspective is formed and uncertainty diminishes as confidence begins to increase.
5. *Collection* – when information pertinent to the focused perspective is gathered and uncertainty subsides as interest and involvement deepens.
6. *Presentation* – when the search is completed with a new understanding enabling the person to explain their learning to others or in some way put the learning to use.

Table 1: Model of the Information Search Process

	Initiation	Selection	Exploration	Formulation	Collection	Presentation
Feelings (affective)	Uncertainty	Optimism	Confusion frustration doubt	Clarity	Sense of direction/ confidence	Satisfaction or disappointment
Thoughts (cognitive)	Vague	—————>	—————>	Focused	—————>	—————>
Actions (physical)	Seeking	Relevant Exploring	information	Seeking	Pertinent Documenting	information

Table 1: Model of the Information Search Process.
Source: C.C. Kuhlthau, 2004

The ISP model was created based on a series of studies of users searching for information in different information-seeking situations. The ISP model consists of six stages of ISP with feelings shown, cognitive thoughts, and physical actions taken in each. Correspondently, feelings common to each stage change from uncertainty to relief, satisfaction or disappointment; thoughts shift from general or vague to more focused; actions range from seeking background information to seeking focused information; and tasks transform from recognition to completion. The ISP model has been widely tested and validated in a variety of digital environments (Cole, 2001; Hyldegard, 2006).

3.0 Vakkari's Theory of the Task-based Information Retrieval Process

Vakkari's theory of the task-based IR process considers the ISP as of the task performance process. This theory is derived from a series of longitudinal studies that investigate students' information-seeking process in their research proposal-writing process for their master's theses (Vakkari, 2001) and (Pennanem & Vakkari, 2003). Based on the results of a series of studies, this model illustrates how the task performance process in particular stages of ISP influences the information sought, search tactics applied, terms chosen, operators used, relevance judgments assessed, and documents obtained

and used. It further enhances Kuhlthau's model of the ISP in terms of the relationships between stages of task and types of information searched for, changes in search tactics and terms, as well as relevance judgments. This theory systematically presents the impact of tasks on the search process.

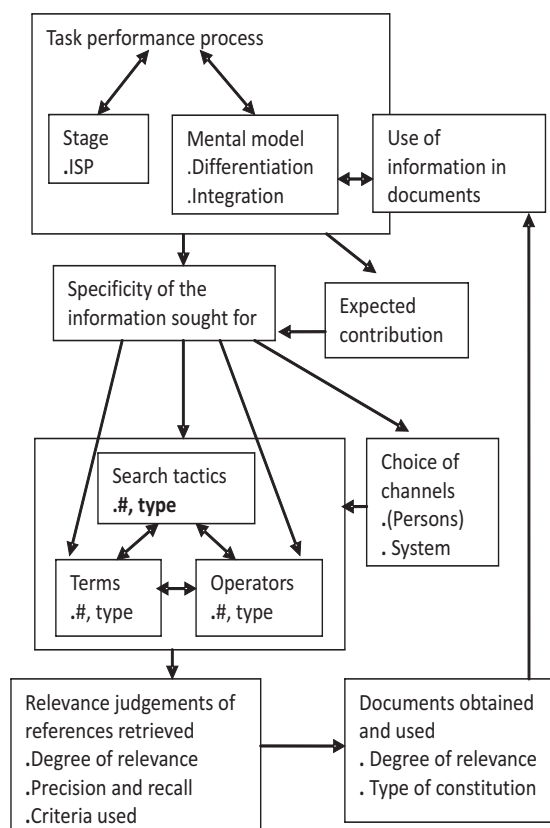


Fig. 1: Vakkari's theory of the task-based IR Process. Source: Vakkari, P. (2001)

4.0 Ingwersen and Jarvelin's Cognitive Model

Ingwersen and Jarvelin (2005) developed a cognitive framework of interactive information-seeking, retrieval and behavioural processes (IS&R) based on Ingersen's original work in 1992 and 1996 on the process of IR interactions. The new research framework places the cognitive actors or teams which bring their organizational, cultural, and social context to the interaction as the major components of model instead of the searcher as the centre of

the interaction. The cognitive actors or teams include creators of information objects, indexers, designers of interfaces, designers of retrieval mechanisms, gatekeepers, searchers, and communities representing different groups. While the first four arrows [1-4] present the interaction process, the rest of the four arrows [5-8] reflect the different types of generation and transformation of cognition or cognitive influence. Fig. 2 illustrates modified Ingwersen and Jarvelin's (2005) complex cognitive framework of interactive information seeking and retrieval.

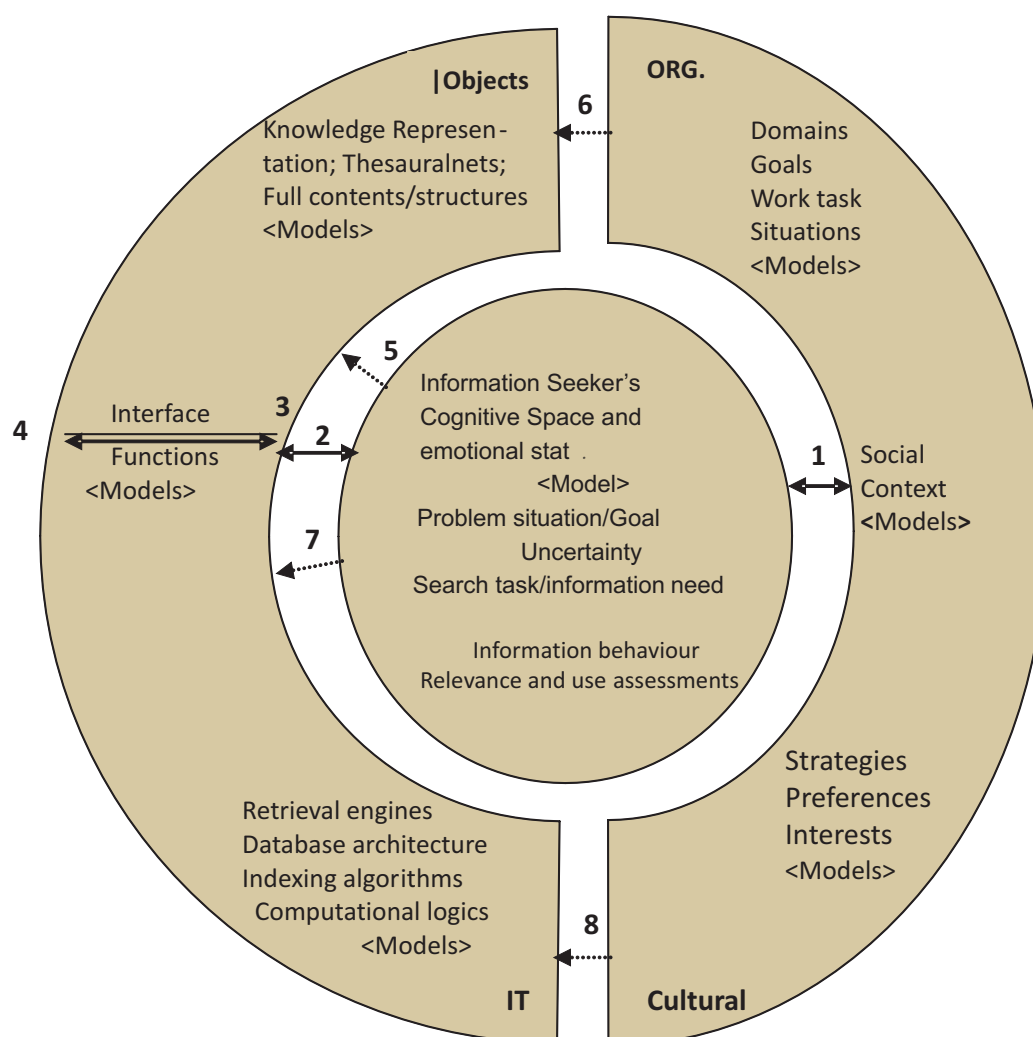


Fig.2: Ingwersen & Jarvelin's (2005) framework of Information Seeking/Retrieval

An information seeker's cognitive space, interacting with both social context and Information Retrieval systems, plays a central role. Interaction and perception are the central processes of the model. "Models" in each of the components reflect the perception of interpretation of their own certain situation. All the participating cognitive structures are interrelated. This is one of the most comprehensive frameworks that reflect the dynamics and complexity of information-seeking and the retrieval process as well as associated factors.

5.0 Implication of ISP for Information Services and Systems

Information searching is traditionally portrayed as a systematic, orderly, and rational procedure rather than the uncertain, confusing process that users commonly experience. After the search is completed, the topic understood, and the problem solved, a person may look back and deny the chaos and confusion that was actually experienced in the process. A gap exists between user's expectations in information use and search design.

The ISP considers uncertainty as natural and essential for constructing personal knowledge in the process of information seeking rather than regarding the reduction of uncertainty as the primary objective of information seeking. Uncertainty is a concept that offers insight into the user's quest for meaning within the ISP. If uncertainty is viewed as a sign of the beginning of learning and creativity, the goal of library and information services shifts from reducing uncertainty to supporting the user's constructive process. Increased uncertainty in the ISP indicates a need for intervention that enables the person to move on to further construction and understanding. Uncertainty in the ISP indicates a zone of intervention in the ISP for information intermediaries.

Conclusion

Information searching has evolved from searching for information using manual information systems to using electronic IR systems, as well as from intermediary search to end-user search. Research has shown that the ISP is a dynamic thereby enabling people to apply multiple types of search strategies. Search models have been developed to illustrate either the dynamic search process or major elements that affect the search process. Particularly, differences and similarities between Kuhlthau's model of information search process (ISP), Vakkari's theory of the task-based IR process and Ingwersen and Jarvelin's cognitive model were examined. Kuhlthau's model of the ISP is articulated in a holistic view of information seeking from the user's perspective in six stages. Vakkari's theory systematically presents how tasks have impact on the search process. Ingwersen and Jarvelin's model is one of the most comprehensive frameworks that reflect the dynamics and complexity of information-seeking and the retrieval process as well as associated factors.

References

- Chu, H. (2003) *Information Representation and Retrieval in the Digital Age. Information Today*: Medford, NJ.
- Cole, C. (2001). *Intelligent Information Retrieval: Part IV, Testing the Timing of two Information Retrieval Devices in a Naturalistic Setting. Information Process Management*, 37 (1), 163-182
- Hyldegard, J. (2006). *Collaborative Information Behaviour: Exploring Kuhlthau's Information Search Process Model in a group-based Educational Setting. Information Process Management*, 42 (1), 276-298.

Ingwersen P. and Jarvelin, K. (2005). *The Turn: Integration of Information Seeking and Retrieval in Context*. Heidelberg Germany; Springer.

Kuhlthau, C.C. (1999). The role of Experience in the Information Search Process of an early career Information worker: Perceptions of Uncertainty, Complexity, Construction and Sources. *Journal of American Society of Information Science*, 50(5), 399-412.

Kuhlthau, C.C. (2004). *Seeking Meaning: a Process Approach to Library and Information Services*, 2nd Ed.; Westport, CT, Libraries Unlimited.

Kuhlthau, C.C. (2010). Information Search Process (ISP) Model. In: *Encyclopedia of Library and Information Sciences*, 3rd edition, CRC by Taylor & Francis, 2586-2591

Pennanen, M. & Vakkari, P. (2003). Students' Conceptual Structure, Search Process and outcome while Preparing a Research Proposal. *Journal of American Society of Information Science*, 54(8), 759-770.

Vakkari, P. (2001). A Theory of the Task-based Information Retrieval Process. *Journal of Documentation*, 57(1) 44-60.

Xie, I. (2010). Information Searching and Search Models. In: *Encyclopedia of library and information science*, 3rd Edition, CRC by Taylor & Francis, 2592-2601