

INFORMATION SEARCH PROCESS

By Carol Collier Kuhlthau

Keywords

information search process, search behavior, library research, information retrieval, reference services, affective dimension, information seeking and use

Abstract

The Information Search Process (ISP) is a six stage model of the users' holistic experience in the process of information seeking. The ISP model, based on two decades of empirical research, identifies three realms of experience: the affective (feelings), the cognitive (thoughts) and the physical (actions) common to each stage. These studies were among the first to investigate the affective aspects or the feelings of a person in the process of information seeking along with the cognitive and physical aspects. Central to the ISP is the notion that uncertainty, both affective and cognitive, increases and decreases in the process of information seeking. A principle of uncertainty for information seeking is proposed that states that information commonly increases uncertainty in the early stages of the search process. Increased uncertainty indicates a zone of intervention for intermediaries and system designers.

INTRODUCTION

Prior to this research most studies were constrained by the system's definition of information needs. For the most part, library and information science concentrated on the system's representation of texts rather than on the user's tasks, problems and processes in information gathering. The classic triad of thoughts, actions and feelings central to any

constructive process had rarely been taken into consideration in study or discussion of information seeking behavior. Although cognitive processes were increasingly recognized as significant components for understanding information behavior, affective experience continued to be overlooked. There was little or no acknowledgement that the feelings of users may have any import. In the study and understanding of information seeking behavior, Kuhlthau's work introduced the holistic experience of information seeking from the user's perspective and stressed the important role of affect in information seeking behavior.

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 (actions) common to each stage (1). The ISP reveals information seeking as a process of construction influenced by Kelly's personal construct theory (2) with information increasing uncertainty in the early stages of the ISP.

The development of the ISP as a conceptual framework is the result of more than two decades of empirical research that began with a qualitative study of secondary school students in the emergence of an initial model, that was verified and refined through various quantitative and longitudinal methods of diverse library users and further developed in case studies of people in the workplace. To summarize the findings of these studies of the user's perspective of the ISP, the affective symptoms of uncertainty, confusion and frustration prevalent in the early stages are associated with vague, unclear thoughts about a topic or problem. As knowledge states shifted to clearer, more focused

thoughts a corresponding shift was noted in feelings of increased confidence and certainty. Affective aspects, such as uncertainty and confusion can influence relevance judgments as much as cognitive aspects, such as personal knowledge and information content. Central in the model of the ISP is uncertainty described formally as a principle of uncertainty for information seeking. Increased uncertainty in the exploration stage of the ISP indicates a zone of intervention for intermediaries and system designers (3).

MODEL OF THE INFORMATION SEARCH PROCESS (ISP)

The model of the ISP describes users' 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 progresses. 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 (4) (5). Further studies have examined the implementation of a process approach in education contexts and investigated the ISP in the workplace (6).

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 (7). 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:

- *Initiation*, when a person first becomes aware of a lack of knowledge or understanding and feelings of uncertainty and apprehension are common.
- *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.
- *Exploration*, when inconsistent, incompatible information is encountered and uncertainty, confusion, and doubt frequently increase and people find themselves “in the dip” of confidence.
- *Formulation*, when a focused perspective is formed and uncertainty diminishes as confidence begins to increase.
- *Collection*, when information pertinent to the focused perspective is gathered and uncertainty subsides as interest and involvement deepens.
- *Presentation*, when the search is completed with a new understanding enabling the person to explain his or her learning to others or in some way put the learning to use

Figure 1

Model of the Information Search Process							
	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Assessment
Feelings (Affective)	Uncertainty	Optimism	Confusion Frustration Doubt	Clarity	Sense of direction / Confidence	Satisfaction or Disappointment	Sense of accomplish- ment
Thoughts (Cognitive)	vague	→			focused	→	Increased self- awareness
Actions (Physical)	seeking	relevant Exploring	information	seeking	pertinent Documenting	information	

(Kuhlthau, 2004, p. 82)

In the first stage, *initiation*, a person becomes aware of a gap in knowledge or a lack of understanding, where feelings of uncertainty and apprehension are common. At this point, the task is merely to recognize a need for information. Thoughts center on contemplating the problem, comprehending the task, and relating the problem to prior experience and personal knowledge. Actions frequently involve discussing possible avenues of approach or topics to pursue.

In the second stage, *selection*, the task is to identify and select the general topic to be investigated and the approach to be pursued. Feelings of uncertainty often give way to optimism after the selection as been made and there is a readiness to begin the search. Thoughts center on weighing prospective topics against the criteria of task requirements, time allotted, personal interest, and information available. The outcome of the possible choices is predicted, and the topic or approach judged to have the greatest potential for

success is selected. Typical actions are to confer with others or to make a preliminary search of information available and then to skim and scan for an overview of alternative topics. When, for whatever reason, selection is delayed or postponed, feelings of anxiety are likely to intensify until the choice is made.

The third stage is *Exploration* characterized by feelings of confusion, uncertainty, and doubt which frequently increase during this time. The task is to investigate information on the general topic in order to extend personal understanding. Thoughts center on becoming oriented and sufficiently informed about the topic to form a focus or a personal point of view. At this stage in the ISP, an inability to express precisely what information is needed can make communication between the user and the system awkward. Actions involve locating information about the general topic, reading to become informed, and relating new information to what is already known. In this stage the information encountered rarely fits smoothly with previously-held constructs, and information from different sources frequently seems inconsistent and incompatible. People may find the situation quite discouraging and even threatening, causing a sense of personal inadequacy as well as frustration with the system. Some actually may be inclined to abandon the search altogether at this stage. Exploration is considered the most difficult stage in the ISP when the information encountered can increase uncertainty prompting a dip in confidence.

The fourth stage in the ISP, *Formulation*, is the turning point of the ISP, when feelings of uncertainty diminish and confidence increases. The task is to form a focus from the information encountered. Thoughts involve identifying and selecting ideas in the information from which to form a focused perspective of the topic. A focus in the

search process is comparable to a hypothesis in the process of construction. The topic becomes more personalized at this stage if construction is taking place. While a focus may be formed in a sudden moment of insight, it is more likely to emerge gradually as constructs become clearer. During this time, a change in feelings is commonly noted, with indications of increased confidence and a sense of clarity. People often express an awareness of being involved in finding meaning such as purposefully engaging in “focusing and narrowing,” in seeking “a thread,” “a story,” “answers to all my questions,” “a central theme” or “a guiding idea.” The four criteria used to select a topic may be again employed to choose a focus: Task; What am I trying to accomplish? Time; How much time do I have? Interest; What do I find personally interesting? Availability; What information is available to me?

Collection is the fifth stage in the ISP when interaction between the user and the information system functions most effectively and efficiently. At this point, the task is to gather information related to the focused topic. Thoughts center on defining, extending, and supporting the focus. Actions involve selecting information relevant to the focused perspective of the topic and making detailed notes on that which pertains specifically to the focus. General information on the topic is no longer relevant after formulation. The person, with a clearer sense of direction, can specify the need for pertinent, focused information to intermediaries and to systems, thereby facilitating a comprehensive search of available resources. Feelings of confidence continue to increase as uncertainty subsides, with interest in the project deepening.

In *presentation*, the sixth stage, feelings of relief are common with a sense of satisfaction if the search has gone well or disappointment if it has not. The task is to

complete the search and to prepare to present or otherwise use the findings. Thoughts concentrate on culminating the search with a personalized synthesis of the topic or problem. Actions involve a summary search in which decreasing relevance and increasing redundancy are noted in the information encountered.

ROLE OF AFFECT IN INFORMATION SEEKING BEHAVIOR

These studies were among the first to investigate the affective aspects or feelings in the process of information seeking along with the cognitive and physical aspects. Prior to the introduction of the ISP the affective dimension of information seeking had not been fully recognized in library and information services and systems. One of the important findings of this research was the discovery of a sharp increase in uncertainty and decrease in confidence after a search had been initiated. A person “in the dip” commonly experienced uncertainty, confusion and anxiety until a focus or a personal perspective had been formed.

The ISP presents information seeking as a process of construction influenced by George Kelly’s personal construct theory (2). Information seeking involves construction in which the person actively pursues understanding and seeks meaning from the information encountered over a period of time. The process is commonly experienced as a series of thoughts and feelings that shift from vague and anxious to clear and confident as the search progresses.

Kelly describes the emotional experience of constructing meaning from new information. The information is assimilated in a series of phases, beginning with confusion. Confusion increases as inconsistencies and incompatibilities are confronted between the information and the constructs the person already holds. As confusion

mounts, it frequently causes doubt in the ability to assimilate the new information. The disruption caused by the new ideas may become so threatening that the new information is discarded and construction abandoned. At this point, Kelly proposes another alternative to move the process of construction along. The person may form a tentative hypothesis to move toward incorporating the new construct into the existing system of personally held constructs.

The ISP is a process of seeking meaning not just finding and reproducing information. This is a process of construction involving exploration and formulation that rarely proceeds directly from selection to collection. Experience influences the decisions and choices a person makes throughout the process of information seeking.

Studies of the ISP in the workplace reveal that a person's experience of the stages in the ISP is related to how much the person knows about the problem and the degree of construction that should be undertaken during information seeking. In more routine tasks, where the goal is to answer a simple question or to monitor periodic change, people do not usually experience stages in their information seeking. In more complex tasks, where the goal requires considerable construction and learning, people are likely to experience a process as described in the ISP model (6).

Focus formulation as a pivotal point in the ISP

The formulation of a focus or personal perspective is a pivotal point in the ISP. Focus formulation calls for reflective thinking about the information encountered in the exploration stage of the ISP that provides a direction for the completion of the search. A focus is a guiding idea to concentrate on to complete the search and accomplish the task.

People often find the period preceding formulation of a focus the most difficult phase in the search process. Exploration is a difficult stage because uncertainty commonly increases, rather than gradually decreases, during this time. Peoples can experience anxiety and frustration as they encounter information from many different perspectives, much of which may not be compatible with their specific constructs and personal knowledge. The connection between feelings and formulating is evident from the rise in confidence that parallels increased clarity as formulation unfolds. Formulation, the central task in the ISP, is frequently misunderstood when the search process is thought of as merely a process of collection not a construction activity.

Exploration facilitates formulating a focus during the search process. However, people often attempt to move from selection directly to collection without the essential exploration for the formulation that gives direction to the search. Exploring uncovers information for formulating new constructs, whereas collecting gathers information for documenting established constructs. Tolerance for the mounting uncertainty in the exploration stage is important for formulation within the ISP. Using information involves interpreting and creating. No matter the amount or the quality of the information gathered, the problem is not solved or the topic understood until the information has been interpreted. Understanding develops through extending and defining a topic by reflecting on the information encountered to solidify personal understanding.

Acquiring more information can increase uncertainty

The axiom that information reduces uncertainty is not necessarily the user's experience in information seeking. In some situations, new information actually

increases uncertainty. Prior to formulation users are likely to experience heightened uncertainty in the fact of unique, incompatible, inconsistent information that requires construction and interpretation. It seems helpful for users to expect uncertainty to increase during the exploration stage of the ISP rather than thinking that increased uncertainty is a symptom that something has gone wrong. The tolerance of uncertainty is introduced as enabling the early stages of the ISP, when the experience of uncertainty may overwhelm the person and deter progress in the process. Uncertainty from the user's perspective is a natural experience in the search process. If unexpected, the presence of uncertainty and particularly any increase in uncertainty can heighten anxiety.

Central to the ISP model is the notion that uncertainty, both cognitive and affective, increases and decreases in the process of information seeking. Uncertainty, the predominant experience in the early stages of the search process, had not been sufficiently addressed in library and information services.

PRINCIPLE OF UNCERTAINTY FOR INFORMATION SEEKING

Uncertainty is a cognitive state that commonly causes affective symptoms of anxiety and lack of confidence. Uncertainty and anxiety can be expected in the early stages of the ISP. The affective symptoms of uncertainty, confusion and frustration are associated with vague, unclear thought about a topic or question. As knowledge states shift to more clearly focused thoughts, a parallel shift occurs in feelings of increased confidence. Uncertainty due to a lack of understanding, a gap in meaning, or a limited construct initiates the process of information seeking (8).

The principle is expanded by six corollaries: process corollary, formulation corollary, redundancy corollary, mood corollary, prediction corollary, and interest corollary.

Six Corollaries of the principle of uncertainty

1. Process Corollary

The process of information seeking involves construction in which the person actively pursues understanding and meaning from the information encountered over a period of time. The process is commonly experienced in a series of thoughts and feelings that shift from vague and anxious to clear and confident, as the search progresses.

2. Formulation Corollary

Formulation is thinking, developing an understanding and extending and defining a topic from the information encountered in the early stages of a search. The formulation of a focus or a guiding idea is a critical, pivotal point in the ISP when a general topic becomes clearer and a particular perspective is formed as the person moves from uncertainty to understanding.

3. Redundancy Corollary

The interplay of seeking what is expected or redundant and encountering what is unexpected or unique results in an underlying tension of the ISP. Redundant information fits into what the user already knows and is readily recognized as being relevant or not. Unique information is new and extends knowledge and does not match the person's constructs requiring reconstruction to be recognized as useful. Too much redundant information leads to boredom, whereas too much unique information causes anxiety. The

lack of redundancy in the early stages of the ISP may be an underlying cause of anxiety related to uncertainty. Uncertainty may decrease as redundancy increases.

4. Mood Corollary

Mood, a stance or attitude that the person assumes, opens or closes the range of possibilities in a search. According to Kelly, an invitational mood leads to expansive, exploratory actions, whereas an indicative mood fosters conclusive actions that lead to closure. The person's mood is likely to shift during the ISP. An invitational mood may be helpful in the early stages and an indicative mood in the later stages. A person in an invitational mood would tend to take more expansive, exploratory actions, while a user in an indicative mood prefers conclusive actions that lead to closure.

5. Prediction Corollary

The ISP is a series of personal choices based on the person's predictions of what will happen if a particular action is taken. People make predictions derived from constructs built on past experience about what sources, information and strategies will be relevant and effective. These predictions lead to the choices they make in the stages of the ISP. People develop expectations and make predictions about the sources used or not used, the sequence of source use, and the information selected from the sources as relevant or irrelevant. Relevance is not absolute or constant but varies considerably from person to person.

6. Interest Corollary

Interest increases as the exploratory inquiry leads to formulation in the ISP. Motivation and intellectual engagement intensify along with construction. Personal interest may be expected to increase as uncertainty decreases. The person's interest and motivation grows as the search progresses. Interest is higher in later stages after the person has formed a focus and has enough understanding of the topic to become intellectually engaged.

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 users' 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 innovation 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 (9).

Zone of intervention for information services and systems

The zone of intervention is a concept modeled on Vygotsky's notion of a zone of proximal development (10). Vygotsky, the soviet psychologist whose work has had a profound influence on learning theory, developed the concept of identifying an area or zone in which intervention would be most helpful to a learner. The zone of proximal development is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined by problem solving under professional guidance or in collaboration with more capable peers. This concept provides a way of understanding intervention in the constructive process of another person.

The zone of intervention in information seeking may be thought of in a similar way. The zone of intervention is that area in which an information user can do with advice and assistance what he or she cannot do alone or can do only with difficulty. Intervention within this zone enables individuals to progress in the accomplishment of their task. Intervention outside this zone is inefficient and unnecessary, experienced by users as intrusive on the one hand and overwhelming on the other.

Taken together the stages of the ISP, uncertainty principle and the concept of a zone of intervention proposes a conceptual framework for understanding information seeking as a process of construction from the user's perspective. In summary, the ISP model describes the experience and behavior of people involved in extensive research projects. People using libraries and information systems to learn about a particular subject or to investigate a problem or issue often have difficulty in the early stages of information seeking. Even when they begin with great enthusiasm and initial success, many become confused and uncertain as to how to proceed after a short period of time.

This is particularly noticeable with students who have been assigned a research paper but is not limited to students. Initial hesitation, confusion, and uncertainty are reported by people in all types of libraries and in the workplace. In fact, we have no way of knowing just how many people give up after initiating a search because they become uncertain and feel incompetent to continue (11).

CONCLUSION

People engage in an information search experience holistically, with an interplay of thoughts, feelings and actions. Common patterns of thinking, feeling, and acting are characteristic in each phase. These studies were among the first to investigate the affective aspects or the feelings of a person in the process of information seeking along with the cognitive and physical aspects. Rather than a steady increase in confidence from the beginning of a search to the conclusion, as might be expected, a dip in confidence is commonly experienced once an individual has initiated a search and begins to encounter conflicting and inconsistent information. A person “in the dip” is increasingly uncertain and confused until a focus is formed to provide a path for seeking meaning and criteria for judging relevance. Advances in information technology, that open access to a vast assortment of sources, have not helped the user’s dilemma and may have intensified the sense of confusion and uncertainty. Information systems may intensify the problem particularly in the early stages of the ISP by overwhelming the user with “everything” all at once. Increased uncertainty indicates a zone of intervention in the process of information seeking for information intermediaries.

References

- (1) Kuhlthau, C. C. Developing a model of the library search process:
Investigation of cognitive and affective aspects. *Reference Quarterly* **1988**,
28 (2), 232-242.
- (2) Kelly, G. A. *A Theory of Personality: The Psychology of Personal
Constructs*, Norton, New York, 1963.
- (3) Kuhlthau, C. C. Inside the search process: Information seeking from the
user's perspective. *Journal of the American Society for Information Science*
1991, 42 (5), 361-371.
- (4) Kuhlthau, C. C. Longitudinal case studies of the information search process
of users in libraries. *Library and Information Science Research* **1988**, 10,
257-304.
- (5) Kuhlthau, C. C., Turock, B. J., & George, M. W. Validating a model of the
search process: A comparison of academic, public and school library users.
Library and Information Science Research **1990**, 12 (1). 5-13.
- (6) Kuhlthau, C. C. The role of experience in the information search process of
an early career information worker: Perceptions of uncertainty, complexity,
construction and sources. *Journal of the American Society for Information
Science* **1999**, 50 (5), 399-412.
- (7) Kuhlthau, C. C. *Seeking Meaning: A Process Approach to Library and
Information Services*, 2nd edition, Libraries Unlimited, Westport, CT., 2004.
- (8) Kuhlthau, C. C. A principle of uncertainty for information seeking. *Journal
of Documentation* **1993**, 49 (4), 339-355.

- (9) Kuhlthau, C. C. The concept of a zone of intervention for identifying the role of intermediaries in the information search process. In *Global Complexity; Information, Chaos and Control*, Proceedings of the 59th American Society for Information Science Annual Meeting, Baltimore, MD., October 21-24, 1996; Hardin, S, Eds.; Information Today, Medford NJ, 1996, 91-94.
- (10) Vygotsky, L. *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press, Cambridge, MA., 1978.
- (11) Kuhlthau, C. C. Accommodating the user's information search process: Challenges for information retrieval system designers. *Bulletin of the American Society for Information Science* **1999**, 25, 12-16.

Further Reading

Kuhlthau, C. C. *Seeking Meaning: A Process Approach to Library and Information Services*, 2nd edition, Libraries Unlimited, Westport, CT., 2004.

INFORMATION SEARCH PROCESS

By Carol Collier Kuhlthau

Professor Emerita

Department of Library and Information Science

Rutgers University