

From Information to Meaning: Confronting Challenges of the Twenty-first Century

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New challenges arise for researchers and practitioners as we move away from concentration on the technology of searching, and turn our attention to using information for problem solving and creativity in the workplace and daily living. This paper explores links between information behavior, information literacy and the impact of information, drawing on the author's research into the user's perspective of information seeking and use and the model of the Information Search Process (ISP). The ISP model describes thoughts, actions and feelings in six stages of interacting with information to

construct meaning. Central to the ISP model is the finding that information commonly increases uncertainty in the early stages of the search process. Increased uncertainty creates a zone of intervention for intermediaries and system designers that support users in their quest for seeking meaning from information. Innovative approaches to interaction between people and information are needed to bridge the divide between information behavior, information literacy and impact of information in order to address issues of the twenty-first century.

Introduction

New challenges arise as we move away from concentration on the technology of searching, and turn our attention to using information for problem solving and creativity in the workplace and daily living.

The theme of this conference is the links between information behavior, information impact and information literacy. As we move into the twenty-first century we need to reconsider each of these and the essential relationship and interaction between them. In these papers, we have the opportunity to delve into these issues.

Information behavior

Over the past twenty years, user studies have substantially increased our understanding of information behavior. Major concepts such as relevance,

anomalous state of knowledge, uncertainty as well as models of information seeking behavior and theoretical frameworks, such as sensemaking introduced by Dervin (1983), have been examined in a variety of contexts with different types of users to ground the concepts for more general application. The studies on relevance that build on Saracevic's (1975) work are an excellent example. Taylor's levels of information need (1968) and information use environments (1991), Wilson's (1999) model of information seeking and Savolainen's (1995) everyday life information seeking have increased our understanding of information behavior.

Many useful concepts for application into design of information services and systems have emerged from this research, such as David Ellis's (1989) work on different information seeking activities incorporating *browsing, monitoring, chaining, differentiating* and *extracting*; Chang and Rice (1993) on *browsing*; Chun Wei Choo (2006) on *monitoring*

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and environmental scanning; Marcia Bates (1989) development of the metaphor of berry picking to describe selecting and extracting. As in berry picking not everything is extracted from one place or source, only some items of information and certain ideas are selected for use. What is extracted from one source leads the path to the next source of information. These are just a few examples of the development of important concepts in information behavior.

Affective, cognitive and physical dimensions

My own research on the user's perspective of information seeking revealed many new insights into information behavior (Kuhlthau 2004). My 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 or in user education. An important finding in 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 even some anxiety until a focus or a personal perspective had been formed. I have come to understand that this challenging time is a creative, pivotal stage of the search process.

Model of the ISP

The development of the model of the ISP as a conceptual framework is the result of more than two decades of research that began with a qualitative study of secondary school students and the emergence of an initial model that was verified and refined through quantitative and longitudinal methods with diverse library users and further developed in case studies of people in the workplace (Kuhlthau 2004).

After extensive research, I was able to refine the model and expand it as a more general model of information seeking behavior known as the Information Search Process (ISP). The ISP presents a holistic view of information seeking from the user's perspective in six stages: initiation, selection, exploration, formulation, collection and presenta-

tion. 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 (Kuhlthau 2004).

The model of the ISP articulates 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.

Formulation of a focus or a personal perspective of the topic is a pivotal point in the ISP. At that point, feelings shift from uncertain to confident; thoughts change from vague to clear and interest increases. 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 construction and learning to be accomplished. The model reveals a process in which a person is seeking meaning in the course of seeking information. The model clearly reveals the link between information seeking behavior and the impact of information. In fact, from the user's perspective, the two are inseparably connected.

The model remains a dynamic description of the information user's experience and dilemma in seeking meaning. Occasionally, the ISP has been referred to as a linear model. I would argue that it is a sequential model rather than a linear model. The ISP is experienced as a sequence of one thing after another in a period of time. This is the way life is lived and experienced. Of course, there may be some planning within each stage for the stages

to follow, and reflection in what went on before. Still one event follows another in a sequence even though recursion and planning may be evident within each of the stages. The naïve observation of linearity overlooks the depth of the holistic experience captured in the model. The model rings true for many people who are in the process of constructing meaning from a variety of sources of information because it is able to capture the sequential holistic experience of the process of constructing meaning from multiple sources of information that links information behavior to information impact.

Uncertainty

Central to the model of the ISP is the concept of uncertainty. Uncertainty was not a new concept in information science, but affective uncertainty had not been extensively studied or developed as an important attribute of the concept. 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 the formulation stage, users are likely to experience heightened uncertainty in the face of incompatible, inconsistent information since it requires thought, construction and interpretation. It is helpful for people to learn that uncertainty increases during the exploration stage of the ISP rather than thinking that increased uncertainty is a symptom that something has gone wrong. 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 and frustration, perhaps to the point of quitting. Clearly there is a critical link between this research and information literacy.

Kelly's (1963) personal construct theory provided the example of a way to present a conceptual framework with a central principle and a number of explanatory corollaries. I thought it would be useful, and perhaps a bit amusing, to state uncertainty as a principle for library and information science. The principle of uncertainty for information seeking is:

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. (Kuhlthau 2004)

The principle of uncertainty is further elaborated by six corollaries: process corollary, formulation corollary, redundancy corollary, mood corollary, prediction corollary, and interest corollary. Each corollary is an important related concept drawn from the findings of the studies of the ISP.

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 has not helped the user's dilemma and may heightened 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 or limiting access to a few most used sources.

Information impact

Information behavior can only be understood within the context of how the information will be used, in other words the impact of the 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 impact of information is what the user is interested in and what motivates the information seeking. The ISP is a task model of information behavior that describes people seeking information to accomplish a task within a specific period of time. The title of my book *Seeking Meaning* (1993, 2004) emphasizes the impact of information on information behavior. People have goals for seeking information and the impact of the information is predominant in their information behavior. People seek meaning from information that presents considerable challenges for information researchers and practitioners in the twenty-first century.

The research on information goals enables us to understand different approaches to information seeking by individuals with the same or similar tasks. Louise Limberg (2003) studied the influence of differing information goals on students' infor-

mation behavior. She found that within the same school assignment the goals of fact finding, getting a right answer or analyzing and synthesizing resulted in quite different outcomes. Ross Todd's (1997) similar findings developed the companion concept of information intents.

The concept of task complexity, developed by Katie Bystrom and the research group at the University of Tampere, Finland (Bystrom & Jarvelin 1995) have provided insight for my own understanding of the nuances of information impact. I am often asked if I think that people always experience the stages of the ISP in every information seeking task. Clearly they do not. But how to differentiate between tasks was a problem for me. When I introduced the concept of task complexity in my workplace studies, I found that workers could easily distinguish between different types of information behavior and use in complex tasks and in routine tasks. They described simple straightforward information seeking in routine work tasks and a process of construction and formulation in those tasks identified as complex. One person explained that complex tasks involve a dynamic change in thinking, referring to these tasks as "the really good ones that you lose sleep over" (Kuhlthau 2004, 168). These projects were found to take an extended period of time. A participant explained, "Those are the ones that are really time consuming because you are changing your entire thinking on an industry" (Kuhlthau 2004, 169). And went on to explain the uncertainty in connection with complex tasks in this way, "You feel anxiety because you are changing your whole view of the world." He described being "out of my element" and "treading into new territory" (Kuhlthau 2004, 170). The concept of task complexity offered an explanation of why people don't experience the ISP in every task. The concept of routine and complex tasks is critical for understanding when to expect users to experience stages in the ISP.

Following are examples from my own research of the information impact in tasks in three different contexts: educational tasks, work tasks, and everyday life tasks.

Educational tasks

In my first study of secondary school students I found that forming a focus in the process of information seeking was the main task of the students,

rather than merely gathering information related to a topic. To accomplish the assignment students needed to construct their understanding of the information they encountered. Students who gathered lots of information but did not construct a focused perspective had great difficulty writing and presenting their work. Here is how one student described her dilemma.

I had a general idea not a specific focus, but an idea. As I was writing, I didn't know what my focus was. When I was finished, I didn't know what my focus was. My teacher says she doesn't know what my focus was. I don't think I ever acquired a focus. It was an impossible paper to write. I would just sit there and say, "I'm stuck." If I learned anything from that paper it is, you have to have a focus. You have to have something to center on. You can't just have a topic. You should have an idea when you start. I had a topic but I didn't know what I wanted to do with it. I figured that when I did my research it would focus in. But I didn't let it. I kept saying, "this is interesting and this is interesting and I'll just smush it altogether." It didn't work out. Other students talked about forming a point of view and gaining a personal perspective of the topic. From this study I drew the concept of formulation within the constructive process of information seeking. (Kuhlthau 2004, 40)

Work tasks

Later, in case studies of information seeking in the workplace, I found similar evidence related to the impact of information. The securities analyst talked about finding an angle to present to his clients and the lawyers sought a strategy for presenting a case. The securities analyst explained the main problem many novice analysts had was to gather information but not been able to write the report or as he said, "get out the product" (Kuhlthau 2004, 173). Over and over the importance of the interpretation of the information and the constructive process of formulating a perspective from information gathered provided insight for explaining the information behavior of the subjects in my studies.

For example, in a longitudinal study of an information worker comparing novice and expert approaches to work tasks, I found that the expert had quite different goals in information seeking than the novice. The novice was looking for the right answer. The expert was seeking to add value to the client's knowledge. Here is how this expert explains the change in his information goal. "The task has changed from when I first started. It is not to buy or sell but to add value. The best way I can

help my more sophisticated client is by adding value to their knowledge base... The young analyst who is not confident in his industry worries about getting the story right. Now my attention is on adding value" (Kuhlthau 2004, 174). These different information goals resulted in a different information behavior and different information impact. The links between information behavior and information impact were very closely connected.

An important problem emerged in my study of the information search process of lawyers that reveals the links between information behavior, information impact and also the need for closely aligning information literacy. These users' experiences and expectations in complex information seeking tasks were not easily accommodated by the information system available to them. The problem for these workers was that the systems available to them did not sufficiently support their process of construction in the information search process. This is how they explained the problem.

First, they described how they go about their work to accomplish their more complex tasks of preparing for trial. "I find that while I am looking for my issue I come across something else, apparently haphazardly. But it has happened so many times that it isn't haphazard and I usually end up finding the case that way. I start looking for A, and while looking for A, I find B. Then A isn't the issue I am looking for. Now it's B. I have found something that really starts to formulate the issue. It has happened so many times that I am convinced that there is something else going on here... At first I don't really see what I am looking for and then the next one after it catches my eye and I keep going. And finally...I find the seminal case that turns the key one way or another. I go in not knowing what the case is, but finding it. And once I get there I do the research on it" (Kuhlthau 2004, 180).

Obviously the lawyers' information behavior was linked to the impact of information for the accomplishment of their task. But there are indications that information literacy was another link in the information chain that needed to be strengthened and developed for these workers.

Every day life tasks

At Rutgers I developed a course in Designing User Centered Services and Systems in which students select a cohort of users who have similar

information tasks and needs as a community of practice. They study this cohort throughout the semester and design an information service and system tailored to their needs. They have studied people with information needs in the course of accomplishing a variety of every day life tasks. Following is a list of some of the tasks my students have studied with specific examples of problems requiring information.

- Consumer tasks – buying a house, car or other major purchase
- Personal tasks – adopting a child, raising a child, care for an elderly parent
- Health tasks – illness and wellness decisions (surviving breast cancer)
- Citizenship tasks – environmental concerns, candidate choices, governance
- Decisions, new immigrant decisions
- Educational tasks – career decisions, academic research, language issues, student
- Life issues, housing.
- Work tasks of securities analyst, lawyers, small business entrepreneurs, nurses, journalists, physicians, teachers, artists, beekeepers and people starting a business.

The fundamental questions are: What are people trying to do? What task have they set for themselves? What are they striving to accomplish? What problems do they have in seeking and using information to accomplish their tasks? All of this information behavior is directly connected to information impact for solving a problem or accomplishing a task, or learning about something of personal import, concern and engagement.

All three of these contexts of tasks show a critical need for professional intervention as well as a high level of information literacy. Meeting the challenges of information provision in the twenty-first century will take ingenuity and risk. That will mean setting aside familiar approaches to strike out into new territory and require new ways of thinking about intervention and education. First we consider ways of approaching intervention.

Intervention in the ISP

The model of the stages of ISP shows major decision points or zones where users find intervention helpful. By concentrating on these zones, librari-

Information literacy

ans can provide effective and efficient library and information services tailored to users specific needs. I found that the participants in my studies wanted help in their information seeking, but not necessarily the kind of help that they thought was available. The student explained that without a focus the paper was impossible to write. The securities analyst explained that a serious problem for many people in his line of work was collecting masses of information but not formulating a focused perspective to present in a report for clients. The lawyer dreamed of a 'just for me' service that would enable constructing a complex strategy for trial. In everyday life information seeking a whole range of tasks requires constructing from a variety of sources of information over an extended period of time.

Increased uncertainty creates a zone of intervention for intermediaries and system designers that support users in their quest for seeking meaning from information. Based on the model of the ISP and the principle of uncertainty for information seeking, I developed the concept of a zone of intervention. The central idea in the zone of intervention is that increased uncertainty indicates a need for assistance and accommodation. The zone of intervention is a concept modeled on Vygotsky's (1978) notion of a zone of proximal development that 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 or overwhelming on the other (Kuhlthau 2004, 129).

Important questions arise concerning the relationship of intervention and information literacy. Is the goal of information literacy to enable people to be completely independent and self sufficient? Or does the literate person know when and where to seek assistance and help? Some questions to consider when designing intervention: What is enough? What is intrusive? What is helpful? What is limiting and restrictive? What is expansive and inviting?

What is information literacy? What does information behavior research tell us about information literacy? How does information literacy link to information behavior and information impact?

Worldwide access to information technology has turned attention to serious questions about education in countries across the globe (Friedman 2006). Educational leaders and policy makers are worried about the next generation of innovators and creators. Vast quantities of information fuel this global society and the ability to locate, evaluate and use appropriate information for creation and innovation is essential. Thoughtful educators seek ways to build student competencies for living and working with new technologies. Information literacy is the ability to locate, evaluate and use information wisely. Information literacy is at the core of what it means to be educated in this century.

User studies show that the impact of information for learning, creating and innovating in the context of daily life constitutes information literacy. User studies reveal the direct connection between information behavior and the use or impact of information in a variety of contexts. We now have a broad understanding of many of the concepts that underlie the ability to locate, evaluate and use information. Studies of the impact of school libraries on student learning have revealed inquiry as a valuable approach for learning in the twenty-first-century school (Todd, Kuhlthau & Heinstrom 2005; Williams & Wavell 2001). We also are aware of serious constraints on problem solving and innovation in situations where the ability to locate, evaluate and use information is lacking. It is high time to apply what we know about information behavior and information impact to information literacy programs. We need to prepare the next generation of information users in innovative educational programs that apply concepts drawn from research findings.

Guided inquiry

I have been working on this problem over the past several years and have developed a program for developing information literacy called Guided Inquiry (Kuhlthau, Maniotes & Caspari 2007). Guided Inquiry immerses students in information seeking

as a way of learning and prepares them for the active engagement with information required in all aspects of living and working in the information society.

Guided Inquiry applies a concepts approach to information literacy. The general concepts developed in user studies are introduced as basic strategies to locate, evaluate and use library materials and the wide range of resources available through digitized information technology and in the local community. Understanding these basic concepts provides students with the foundation for wise use of information in the work place and in daily living that is fundamental to information literacy. These concepts are developed gradually over the course of students' primary and secondary education.

Guided Inquiry encourages students to think of inquiry as a journey and that they need to find a trail through the information. The path that they choose may not be the same as another student would follow. The choices they make along the way of what information is important and interesting forges their trail from source to source as in Bates's berry picking concept (Bates 1989).

The concept of trails and paths helps students to find their way through information. Guided Inquiry introduces students to strategies developed in information science research to find their way through a variety of sources of information. By introducing the concept of following a trail or path through the information students develop the notion of a search strategy. Students develop expertise in locating information through their understanding of the information seeking concepts of *browsing*, *monitoring*, *chaining*, *differentiating* and *extracting* (Ellis 1989).

Differentiating, for example, is using differences between sources to judge the nature and quality of the material. It involves comparing and selecting sources by noticing differences between the quality, expertise, accuracy, currency and perspective of the information as characteristics for evaluating sources. Guided Inquiry helps students learn how sources differ and ways to make good choices for their inquiry.

Many online systems incorporate these strategies in their search capabilities. As Choo explains (2006, 62), "if we visualize the World Wide Web as a hyperlinked information system distributed over numerous networks, most of the information

seeking behaviors categories in Ellis's model are already being supported by capabilities available in common web browsers. Thus a user could use the browser to reach a search engine to locate sources of interest (starting); follow hypertext links to related information resources in both backward and forward – linking directions (chaining); scan the web pages of the sources selected (browsing); bookmark useful sources for future reference and visits (differentiating); subscribe to e-mail based services that alert the user of new information or developments (monitoring); and search a particular source or site for all information on that site on a particular topic (extracting)." Students who understand these strategies are prepared to make full use of search capabilities of the technological information environment. Guided Inquiry prepares students to develop their own search strategy for finding their way through a vast amount of information that is fundamental to information literacy.

Links between information behavior, information impact, and information literacy

And so we return to the theme of this conference – the links between information behavior, information impact and information literacy. What is the essential relationship and interaction between these three?

We have considered the contribution of user studies to our understanding of information behavior. We have seen the close relationship of information behavior to the impact of information. From the user's perspective these are inseparably connected. We have considered ways of meeting the challenge of information provision through intervention and information literacy.

Innovative approaches to interaction between people and information are needed to bridge the divide between information behavior, information literacy and impact of information in order to seek meaning from information. The challenge facing us today is to bring together the allied areas of the field into an overarching conceptual framework that represents the unified whole. Over the next days of the conference we have the opportunity to delve into the dynamics of collaboration of these three areas of the information field. Consider the potential of bringing together these diverse aspects of the field. Meeting this challenge substan-

tially increases the capacity for solving some of the more pressing problems of facing people today.

The future holds interesting prospects for information researchers and practitioners that open paths to learning and creating in rich information environments. This is only the beginning of our journey into the vast potential of the field of library and information science. We have the unique opportunity and, I would stress, responsibility to contribute our expertise for addressing the pressing problems before us all in the early decades of the twenty-first century.

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