Toward a User-Centered Information Service

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The concept of user-centered library services is widely discussed in library literature as an antidote to a systems-centered approach. What is not well understood, however, is the need for a theoretical and conceptual underpinning to guide the development of a user-centered service. Dervin and others have provided some insights into the nature of information and information seeking that can serve as a conceptual base for understanding how our thinking has to change in order to develop user-centered services. This study suggests how an altered understanding of information can provide the basis for rethinking and potentially redesigning the library's mission, the provision of traditional services, the design of systems, and the measurement of services. Some concepts from psychology are suggested as a tool for increasing our understanding of how to design user-centered services.

Introduction

Much of the dissatisfaction with current research and practice in information needs was captured in Dervin and Nilan’s 1986 ARIST review. Frustration on the part of information professionals stemmed from, among other things, the proliferation of systems that puzzled or irritated users and from the nagging suspicion that the needs of users were not well understood. Researchers were concerned by the lack of a strong theoretical base from which to design systems and services and by the lack of replication and of building on existing research (Dervin & Nilan, 1986). Not surprisingly, research had failed to inform practice.

If we are to bridge the gap, we need a persuasive theoretical underpinning to any changes in practice. We have that in the work of Brenda Dervin. Although Dervin’s work is not free from problems, it is nonetheless a powerful theory-based, user-centered approach to information needs. What is missing—and very much needed—is a way of applying and extending Dervin’s theory to the creation of a newly conceived information service in a traditional setting. Library services as we know them need to be reconceptualized in terms of a user-centered approach. This is by no means an easy task. There is not much to guide us, and the results are far from certain. But as many authors have pointed out, to remain content with the status quo is to risk obsolescence.

This study will focus on interpreting Dervin’s theory in the practical context of library services. It will raise basic questions. “What does it mean to have a user-centered reference service?” “What would a user-centered approach to cataloging entail?” It will examine how we might apply the sense-making approach throughout the library or information center. A sense-making approach to understanding how users seek, acquire, understand, and use information will require us to rethink the traditional service categories, the ways in which we evaluate and measure our services, and the goals of our services. Ultimately, we will also need to reexamine the way in which information professionals are trained, as well as the ways in which users think about our services and about libraries in general.

The term “user-centered,” of course, is less than sharply defined. It is normally associated with the idea of increased attention to the needs of users of systems. I employ it here to denote a focused approach to thinking about information services and systems: one that regards information as something in part constructed by users, that recognizes common traits which humans share in processing information, and that views the contexts in which information needs arise (and the contexts in which they are pursued) as significant factors in the design of user-centered information systems and services. I mean this article to be provocative and suggestive rather than prescriptive. It does not contain “the answer,” nor does it ask all the questions. But it offers a start toward bridging the famous gap between research and practice.

The Traditional Information Paradigm

At the core of Dervin’s approach is the rejection of the traditional paradigm of information and the substitution
of a "constructivist" paradigm. The traditional paradigm, based on Shannon and Weaver (1949), sees information as external, objective, as something that exists outside the individual. It is a message transmitted from sender to receiver through a channel, and the message is informational in that it reduces ambiguity by reducing the number of alternative messages that could have been sent. Information in this traditional sense exists in an ordered world that is discoverable, definable, and measurable. When we seek information through the traditional paradigm, our goal is to find the external "information reality" that corresponds to our internal need.

As Dervin (1976; Dervin, Jacobson, & Nilan, 1982) points out, we don't talk as if we hold this traditional view of information. On the contrary, we admit that knowledge isn't absolute, that what really matters are people, that people change, and that a message sent doesn't equal a message received. Yet the library world continues to make assumptions based directly on the traditional model of information. Information is seen as something objective to be ferreted out from systems and reference tools and presented to the user, preferably at the right time and in the right format. Whatever the user's need, there is information to satisfy it. If we don't have the information, we can get it. Information is acquired through formal information systems such as books, journals, and online databases. Information must be "objective" to be valuable. Our users want (and deserve) the best information available.

Such assumptions, based on the traditional model, have dictated the kinds of services we supply and the kinds of libraries we have created. We have (until quite recently) concentrated primarily on acquiring and managing collections of materials. We have utilized extensive cataloging and indexing systems to provide access to these materials. We have provided access to numerous databases that produce citations and abstracts and even full-text. We retrieve and duplicate articles from our own materials and from sources outside of our institutions. And we have not ignored the user. We ask users for feedback on our services; we survey them to find out what they want; we market our services to them; and we offer to train them in using our services and systems. Services based on the traditional model target the "middle range" of users, those, for example, neither totally naive nor fully expert.

In general, users often seem pleased with our services. Those who respond to our surveys frequently indicate that they like what we do. The complaints are usually the obvious ones: we don't process things fast enough, interlibrary loan procedures are cumbersome, cataloging seems arbitrary, we don't have the book they want. The response to such complaints is equally familiar: if we had more resources, we could add more staff, provide better and faster services, and all would be well.

The fundamental issue, however, is not whether additional staff and resources could make the traditional model function better. Improvement is certainly possible, although additional resources in the short term seem unlikely. The basic issue is whether we are seeking to improve the right model.

Indeed, the changing economic climate and the changing information climate indicate serious threats to our position as traditional information intermediaries. Particularly in special libraries, information brokers direct-market services to users. The electronic information explosion has increased access to information of all kinds from computers at home and at work. The integrated technologies first demonstrated in the 1980's will become a reality in the nineties. A cover story in USA Today (November 19, 1992) indicated that the traditional passively receptive television set is about to change into a "multimedia, interactive TV, on-demand video, a knowledge navigator or who knows what else." Such systems integrate hypertext and images, providing information on a multitude of topics and in all kinds of formats: transcripts, maps, graphs, photographs, texts. Customized, personalized information will become available to individuals directly. Libraries consequently will be forced to change if they want to continue to play a role in information provision. One option is to revamp libraries in ways that recognize the centrality of the individual and that understand the changing nature of information. This, I believe, requires a fundamental change in models: the shift to a constructivist concept of information linked to a "sense-making" model of information seeking.

The Constructivist Model

Dervin's constructivist model of information (1976, 1977, 1992; Waldron & Dervin, 1992) views information not as something objective and external, but as something constructed by the user. Information does not exist in the abstract—it needs to be interpreted: a threatening shape in a dark alley turns out to be bags of discarded trash; an article on Ben and Jerry triggers an idea on how to market a drug. Further, Dervin sees individuals moving along a time-space continuum that is constantly shifting. Such a world requires that we strive to make sense of ourselves and our environment through continual adjustments. We construct cognitive maps of our environment that are constantly being altered and refined as we experience new information. We are changed by new information, which thus changes how we interpret information past and future. We do not just adapt to a static world but create a reality that changes with us. How many times have we reread an article only to find something new and unexpected in it?

The sense-making model which derives from this constructivist paradigm is basically a cognitive approach to information seeking, in that it recognizes information as

2While Dervin describes "user constructs" (Dervin, 1983) and contrasts traditional and "alternative" paradigms (Dervin & Nilan, 1986), she does not apply the terms "traditional" and "constructivist" to the concepts of the old and new information paradigms. She generally refers instead to traditional and "sense-making" paradigms. The sense-making paradigm, however, is not an information model, but rather an information-seeking model. It is for this reason that I use the term "constructivist" when describing the new information model.
something that involves internal cognitive processes. Sense-making is not, however, solely intellectual. Affect or emotion is intimately involved in the individual's cognitive response to information. It can be an important element in, for example, the evaluation of relevance. It is clearly crucial in understanding the concept of need. While Dervin doesn't specifically focus on the affective dimension of cognitive processes, it can be inferred from her approach and developed in ways that complicate and enrich her model.  

The user of information becomes the focus in this sense-making model. Information becomes "whatever an individual finds 'informing'" (Dervin, 1977, p. 22). The sense-making model sees information as subjective, situational, holistic, and cognitive (Dervin & Nilan, 1986): in short, as constructivist. It focuses on understanding information within specific contexts and on understanding how information needs develop and how they are satisfied. It regards the user not as a passive receiver of external information but as the center in an active, ongoing process of change: information triggers perceptual changes in the user, and changes in the user alter how the information is perceived.

This approach immediately raises questions. If the individual is to be the focus, how do we deal with the dizzying array of different, unique information needs that all these diverse individuals will have? How can we provide a coherent service if everyone needs something different? It is at this point that Dervin differs from others who also reject the traditional paradigm of information. Dervin's work has been directed at understanding information needs by finding a way to acknowledge the uniqueness of individuals and their circumstances, while identifying commonalities in the processes they go through. Such commonalities permit systems and services to be created that provide appropriate help.

Dervin's method for studying information needs employs the "situation-gap-use" metaphor. She argues that all information needs stem from a discontinuity or "gap" in one's knowledge. The gap develops out of a specific "situation," and individuals attempt to bridge the gap through employing various tactics. What gets them over the bridge are called "uses" or "helps." Dervin has identified (approximately) 13 categories of metaphoric "gaps" which describe the types of problems people experience: "I hit a blank wall"; "I came to a fork in the road"; "I lost my way." After studying over 40 different groups of people from blood donors to librarians and cancer patients, Dervin concluded that sense-making assumes "there is something systematic about individual behavior to be found by pursuing process orientations" (Dervin, 1992, p. 81). Individual needs are not chaotic but systematic, and the systematic quality of needs must be understood as a process rather than as a static state. In effect, Dervin (among others) believes that information needs can be addressed by understanding the process that each individual goes through in experiencing a gap, in trying to resolve it, and in gaining something (especially new knowledge) from the experience.

Related Approaches to Information Seeking and How They Differ from Dervin

Three researchers whose work seems most closely related to Dervin's cognitive, sense-making approach to information seeking are Belkin, Taylor, and Kuhlthau. Each of these researchers focuses on different facets of the user's information need. All three approaches reflect awareness of the constructivist approach and of the sense-making model. They vary considerably, however, in the extent to which such an understanding is reflected in their work. The order in which they are presented here is significant: Belkin is least representative of the constructivist approach, and Kuhlthau the most. A brief summary of their work will be useful in clarifying how it differs from Dervin's approach.

Belkin

Belkin's approach is based on the hypothesis that an information need arises from an anomaly in the individual's knowledge state (Belkin, 1980, 1982). Because individuals can't easily express what they don't know or what is missing, questions submitted to information systems based on the individual's request won't adequately represent what is needed. In order to get around this difficulty, Belkin focuses instead on a "problem statement" which the individual prepares describing how the information need developed. Here Belkin is taking account of context, of the situational elements of the information need, and at this point Belkin and Dervin are in agreement: exploring the user's situation (Belkin's problem statement) is key, and understanding the gap (Belkin's anomaly) is important. Belkin is taking a cognitive approach in trying to understand how the user has conceptualized his problem.

But here the similarity ends. Belkin's concern is representing the user's problem statement on an information retrieval system; to do so, he converts the words of the statement into a semantic network representing connections among the terms. The context or situation, as represented by the problem statement, has been converted to a series of words and stems. Thus, context is no longer relevant.
except as part of a semantic net, where the frequency of the words is what establishes proximity. In describing the problems out of which their anomalous state arose, for example, users might say "It was very difficult for me to understand why this particular problem occurred when it did." Such a statement, reduced to word proximities, loses its significance. It is finally difficult to see Belkin's approach as fully user centered.

**Taylor**

Taylor has been interested in the user for over 20 years. In his classic paper on question-negotiation (1968), Taylor describes four stages involved in the development of a need-related question, beginning with the inarticulate stirring of uneasiness and concluding with the negotiated system-ready question. His approach here is clearly cognitive. The process he describes, that of struggling to express a need and of seeking information to resolve it, is clearly that of sense-making.

In his work on information use environments, Taylor (1991) has focused directly on the situational aspect of information needs. He believes it is critical to "provide some structure on the uses of information: what information does to or for the recipient and for his or her problem or situation" (p. 221). Users make choices about what information is useful to them at particular times. "These choices," he insists, "are based, not only on subject matter, but on other elements of the context within which a user lives and works" (p. 218). A major contextual emphasis for Taylor is the type of problem being researched (Macmullin & Taylor, 1984); because scientists and teachers tend to research different types of problems, he approaches the study of information use through analyzing the specific professional context.

Taylor sees the information use environment as key to understanding similarities and differences in information seeking and in the information use behavior of specific groups. It is through studying the information seeking and information use of distinctive groups (in his case, engineers, legislators, and physicians) that Taylor sees differences in, for example, their definitions of information and in their conception of what constitutes resolution to a problem. This approach, in its emphasis on studying specific groups, is quite different from what Dervin is proposing.

Dervin is interested in the moment when an individual intersects with the library.7 At this moment, demographics don't matter: scientists or activists, physicians or legislators all share the commonality of an information need. They have come because they feel that the library would be useful (Dervin, 1977, p. 27). It is important to understand the situation that led the individual to seek information in the library and to understand what different kinds of situations lead to different uses of information. These same individuals, with the same demographics, may come to the library on another day for a vastly different purpose. While this is quite obvious in a public library situation, it is also relevant in a research environment. With the advent of increased interdisciplinary and team research a chemist is rarely involved solely in chemistry. Requests may range from the traditional substructure searches to information on disease states or cell biology. Systems which focus on demographics alone will not be responsive to situationally motivated needs. Dervin, for example, sees the situation of "being at a crossroads" as the critical issue. She directs her research at identifying the different kinds of problem situations and at clarifying the specific "helps" that would facilitate bridging the information gap. Taylor acknowledges that "it might be more logical to discuss information users in terms of similar type of problems," which is of course Dervin's approach, but he is most concerned with "eventual input into systems design" and therefore decides instead to categorize users by their professional context (p. 219).

Taylor's approach reflects findings from the studies on information needs of scientists during the 1970s and 1980s (e.g., Allen, 1988; Garvey, 1979; Paisley, 1968). These studies, which focused on information-seeking behavior and on information flow patterns, found clear differences in the ways in which different scientific disciplines used information sources and communicated among themselves. There is, therefore, an obvious value in studying the use of information within a specific (group) context, particularly in a special library environment. Taylor's emphasis on context, however, need not be seen solely as an alternative to the more generic approach suggested by Dervin; it can serve as an effective and valuable supplement: both context and process matter in understanding information needs.

**Kuhlthau**

Of the three researchers, Kuhlthau's approach is closest to Dervin's. She is clearly constructivist in her understanding of information needs. In fact, she describes her theory as a "constructive process" approach (Kuhlthau, 1993). It is obviously also a process approach, though the process she focuses on is different. Crucial to her theoretical position is the "uncertainty principle," a cognitive and affective state that accompanies the initial stages of the research process, when students are unclear about their topic and when they have a gap or lack of clarity in their understanding. She believes that individuals in their approach to information seek meaning rather than answers; that hypothesis formulation is the critical point in the research process; that affective states are influenced by redundancy or uniqueness of information encountered during research; that mood states can be linked to specific stages of the research process; and that personal involvement in the search process increases positive feelings (Kuhlthau, 1993). As this summary suggests, a key for

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7This aspect of Dervin's approach is troublesome: the days of waiting for users to appear in the library are over. However, this is an early article, and Dervin's work has demonstrated many times that nontraditional holistic approaches to users are valuable.
Kuhlthau is the affective state of the user during the research process.

In observing and studying students in several studies over many years, Kuhlthau defined a series of stages that describe the research process, and she has linked these stages with their accompanying emotional states and behaviors. (These stages she then links to "zones of intervention," which I discuss later.) This work shares with Dervin an emphasis on the importance of understanding the processes people go through in seeking information. Kuhlthau differs from Dervin, however, in her emphasis on the experience of students who are assigned research papers. As we have seen, Dervin's process stages (situation-gap-uses) are generic and apply regardless of whether the user is a blood donor or nuclear scientist and regardless of the specific need. Kuhlthau's approach is not generic, and I suspect that corporate research scientists, for example, have a different approach to research and experience somewhat different affective states during the process than students do. Kuhlthau, however, has done an extraordinary job of applying both theoretical constructs and the results of her multiple experiments to a practical system of library service that offers an alternative to the traditional tool and system-oriented approach. In this, she stands alone.

Summary

Belkin, Taylor, and Kuhlthau are each working to expand our understanding of the user's information needs. Belkin actively seeks to model cognitive activity in individual users through exploring the problem state and matching it to retrieval systems; Taylor seeks to understand how specific environments (including the physical setting, the types of information sought, and the nature and characteristics of problems) affect information seeking in different groups; and Kuhlthau identifies stages of research where intervention on the part of information professionals can help users both identify and resolve their information needs.

There are several reasons for examining Belkin, Taylor, and Kuhlthau in relation to Dervin's model. First, their work lends strong support to the belief that we are presently engaged in putting together a constructivist model that marks a significant break with the past. Second, because this model is still in the process of development, individual theorists have significant differences of opinion, and they approach this alternative paradigm from different backgrounds. We must therefore pay careful attention to the ways in which their thinking differs. Third, and most important, Belkin, Taylor, and Kuhlthau offer an opportunity for supplementing Dervin's model. Kuhlthau in particular suggests ways in which a user-centered, constructivist approach to information can help transform the day-to-day practical operations of a library.

Interpreting the Sense-Making Model in an Information Service

If Dervin's theory is to be really useful, it needs to be interpreted for library settings. Dervin has been of some help in focusing on the application of her theory (e.g., Dervin, 1977, 1983; Dervin & Dewdney, 1986), and some selected instances exist of what seem to me truly user-centered approaches in specific library activities, but I have found no attempt to construct an information service based on the sense-making model. What follows is an initial (and incomplete) attempt to suggest some ways in which selected areas of the library might modify or change their approach to library services by incorporating ideas implicit in the sense-making model.

Changes in specific services will be clearer if we first look at the ways in which we now approach services in general. In a corporate research library, for example, we ask questions such as "What information needs do the scientists have?" "What services do they want?" "What kind of information resources do they need?" "How can we help them use our collection and online catalog more effectively?" Such questions center on information as an external commodity to be fitted to users. The general approach they reflect is basically system-oriented or what Dervin calls "information-oriented" rather than user-centered.

A sense-making framework for specific services generates a series of new questions: "What did the user come to understand or find out as a result of, for example, a literature search?" "How did the user construct a new sense of his problem?" "What library resource served as impetus?" "How did the user find the information useful?" Such questions focus on determining how information helped or why it did not. They will help us understand the basis on which the library is or is not helpful to the individual in various specific encounters, involving reference, literature searching, cataloging and the other main services of a library (Dervin, 1976, pp. 20–24).

Before information professionals look at specific services, they need to consider the purpose of the library and to develop a mission statement that reflects a user-centered perspective. In a pharmaceutical research library, for example, a mission statement based on a constructivist model could include facilitating problem-solving. Problem-solving is a large part of what corporate scientists do in a pharmaceutical company. As Taylor (1991) suggests, the professional work group of the user creates a large part of the environmental context in which information needs develop. The facilitation of problem solving, however, is definitely not the current mission in pharmaceutical libraries. Most information centers see their role as providing access to information. Providing access implies a mediating role between users and information sources. Facilitating problem solving, by contrast, implies a more direct involvement in a process of understanding that is occurring in users. And as Durrance (1988) points out,

Well-focused services that require contact between a librarian and a client group within the context of a
problem environment are likely to change the public's perception of the librarian as information specialist. Such services move the librarian beyond answering the isolated reference question and into the role of a professional visibly helping the client solve problems ...

Reference Interview

One of the most obvious places to begin to examine user needs is at the point where users approach information professionals: the information desk. According to Dervin, a major purpose of library research must be focused on the question of how libraries can intervene usefully in individual sense-making processes. Since the individual user of the library cannot be predicted in advance, the librarian cannot be expected to have a perfect system match ready and waiting for each unique user. The librarian can be aware, however, of alternative strategies for interacting with users ... (Dervin, 1977, p. 29).

Staff at the Information Desk know the difficulties of successfully negotiating an interview with a user who is seeking information. While some requests are simple and/or straightforward, others are not. It is important in a user-centered, constructivist model, as Kuhlthau points out (1993, p. 236), to distinguish between the two types of requests; using complex techniques to probe simple information requests is both annoying to the user and a waste of time. Yet some requests are very broad (articles on diabetes in children) when in fact something quite specific is desired (drug therapies); other requests are very specific (a textbook on entomology) when something entirely different is needed (termite control). Still other requests are vague, ambiguous, or incomplete. It is particularly important to understand a user's sense-making process in situations when an information need is ambiguous; the ambiguity indicates that an information need is poorly understood not just by the information professional but by the user.

A user-centered approach to reference, as well as to other information services, has at its core the assumption that it is the information need (rather than wants or demands) that should be addressed. This distinction between wants and needs has been argued in the literature for at least 20 years, without much progress. In thinking about how to understand and create a user-centered information service, I find the following basic concepts to be most useful:

1. Information needs are not necessarily the same as information wants or demands (Green, 1990). This has major implications for how we explore information needs with users in order to determine systems and services we should provide.

2. Information needs are often ambiguous and not easily articulated (Taylor, 1968). We need to acknowledge that often the only way users can articulate what they need is after they see it; that is, they can recognize something that satisfies an information need even though they don't know what to ask for (Miller, 1960, p. 170).

3. Ambiguous information needs—as a particular class of information need—are poorly understood by users and by information professionals alike. Understanding and clarifying ambiguous information needs should be a primary goal of information professionals.

Ambiguous Information Needs (AINs)

Ambiguity is not a state most people enjoy. Research scientists, faced with a problem they are not sure how to resolve, will try different approaches: focusing on the problem, avoiding the problem, working out possible approaches on paper, talking to a colleague, cleaning out files, and so on. What too rarely seems to happen, however, is a trip to the library or information center.10

Information centers are traditionally used most frequently either when specific information is required or when a broad introduction to a new area is desired. This is understandable: when an information need is ambiguous, it is also difficult to communicate. The thought of explaining something that you don't have a good grasp on—and explaining it to a near stranger (the information professional)—is an obvious deterrent. While no studies specifically address this point, the fact that users are unlikely to come to the information center is suggested by Taylor (1968) in his description of the first two stages of question-negotiation.

How would a user-centered information service deal with the problem of ambiguous information needs? There are several possible approaches.

In a pharmaceutical library, for example, where facilitating problem solving was an accepted goal, it would be valuable to provide scientists with assistance earlier in the development of their information need, at the stages when the need is not well-defined. If ambiguous information needs are not being presented to information professionals in formal settings, we will have to go to the scientists in their labs and in informal settings, encourage them to talk about research problems they may be encountering, and find opportunities to help them clarify their needs. Dervin and Dewdney (1986) have proposed "neutral questioning" as an effective way of identifying the user’s information need during the reference interview; similar techniques can be used in less formal settings. Their approach involves using questions which are open-ended but also structured around the three parts of the sense-making model: questions about the situation (can you tell me a little about how this problem arose?); about the gap (what are you trying to understand about “x”?); and about the uses (if you could have exactly the help you wanted, what would it be?). The approach is based

See, for example, Green (1990) for a recent summary of distinctions among wants, needs, and demands.

10 Although we have no figures on how many research scientists come to the information center with AINs, a recent study prepared for the 1991 Faxon Institute (1991) examining chemists, geneticists, and computer scientists reported that of 1,161 information encounters (“any use or acquisition of information, ideas, or data” relating to their work), 31% involved library use.
on Dervin’s theory and has been taught successfully in numerous workshops.

Kuhlthau offers yet another user-centered approach to the reference encounter, helpful regardless of whether the need is ambiguous or relatively clear. She identifies stages of research (selection, exploration, formulation, collection, and presentation) and suggests what type of intervention is appropriate at each level. She calls these levels “zones of intervention” and argues that a type of intervention appropriate for one zone will be inappropriate for another. The types of intervention are defined both for reference and for bibliographic instruction. By analyzing the questions received from users, the information professional aware of the constructivist model can “diagnose” what specific intervention activity is most appropriate.

Literature Searching

Relevance of literature searches have long been evaluated through measures of recall and precision. Relevance of this type has often been determined (by librarians or users themselves) primarily on the basis of the match with the topic being searched (Miller & Tegler, 1986). In a user-centered service, the idea of “pertinence” rather than relevance would be paramount. As Harter distinguishes the two terms, pertinence

is a subjective, private “creation of new knowledge” by the requester in the context of a personal information need. In this sense, relevance is not a property of a document and a request, but is the property of a document and a requester. (Harter, 1984, p. 114).

This description of pertinence clearly epitomizes the constructivist information seeker that Dervin has described and suggests that pertinence should be reintroduced as a measure of search success.

Indexing/Cataloging

Classification schemes and thesauri are highly structured representations of knowledge. They are by no stretch of the imagination user-centered or individualistic. Library services in the traditional technical services area (usually described as cataloging, acquisitions, and serials) at first seem to offer little room for user-centered modifications short of completely reconceiving how knowledge is to be represented. The type of information that is indexed would need to be radically expanded. In archival document collections, for example, the subject of documents is not the only area of interest to researchers. Why the document was issued may be important; the context in which the document was created may matter; the author’s motives, beliefs or values may be most significant. The creation of indexing categories that reflect the context of the document is an example of how indexing can be made more relevant to user needs (see Blair, 1990, 1992; Dervin, 1983). In fact, there are some obvious and effective changes possible that at least take account of the user even if they are not fully user-centered.

One such change might begin by considering when it is that technical services staff have contact with the user. Such contacts invariably involve tracking down items: missing issues, books still in cataloging, items not on the shelves, etc. Designing an easy way for users to check on and retrieve missing items would be a good step forward. The ability to indicate quickly that an item is missing and needed would at least minimize time spent hunting through the library. While this change may seem obvious, tracking systems for acquisitions and cataloging are usually designed for the staff in acquisitions and in cataloging. In some systems, such information is still not available to the users; in others, the tracking information may be accessible, but it is not presented to the user in an easily interpretable format.

Another user-centered approach is to look at the results of cataloging and indexing in order to expand the inherent limitations of these services. It is well-known that indexer consistency is low (e.g., Bates, 1986). As Blair (1986) points out, indexer inconsistency is rivaled by the user’s inconsistency in selection of search terms. This fact is lamented in the literature because (until quite recently) the primary goal of information systems was to “target the desired information through perfect pinpoint match on the one best term” (Bates, 1986, p. 361). The ideal of the perfect match, however, has little point in the context of sense-making, where the user is constantly constructing and reconstructing reality as information is being processed and created. Bates suggests that systems should instead be designed to

show searchers a wide range of descriptive terms and thereby implicitly educate them on the need to produce variety. Do not worry about whether any one term is the best to search with; rather, get the searcher in the habit of using a number of terms . . . or at least exploring various terms until the most descriptive ones are found . . . (p. 361).

This suggestion may sound as if we are still trying to get the user to match the system, but it is in fact based on the idea that associative patterns are the basis of human thinking: a stimulus triggers any number of potential connections, some more strongly, others less strongly. Bates’s approach is an attempt to help users activate their brains when searching and to follow the natural patterns of human thought. By contrast, the user’s most common approach under the traditional model is to guess what specific term(s) the system wants: in other words, to think like a machine—or, more accurately, to think like an indexer choosing preselected language to be manipulated by a machine.

Systems

Systems design is the most obvious place for pursuing a user-centered approach. The term “user-centered” may have come, in fact, from the work of Norman and Draper (1986) on systems design. Though the authors do not specifically
define the phrase "user-centered system design," they pursue a pluralistic approach grounded in cognitive psychology to exploring what goals and needs users have, what tools they need, what kind of tasks they wish to perform, and what methods they prefer to use. The interpretation of these questions through the variety of approaches encompassed in their book provides a rich resource of system designs that can be considered "user-centered."

A clear understanding of the term user-centered is particularly necessary in systems design: without such a focus, it is difficult to know what kind of user to design a system for. Users may be painfully naive or highly skilled and sophisticated in their knowledge of systems. Which user do you design for? One approach in dealing with the issue of how “user” is defined is to focus less on the user and more on what the user is trying to accomplish. Blair (1990) places the central focus of system design on the activity that the users are engaged in. While his approach is certainly user-centered, it is focused on a single activity—the activity that the information-searching supports. Wilson (1973), in his discussion of situational relevance, suggests that the ideal system would decide for each item of information in its database (through a rigorous and logical process) whether or not it was significant and situationally relevant for the particular user.

User-defined feedback about the relevance of citations or of documents as they are retrieved offers a different approach to user-centered systems design. This approach acknowledges that while users may not be able to express the basis on which they make decisions, they nonetheless can recognize what is or is not relevant. Tague (1989), for example, describes an interesting approach to incorporating the user’s feedback into online public access catalogs (OPACs). She describes a system that takes words from user queries that succeed in retrieving relevant items and adds successful words to the bibliographic record for those items. A related approach is taken by experimental systems that employ profiles of users to act as a template in selecting appropriate articles. As the user’s need changes, the profile can be altered to reflect new interests. Several systems (such as OKAPI) incorporate the user’s relevance assessments into a reformulated search and retrieval.

Carroll and Rosson (1987) embrace the differences in users and focus directly on addressing the users’ conflicting cognitive and motivational strategies in using systems. They see users as production-oriented, unwilling to spend a lot of time learning systems, and taking action even when they have little to go on. People try to apply what they already know when interpreting new situations, and unfortunately they often apply incorrect or inadequate knowledge. For example, many people who grew up with typewriters assume that the computer works like a typewriter except for a few new keys. Carroll and Rosson suggest designing systems that assume people will respond to new situations with preconceptions based on prior knowledge and then looking at methods to minimize the damage.

The approaches discussed here all attempt, in different ways, to place the user at the center of the system: the system is designed around what is known not so much about systems as about users. A major advantage of the approach of Carroll and Rosson is that it incorporates into library and information studies some of the principles of human cognition and behavior that we can learn from the discipline of psychology.

The User

Ironically, one serious problem facing information professionals in implementing a user-centered information service is the mindset of the user. I do not refer to the often-discussed problems of user status, including users’ misunderstanding about what information professionals can do and limited knowledge about libraries. I am talking about their attitudes toward information and information seeking. Users developed their attitudes toward information seeking. Users developed their attitudes toward information in the same way everyone else did—they attended school, were assigned papers, and went through the messy process of doing research. As a result, they often tend to view information as something external and objective: out there, somewhere. They, too, feel that there is a right answer for their information need—it’s just a matter of finding it.

Dewdney (Dervin & Dewdney, 1986, p. 508) points out that librarians, when sense-making theory is explained to them, see the constructivist sense-making model as “intuitively reasonable.” But most information professionals don’t see information and information seeking in this way without having it explained. Students in a public library or scientists in a corporate research library are even less likely to consciously adopt a constructivist approach to information seeking. Scientists especially have been trained in the highly ordered, linear scientific method, even though as Harter (1984) suggests, an orderly, linear process is not always rigidly followed. Objective, definitive, factual information is usually the goal.

Two points are useful to consider when thinking about the mindset of users: (1) users generally operate out of the traditional paradigm; and (2) their total behavior doesn’t always reflect this limitation. That is, while users approach information in a highly ordered manner, their response to

11 According to Norman and Draper (p. ix), user-centered system design was the name given to the human–machine interaction project at the University of California, San Diego to coincide with the University’s acronym (UCSD).

what they find indicates the presence of an intuitive, fluid, affective, nonlinear process of understanding. For example, when conducting a literature search, users frequently change direction based on what they find, select articles that have no apparent strong relevance, and generally reflect the real-estate maxim that buyers are liars.\(^\text{14}\) They don’t know exactly what they want, and users who think they know will often be very happy with something quite different. The shifting focus indicates that a constructive process is taking place during which the information need is significantly refined. As the need alters, what constitutes appropriate information to resolve that need is also changing.

Over the past 15 years, the validity of measures of user satisfaction in regard to services and systems has been questioned (e.g., Bates, 1977; Cochrane, 1981; Whitlatch, 1990). One reason why users seem to be generally satisfied with what they find is that, based on cumulative experience with research and with libraries, they have come to expect relatively little. If users saw information as something constructed, their criteria for satisfaction might be different. They would understand that the concept of a “right answer” is not the only way to approach information-seeking and that information often helps to define and clarify the need, not simply satisfy it. After all, most people were satisfied with black-and-white televisions before they were introduced to color. Typewriters satisfied a great many people before they learned about word processors. The change to a constructivist approach may well create satisfaction which users presently cannot imagine.

Decision Making and the Need for Clarity

Research in psychology can help us better understand the cognitive processes and associated behavior that might underlie a constructivist approach. For example, in libraries, as everywhere else, we move in an environment that is uncertain and ambiguous. Every day we face the need to make decisions based on incomplete, obscure, or inaccurate information. And we make them: we drive in fog or blinding rain, trusting that our sense of the road will not betray us; we begin essays, develop opinions, pursue a line of reasoning even when we are not sure where we are going. We do these things because we are driven to act, and the alternative to action feels worse. The need to make quick decisions based on the most likely interpretation of incomplete information is what William James (1892) described in emphasizing our attraction to “the probable and the definite.” Sometimes we are wrong. The large, beige creature turns out to be a pile of dry leaves shifting slightly in the twilight breezes. When we act with incomplete information, even using our best guess as to what is most likely, what we gain in speed we sometimes lose in accuracy.

Few of the decisions we make in a library, of course, are matters of life and death. But some are, especially in medical or legal settings, and we are still governed by the need to make sense of our environment, and to do so quickly. The importance of quick, effective access to information thus highlights the need for a user-centered approach that takes account of the two fundamental cognitive-based processes indicated by the terms “question negotiation” and “knowledge transfer.”

Question Negotiation

Unless it is verbalized or transmitted in signs, an information need is knowable only to the person who has it. Wherever it takes place, question negotiation is normally a verbal process crucial in clarifying information needs. It is likely that question negotiation takes place more than once: initially in the tentative, private struggle to clarify an ambiguous need and later in the public process of communicating the need to either a system or another individual.

Question negotiation has aroused considerable interest from many directions and in many disciplines. Fields such as philosophy, linguistics, semantics, sociology, psychology, information science, education, and computer science have attempted to analyze and understand the processes involved. To a large extent, these different fields have developed theories and approaches in isolation from each other (Graesser & Black, 1985). One aspect of question negotiation especially relevant in a user-centered, constructivist approach involves understanding how questions are related to cognitive structure.

Questions are generated from existing cognitive structure: they have to come from somewhere. The act of asking a question appears to be very effective in “activating the relevant portions of this preexisting cognitive structure” (Kaplan & Kaplan, 1983, p. 184). When we activate specific portions of our cognitive structure, the brain has a relevant place to put the new information that comes in the form of an answer. This is one reason why we remember answers to questions we ask more easily than we remember other kinds of information. Yet when we ask questions our preexisting cognitive structure must be in some way incomplete, and the dilemma created by our incomplete understanding is further complicated by the need to communicate publicly a sense of what it is we don’t know. As LaFrance (1992, p. 23) puts it, questions occasion the telling of stories rather than the furnishing of answers.

The Process of Knowledge Transfer

One of the major stumbling blocks to successful communication is our frequent inability to present information in a way that can be understood and assimilated. Even under ideal circumstances, when two individuals want to

\(^{14}\)The apparent low relevance of some articles selected by users may be explained by the difference between topical (subject) relevance (which is clearly apparent to the searcher) and some other sense of relevance. But it is precisely those other understandings of relevance that are indicative of the “dynamic, situational” nature of the constructivist activity (Schamber, Eisenberg, & Nilan, 1990).
understand each other, interest and enthusiasm are no guarantee of success. In a situation where a research scientist and an information professional attempt to reach a mutual understanding of the scientist's information need, additional complicating factors come into play. Some key features of this difficult interactive situation have already been touched on: the way in which new knowledge is integrated into existing cognitive maps; the desire for clarity; and the role of questions in activating cognitive structure. Now we must add two other concepts important in knowledge transfer: information capacity and expertise.

(a) Information Capacity. There is only so much information that we can absorb at one time. How much we can absorb is to some extent dependent on how much we already know about what is being presented. With a lot of preexisting cognitive structure for a topic, much of what we hear will be familiar and easily assimilated. We then easily pick out pieces of information that are new and place them within our existing knowledge. If we know little about a topic, we quickly begin to feel overwhelmed. We have little existing cognitive structure on which to append these new concepts or ideas.

The limit of our capacity to hold information in active memory is usually described as five, plus or minus two “chunks” or units of information (Mandler, 1975). As we become more expert in a field, the chunks can represent greater amounts of information. This limitation is not as frightening as it sounds: even novices find ways to remember additional things by grouping several concepts under a larger category (you then have to memorize only the larger category) and allowing vivid examples to stand for complex concepts.

(b) Expertise. Research scientists and information professionals are both experts. (Whether information professionals are perceived as expert is another issue.) Being an expert means possessing extensive knowledge and very sophisticated cognitive maps in specific subject areas. Being expert, however, also seems to limit one’s ability to transmit information to others. Part of the difficulty is that once experts understand an idea they seem to regard it as familiar and obvious. They assume that everyone else understands it. If experts often appear rigid and intractable in their ideas, it is because they see the “right answer” so clearly that there is no need for additional information. They tend to use specialized vocabularies and to consider individuals outside their specialty naive.

Three rather surprising aspects of expertise are discussed in a study by Kaplan et al. (1989). Their extensive review of the literature led them to conclude: (1) that experts are not expert by virtue of some generic problem-solving skill, but only in their knowledge of a particular content domain; (2) that the way in which experts initially perceived a problem is what distinguishes them from novices: how they proceed after the problem has been set up was not significant; and (3) that expert knowledge is “abstract, schematic and often inarticulate.”

When experts attempt to explain the process by which they come to their conclusions, they frequently resort to logical or rule-based explanations even though the process they had actually gone through was clearly intuitive and not understood by them (Kaplan et al., pp. 33–34). An expert, such findings suggest, is someone not intrinsically well-suited to communicating ambiguous needs.

The picture of the individual that emerges from these studies in psychology holds complex implications for a user-centered, constructivist model of information. Humans are, by their nature, contradictory: drawn to make quick decisions that reduce uncertainty but struggling to understand clearly enough to make a good decision; striving for order, but enjoying the intellectual challenge of disorderly facts and unconventional ideas; needing the familiar, but craving the risk of the unknown; unable to express what is needed, but nonetheless perpetually asking questions; highly knowledgeable but unable to transfer that knowledge. This is the user whom we wish to serve.

Obviously, developing a user-centered information service for such a complicated creature will not be easy. Nor will such a change solve all problems, revolutionize services, or eliminate unforeseen economic and social challenges to libraries. The full impact of a user-centered approach can only be imagined at this point. It will take time to understand and implement the changes required by the new paradigm. Meanwhile, one thing is certain. A truly user-centered service will require a new understanding—both by information professions and (ultimately) by users—of the very nature of information and of information seeking. A new understanding, however, is not impossible to achieve. Armed with a clear understanding of Dervin’s sense-making theory, fortified by examples of how such theory could be applied in different areas of the library, and chastened by a cognitive psychology that takes a realistic view of the strengths and weaknesses of human beings in information-seeking situations, we can begin to reconceive how information services might become a far more powerful and effective tool for information seeking in a changing information environment.

References