

A Comparative Study of Two Paradigms in Information Retrieval: Centering on Newer Perspectives on Users

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1. Introduction

It is a strongly held belief that we can find some functional similarities among communication, education, and information science research. The most common factor is that all three related areas share the characteristics of “transferring meaning from the sources of the information to the recipients,” or “giving meaning to another person in a communicative interaction.” In all areas we often hear that first, in

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communication, a communication system should be “recipients-controlled,” and second, in education, an education system should be “learner-active,” and third, in information science, an information system should be “user-centric.” In psychology and linguistics, we can also notice a tremendous shift in focus. We believe these fields, together with philosophy, provide us with a proper philosophical, conceptual and methodological framework.

A fundamental philosophical issue and conceptual and methodological considerations are raised from the literature in these areas for this paper. A paradigm shift in education, linguistics, psychology, and communication in general, and in information science in particular, is discussed. Relevant work from all these areas has been chosen and the relationship of this work to the information sciences, in particular, to retrieval processes, is considered. Special care has been taken to identify some problems with the traditional best matching paradigm in concept interpretation, in text representation, and in the searching process. This paper also surveys communication-based techniques that employ browsing and feedback methods to support the searcher.

2. Call for a Paradigm Shift

The essence of the scientific method is that it involves a continuous interaction between observation and conceptualization, each influencing the other and, in the process, generating an increasingly differentiated, integrated, and accurate model of the world.¹⁾

1) Epstein, S. & Erskine, N. The development of personal theories of reality from an interactional perspective. In D. Magnusson & Vernon L.A.(Eds.), Human development : An interactive perspective. (pp. 133-147). New York, Academic Press, 1983.

Our understanding of the world develops not only incrementally, in a manner corresponding to what Kuhn refers to as “normal science,” but also through abrupt reorganizations, in a manner corresponding to what Kuhn refers to as “scientific revolutions,” or paradigm shift.²⁾

A paradigm is a way of looking at the phenomena we are interested in, shared assumptions which govern the outlook of an epoch, and its approach to scientific problems. In its broadest sense a paradigm stands for the entire constellation of beliefs, values, theories, models, and techniques, shared by the members of a given scientific community to legitimize what they are doing or to give direction to their inquiries. Kuhn³⁾ notes that it is usually not long after a paradigm is abandoned by the scientific community that a new paradigm gains acceptance. Often what is involved is reorganization, or “gestalt switch,” where old, familiar data are no longer viewed in the same manner as previously. Paradigm shifts in the natural sciences occur infrequently, are partial, accepted reluctantly, and then not by all scientists. In physics, Galileo, Newton, and Einstein stand out as initiators of paradigm change. In short, our paradigms influence the way in which we conduct our research, the data we collect and classify, and the models and techniques we adopt to facilitate comparison and analysis.

2. 1 Paradigm shift in Psychology

The three dominant paradigms or approaches in 20th-century psychology are introspectionism, behaviorism, and cognitive psychology.

2) Kuhn, T. S. *The Structure of Scientific Revolution*. Chicago : University of Chicago Press, 1970.

3) *Ibid.*

Martindale⁴⁾ discusses these three approaches. He explains that at the beginning of the century, psychology was dominated by the introspectionist approach. Introspectionists held that the proper subject matter of psychology is the study of consciousness or mental processes. Many of the methods employed by the introspectionists were subjective. Introspection involves an attempt to observe one's own mental activities as they occur.

Behaviorists, led by Watson, objected to the subjective and unreliable nature of introspection. Behaviorism stated that the goal of the science of psychology ought to be the study of behavior which can be measured objectively by any observer who cares to do so. Unlike mental events, which are private, behavior is public. Hence there is no problem in obtaining reliable observations. Maltzman⁵⁾ recognizes value judgments in science in that "bodies of knowledge are inextricably influenced, related, and set in one direction or another by value judgments, by volitional decisions that are neither true nor false." In this regard, Reichenbach⁶⁾ introduces a similar concept, volitional bifurcation, which is a decision that leads to divergent systems. Volitional bifurcation involves the most fundamental aims or goals a science may adopt.

Introduction of a volitional bifurcation represents a revolutionary change based upon a value judgment, since it is a decision concerning the aims or goals which science ought to adopt. Maltzman located this

4) Martindale, C. *Cognition and consciousness*. Homewood : IL, The Dorsey Press, 1981.

5) Maltzman, I. A neo-pavlovian interpretation of the OR and classical conditioning in humans : With comments on alcoholism and the poverty of cognitive psychology. In G Davey(Ed.), *Cognitive processes and pavlovian conditioning humans* : ch8, (pp. 213-249), 1987.

6) Reichenbach, H. *Experience and Prediction*. Chicago : University of Chicago Press, 1983.

revolutionary shift in psychology in what is called Watson's behavioristic revolution. He continues that "behaviorism rests upon a value judgment that the purpose of psychology is to provide an explanation of behavior in terms of conditions and laws that are physical in nature." Its goal is to explain the behavior in question. Theoretical concepts in behaviorism that refer to events that are not directly observable are entirely legitimate; a deliberate decision is made to limit oneself only to environmental variables and observable behavior.

Behaviorism rested upon a decision made, and adopted, by a large number of psychologists. It determined the future direction of psychology. Maltzman claims that "a current movement back towards mentalistic psychology (cognitive psychology) in similar fashion is not based upon the falsification of behaviorist aims." Skinner⁷⁾ also concurs. However, the behavioral paradigm, which emphasized the importance of observable behaviors of stimuli and response, often seemed inadequate to explain complex information seeking behavior.⁸⁾ Chomsky,⁹⁾ Bruner,¹⁰⁾ and others seriously challenged the validity of the behaviorist paradigm. They refocused concern from external observable behaviors to the internal information-processing mechanism of the human mind.

In this, cognitive psychology represents something of a return to the historical subject matter of psychology, since it asks questions concern-

7) Skinner, B. F. Cognitive science and behaviorism. British Journal of Psychology, 76, (1985) 291-301.

8) Sprague, G. A. Cognitive psychology and instructional development : Adopting a cognitive perspective for instructional design programs in higher education. Educational Technology, 21(2), (1981) 24-29.

9) Chomsky, N. Syntactic Structures. The Hague : Moulton, 1957.

10) Bruner, J. S. The process of education, Cambridge, Mass. : Harvard University Press, 1960.

ing the nature of consciousness and of mind. This movement is also called a revolution because it is said to have overthrown behaviorism. The cognitive psychologist is in full agreement with the introspectionists that the proper subject matter of psychology is mind rather than behavior. Especially in the education field, in his 'Learning as a Generative process' Wittrock emphasizes cognitive aspects of learning in that:¹¹⁾

Within the last decade or so, educational psychology has again been very much involved in producing a paradigmatic shift in the study of human learning. The current welcomed shift is toward cognitivism, toward reinstating the learner, and his cognitive states and information processing strategies, as a primary determiner of learning with understanding and long-term memory.

In information science also, scholars such as Ingwersen;^{12) 13) 14)} Belkin;¹⁵⁾ De May;¹⁶⁾ Hollnagel;¹⁷⁾ Wilson;¹⁸⁾ Ellis¹⁹⁾ emphasize these

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- 11) Wittrock, M. C. Learning as a generative process. Educational Psychologist, 11(2), (1974) 87-95.
 - 12) Ingwersen, P. Search procedures in the library-Analysed from the cognitive point of view. Jouranal of Documentation, 38(3), (1982) 165-191.
 - 13) Ingwersen, P. Psychological aspects of information retrieval. Social Science Information Studies, 4, (1984) 83-95.
 - 14) Ingwersen, P. Modern indexing and retrieval techniques matching different types of information needs. International Forum on Information and documentation, 14(3), (1989) 17-22.
 - 15) Belkin, N.J. The Problem of 'Matching' in information retrieval. In H.J. Dietschmann(Ed.), Representations and Exchange of Knowledge as a basis of Information Processes (1984) (pp.187-197). B.V.(North-Holland) : Elsevier Science Publishers.
 - 16) De Mey, M. The relevance of the cognitive paradigm for information science. In O. Harbo and L. Kajberg(Eds), Theory and application of information research(pp. 48-61). London : Mansell, (1980).

cognitive aspects of information science research.

2. 2 Shift in Linguistics

Wilson²⁰⁾ states that “much work needs to be done on the relation between concept formation and indexing.” We need to learn the human communication process from linguistics as well. This process teaches that language is the “spectrum from thought through speech.”²¹⁾ We are interested in, for the purpose of information retrieval, to say the least, first, how one understands that which is articulated (spoken or written), and second, how one acquires meanings of concepts. In this perspective linguistics helps information scientists and communication scientists in formulating the basic frameworks.

Bivins²²⁾ briefly introduces a shift in linguistics, which is similar to the shift in psychology. Bivins introduces the old “Object-Referent” model first, then she presents the “behaviorist approach.” Lastly she proposes a Chomskyan cognitive development viewpoint. In discussing the relationship to information science, she contends the universality of

17) Hollnagel, E. The relation between intention, meaning and action. The analysis of meaning. *Informatics*, 5 (1978).

18) Wilson, T.D. On user studies and information needs. *Journal of Documentation*, 37 (1), (1981), 3-15.

19) Ellis, D. The effectiveness of information retrieval systems : The need for improved explanatory framework. *Social Science Information Studies*, 4 (4), 1984 261-272.

20) Wilson, T.D. The Cognitive Approach to Information-seeking behaviour and information use. *Social Science Information Studies*, 4 (2) (1984) 197-204.

21) Bivins, K. Concept Formation : The evidence from experimental psychology and linguistics and its a relationship to information science.

In O. Harbo and L. Kajberg(Eds.), *Theory and Applications of Information Research*. Proceedings of the second International Research on Information Science, 3-6 August 1977, Royal School of Librarianship, Copenhagen. London : Mansell, 1980.

22) *Ibid.* p.71.

the concept in that :

It has long been recognized that dividing 'knowledge,' for example, into main classes is an arbitrary process. but this writer fears that the use of facets, the development of integrative levels, and of relational operators, is not much better. Ranganathan was correct in noting as the first of his three planes of classification that the 'idea' plane is paramount. But in order to use 'ideas' or concepts as the basis for classification, one must know the process of concept formation. This cannot be done, in my opinion, by sitting down, albeit with a group of subject experts, and forming facets either through semantic factoring, or by any other still arbitrary means. Which of us can say that the elements of a word or concept are universally 'x' and 'y'?

3. Philosophical and Conceptual Considerations

The purpose of inquiry in social science is to provide a valid, reliable picture of human behavior. One of the most fundamental philosophical assumptions for any study of human behavior is the assumption that characterizes the nature of the phenomena of interest. In library and information science, early attempts at examining user behaviors used models "borrowed from the exact sciences." The phenomena of interest in the exact sciences (e. g., physics, chemistry, etc.) are what Carter has called "single-step" entities.²³⁾ His definition of these phenomena is that they remain at rest or in motion until some external force changes their state. These phenomena are passive; they have no observational

23) Carter, R.F. Discontinuity and Communication. Paper presented at East-West Center Conference on Communication Theory. Honolulu, HI. 1980.

or movement capability of their own. In contrast Carter talks about “multi-step” entities as the phenomena of interest to social scientists. Multi-step entities have both observational and movement capabilities that are essential to their continued existence and are therefore necessary foci for inquiry into their behavior.

Information is traditionally seen from the objectivist’s point of view in that it presupposes a notion of information as having an existence which is independent of, and external to, thought. In his “objective knowledge,” Popper²⁴⁾ divides the universe into three:

World 1 comprises physical objects, World 2 the world of subjective, mental states, and world 3 of objective knowledge – that is, of the content of World 2: theories, ideas, concepts, artistic creation, and even the products of animals, structures like spiders webs and birds’ nests.

World 2 is thus responsible for creating the stuff of World 3, yet once created, this objective knowledge has its own volition: it is independent; it has its own ontological status. In his view, knowledge, once recorded, can carry the thoughts of its author across time and space.

According to Rudd,²⁵⁾ if Popper’s third world model is accepted, then information is seen to inhere in things (books, problems, theories, etc), which people may or may not understand. This is an essentially passive conception of information. On the other hand we have a much more dynamic concept of information which says that it is meaningless to speak of information divorced from people. It becomes knowledge only

24) Popper, L. *Objective knowledge : An evolutionary approach*.
London : Oxford University Press, 1972

25) Rudd, D. Do we really need World III? *Information science with or without Popper*.
Journal of Information Science, 7, (1983) 99-105.

as the reader imposes meaning on it. Rudd also warns against the Popperians' notion of information which ignores the social context of information.

The objectivist's underspinning of information science is that it leads to an attempt to impose a preferred language, for the purpose of information retrieval. This notion of Popper's World 3, objective knowledge, has been used by a number of writers in library and information science: Brooks,²⁶⁾ Gallina,²⁷⁾ Neill,²⁸⁾ Farradane,²⁹⁾ and Swanson³⁰⁾ incorporated Popper's work into a discussion of the kind of access to recorded information that would best facilitate the growth of knowledge. Since then, in library and information science, early attempts at examining user behaviors used models "borrowed" from the exact sciences(e.g., Shannon & Weaver's communication theory³¹⁾). In doing so, we implicitly incorporated a set of assumptions including the nature of the phenomenon and the nature of reality. These in turn favored limited assumptions about the nature of human beings and the nature of the environments in which users seek and use information.

This is not to criticize Shannon & Weaver, I am merely pointing out that the importation of an exact science model into behavioral inquiry

26) Brooks, B.C. The foundations of information science : part I. Journal of Information Science, 2 (5), (1980) 125-133.

27) Gallina, P. L. Karl Popper's 3 worlds and some considerations for information science. Proceedings of the 11th Annual CAIS Conference, Halifax, May 24-26 (pp.193-203). Perth, Ontario, Canadian Association for information Science.(1983)

28) Neill, S.D. The reference process and philosophy of Karl Popper. RQ, 24 (3), (1985) 309-319.

29) Farradane, J. The nature of information. Journal of Information Science, 1 (3), (1979)

30) Swanson, D.R. Libraries and the growth of knowledge. Library Quarterly, 50 (1), (1980) 112-134.

31) Shannon, C.E. and Weaver, W. The mathematical theory of communication. Urban. Il : University of Illinois Press 1960

contexts has led us to do a disservice to crucial aspects of the phenomena that are the focus of our inquiry. There is nothing wrong with the model, only in its use in library and information science.

Dervin criticizes this notion of objectivism in that:³²⁾

The user's uniqueness was not considered, and it was assumed that packaged information would answer the need: The core assumption (of the traditional approach) is that information exists independent of human action and that its value lies in describing reality, and because information has its own order and organization, diverse citizens must bend to the information in order to use it.

She has depicted the typical information system as a failure, and this failure is attributed to blindness to differences between individuals and how people "make" information. Experts are trying to identify an underlying historical, socio-cultural topic of the information, but only users can place this topic within their own situational contexts.

In her view, experts make judgments as to how their "information" will help.³³⁾ Rudd also foresees this sure failure in that when "information is treated as an objective resource, unsullied by its social context, disaster can only follow".³⁴⁾

In discussing the "Constructivist Theory of Information," Dervin

32) Dervin, B. Useful theory for librarianship : communication not information. Drexel Library Quarterly, 13 (3), (1977) p.20.

33) Dervin, B., An overview of sense-making research : concepts, methods and results to date. presented at : International Communications Association Annual Meeting, Dallas, May 1983. Seattle, Washington, School of Communications, University of Washington. p.25.

34) Rudd, D. Letter to the Editor. Aslib Proceedings, 34 (9), (1982) p.421.

criticizes what has been called a “hypodermic theory of communication” in that: “a source sends a message which is then seen to exist much as a brick exists, if the message hits the target, it ought to have an effect, that is, be understood.” In dealing with the nature of information, Dervin goes on to criticize that :³⁵⁾

information can be dumped into people’s heads as if people’s heads were empty buckets. To make this assumption it must be assumed that information is a thing rather than a construction, that it exists independently of observers and has an inherent, correct, absolute, and isomorphic relationship to the reality it describes.

Taken together, information is not a physical thing which can be moved around from place to place. It is the user who makes ‘information’ depending on the situational and environmental context. Wilson³⁶⁾ explains this concept, which is described by the German word Weltanschauung. Literally translated it means ‘world-view,’ i.e. that view of the world which enables each observer to attribute meaning to what is observed. It may be likened to a filter in the head of an observer which has been formed and is continually moulded by experience, personality, politics, society, and the situation.

Indeed, as Dretske³⁷⁾ claims, “Beauty is in the eye of the beholder,

35) Dervin, B. *Mass Communicating : Changing Conceptions of the Audience*. In : Ruce, Ronald ; Paisley, William eds. Public Communication Campaigns. Beverly Hills, CA : Sage Publications : 1981. p.70

36) Wilson, B. *Systems : Concepts, Methodologies, and Applications*. Chichester : John Wiley & Sons, 1984.

37) Dretske, F.I. *Knowledge and the flow of information*. Cambridge, Mass : The MIT Press, 1982.

and information is in the head of the receiver.” Budd³⁸⁾ also states that “information itself is intrinsically devoid of meaning or relevance or significance. These are characteristics which humans communicationally attach to information, toward some goal or end. Meanings are in people, not in words or in data.” Hollnagel³⁹⁾ also emphasizes subjective aspects of information in that “what the meaning of a text is cannot and should not be based on the concept of ‘truth’ but rather on the concept of ‘intention’ and ‘action’... meaning cannot be considered unless there is an intention expressed in the text and a possibility of validating the interpretation of that intention through action.”

The meaning should therefore be seen as an interaction between the information and the user. Something only becomes information when it is assigned a significance, or interpreted as a sign, by some cognitive agent. In discussing the nature and use of information, Anderson⁴⁰⁾ cites Dretske’s work; a central idea is that meaning is manufactured from the raw material of information. The extraction of meaningful knowledge is the work of suitably equipped cognitive processors. What then goes on, in Dretske’s account, in cognitive processing is a kind of filtering in which structures with higher orders of intentionality are constructed. That is to say that all information, including implied information, other than the chosen interpretation of the incoming signals, is filtered out. Information science has been essentially ignoring the user component of meaning in information system design.

38) Budd, R. W. Limiting access to information : A view from the Leeward Side. The Information Society, 5, (1987) p.42.

39) Hollnagel. *Op. Cit.* p.142

40) Anderson, R.H. Information, systems and the construction of Meaning. International Journal of Information Management, 7, (1987) 181-185.

4. A Comparison of Two Paradigms

Advances in cognitive psychology have replaced the conception of learning, or information seeking with more active information processing in which users interpret incoming information and construct meaning from it in terms of their own base of knowledge, or situational context.⁴¹⁾ Husserl and Dretske's notion of 'intentionality' share this notion. Thus information seeking is not conceived of as "a passive reception of someone else's organizations and abstractions" but actively engaging in constructing or generating meaning from material.⁴²⁾

4. 1 Mechanistic vs. Dynamic Model

Among the basic models of man, two can be distinguished as having special importance for the present discussion: mechanistic and dynamic. These two models use different root metaphors as concepts for explaining human behavior. The mechanistic model takes the machine as the basic metaphor. In this the individual is seen as passive and reactive rather than as an active agent.

Complex psychological phenomena are regarded as being reducible to simple elements or operations. In an analogous sense, qualitative changes are reducible to quantitative changes. Lows remain constant and invariant over time, and strict determinism is assumed. Thus, inde-

41) Jonassen, D.H. Developing a learning strategy using pattern notes : A new technology. Programmed Learning and Educational Technology, 21 (3), (1984) 163-175.

42) Wittorck, M.C. The cognitive movement in instruction. Educational Psychologist, 13, (1978) 15-30.

pendent and dependent variables can be clearly specified. Even though this mechanistic model of man may no longer be accepted explicitly by psychologists as the basic metaphor, it still exerts a strong influence on psychological theory and research.

The major criticism of this mechanistic view, addressing information theory's conceptualization of information and its use by humans, was made by Dervin, Nilan and Jacobson in terms of a challenge to 'traditional' communication research:⁴³⁾

The challenge says that traditionally the field has looked at information as if were a thing, something that existed outside of people and could, thus, be transferred from person to person. In this view, humans are posited as adaptive creatures, computer-like in their information processing strategies. These traditional approaches posit man as an imperfect information processor and measure the discrepancy between what sources they have transmitted informationally and what receivers get.

While information processing has traditionally been looked at as a mechanistic process, social scientists and communication researchers are coming to understand that it is instead a cognitive, symbolic, and constructive and interpretive act.

This dynamic model is the converse of the mechanistic model, because it views man as being inherently active and acting upon the environment, instead of being a passive recipient of external stimuli. The model emphasizes that all parts of an ongoing system are interrelated in a complex way. Therefore, it is not always meaningful to maintain

43) Dervin, B., Nilan, M. and Jacobson, T. Improving predictions of information use : A comaparison of predictor types in a health communication setting. Communication Yearbook, 5, (1982) p.807.

the distinction between dependent and independent variables, since an element may be related to other elements in the process both as a cause and as an effect. Moreover, the individual is an organized configuration of parts, with the whole being greater than the sum of the parts and giving meaning to constituent parts.

Early efforts in educational and information technology existed almost exclusively in the theoretical venue of behaviorism or behavioral psychology which technologists have referred to as “the mechanical model of man.” In this model, users were treated as intellectually passive receptors and encoders; information was presented to them through a medium; they had little or no input into what was actually retained. Farradane’s conception of human behavior is also mechanical. He considers information objective, and humans, if their thinking processes are accurate and in good working order, will all process information as determined by the originator.⁴⁴⁾

4. 2 System’s Approach vs. User-Centric Approach

As Dervin and Nilan⁴⁵⁾ see it, the basic problem with most of the extant research is that it is conducted in terms of the system rather than the user, and that what is studied is confined to the point of intersection between user and system. Rosenberg⁴⁶⁾ was also concerned that the computer (machine) had become the basic metaphor for his discipline, information science.

44) Farradane, *op. cit.*

45) Dervin, B. & Nilan, M. Information needs and Uses, Annual Review of Information Scienced and Technology, 21. (1986) 13-33.

46) Rosenberg, V. The scientific premises of information science. Journal of the American Society for Information Science, (1974) 263-269.

He expressed concern that the mechanical, reductionist view of humanity actually hindered a fundamental understanding of information from the human point of view. For him, a telling example was the effect of computerizing criminal records. The result was that all persons, even if only accused of a specific crime, were treated alike, regardless of the ultimate outcome of the case. He argued for a more holistic approach to information science in general. Still another telling example is that, to Boolean logic, all retrieved items have the same value, and non-retrieved texts—although relevant—remain unknown for the system as well as the user.

The traditional approach has also been criticized for being “rigid” and “non-humanistic.” It is not sufficiently comprehensive to deal with the variety of users. It has been suggested that the efficiency of a system is often considered more important than the individuals within the system. For example, the expert’s ideal behavior (e.g., in Human Interaction with a Computer) determines the best set of commands. User errors are then treated as a problem for the model rather than in their own right.

In fact, a user’s actual behavior is meaningful and legitimate in its own right. Indeed, there has been a great deal of attention to the user in traditional approaches, but with different methodology and emphasis.

The proposed newer perspective turns this around; researchers try to get some picture of reality from the user’s point of view. This is the phenomenologist’s point of view. The phenomenologist views human behavior as what people say and do, as a product of how people interpret their world. The primary distinction between past studies and this newer perspective is the philosophic and methodological focus on users.

We have also learned over the past dozen years or so that the user is

an active, learning-participant in the system and can no longer be treated as an unvarying constant—an assumption implied in most of the earlier work. As users interact with the various components of a system (including training materials, intermediaries, preliminary output, on-line tools, etc.), their understanding of their problem changes. By not taking this factor into account, earlier work in information science may have failed to assess the full effect of the system on the user and may have used an inadequate criterion for system performance. Indeed, the individual's communication behavior should be seen as dependent on past experience and the specific situational conditions perceived by the individual. In this sense, Grossberg emphasizes these creative qualities:⁴⁷⁾

The individual is neither an isolated consciousness nor merely an actor within a context of interactions. It is an organism constantly related and oriented to its environment and hence, it is the locus of particular interpretive processes by which that orientation is accomplished. Meanings are not located within some privileged domain of consciousness but are toward which the individual is oriented. Thus 'reality' is constituted in a continuous process of interpretation by which the individual makes sense of and acts in the world.

In this regard in the education field, Wittrock also emphasizes individualistic, active learning in that:⁴⁸⁾

In cognitive models, learners have active roles in instruction and a new

47) Grossberg, L. Does Communication Theory Need Intersubjectivity? Toward and Immanent Philosophy of Interpersonal Relations. Communication Yearbook, 5, (1982) 171-205.

48) Wittrock, M. C. The cognitive movement in instruction. Educational Psychologist, 13, (1978) p.26.

responsibility for learning. They are not passive consumers of information, and learning does not occur automatically when teachers give out the information they are to learn, they still must discover its meaning.

4.3 Methodological Comparison

One of the significant consequences of the revolutionary changes in information science is the recognition, first of all, that information should not be seen from the objectivist's point of view (or should be seen as intersubjectivity) and, second, that human beings react to information in complex ways, not as designers thought they would do. It is obvious that we need to elaborate on the methodological distinctions between the traditional paradigm and the alternative paradigm.

The purpose of 'method' in inquiry is to facilitate observation of the phenomenon of interest. In other words, researchers are attempting to get a picture of the phenomena that is as clear and valid as possible. In user studies, observation instruments (i.e., questionnaires, interview protocols, experimental situations, etc) have been operationalized taking the complete set of traditional philosophical and conceptual parameters implicitly into consideration. For example, if no consideration is given to the perception by users that their needs, reality, and information can change over time, then the central role of time passing is left out of methodological considerations. The resultant observations in user studies reify the system rather than clarify user behaviors.

At this point, we have central methodological considerations. First, because human beings behave in the context of changing time and space, we need methods that are deliberately oriented to user perceptions rather than a priori system constraints in the observers'

value orientations. In traditional user studies, these considerations have been either ignored completely, ignored because they were perceived as being too complex to manage, or only dealt with superficially. From the alternative perspective these considerations are fundamental.

Dervin's "situation → gap → use" model incorporates these considerations. She describes her model from the perspective of an individual travelling down a "road" in his/her mind, —a cognitive road that represents the individual's perception of his/her environment at a particular point in space and time (i. e., situation). Some aspects of the perceived environments that are unclear or uncertain are referred to as "gaps" in the road. The individual knows where s/he is heading (i. e. , his/her goal or objective), but perceives the gap as needing to be bridged before s/he realizes his/her objectives.⁵⁰⁾ Information is whatever the user sees as enabling him/her to continue to move down the road. Therefore, information use is defined as whatever the individual sees as bridging the gap.

Another group of authors also claim some methodological changes. Paisley⁵¹⁾ commented upon "*a productive entente*" between information science and behavioral science, it still seems that research into users' information behavior suffers from two abiding problems, one of which is a heavy dependence upon 'positivist' or 'scientific' approaches using the mail-in, self-completed questionnaire to collect information which can easily convert machine-readable data to produce statistical results.

49) Dervin(1983). *op. cit.*

50) Carter calls this phenomena a "discontinuity" ; Belkin, Oddy and Brooks call it an "Anomalous State of Knowledge(ASK)" ; Taylor calls it a "problem situation"

51) Paisley, W.J. Information Needs and Users. In : Caudra, C.A., Ed. Annual Review of Information Science and Technology, 3. Chicago ; Brittanica, 1968.

Mick, Lindsey and Callahan⁵²⁾ also criticize a heavy dependence on the mailed, self-completed questionnaire. With this in mind, Wilson conducted a Project INISS (“Information Needs and Information Services in local authority Social services departments”) Mintzberg⁵³⁾ provided a methodological background for this approach. Wilson⁵⁴⁾ calls these research methods a paradigm shift. He believes that “this shift has been necessary given the increasing concern for ill structured (soft) problems to which there are no such things as ‘right,’ or optimized, answers.”

Wilson⁵⁵⁾ calls for qualitative research in information science. Indeed we need this methodology, but we can’t discard quantitative methodology. There is a place for both quantitative and qualitative methods in the inquiry into user behaviors, sometimes both in the same study. Sometimes we might need multiple operation of the methodology.

I would argue this battle is really a non-issue and is largely the result of tension between humanists who react unfavorably towards mechanistic models of human behavior and the propensity of traditional researchers to inappropriately use numbers (e. g., using interval level statistics on ordinal level data). What we need again is to find the most appropriate ‘tools’ available for an individual study.

Kaplan⁵⁶⁾ illuminates this notion in terms of his discussion of the “law of the instrument.” The example he uses is that of a young child who

52) Mick, C. K., Lindsey, G.N. and Callahan, D. Toward usable user studies, Journal of the American Society for Information Science, 30 (5), (1980) 212-222.

53) Mintzberg, H. The nature of managerial work. New York : Harper, 1973.

54) Wilson, B. *op. cit.* p.64.

55) Wilson, T.D. The cognitive approach to information-seeking behaviour and information use. Social Science Information Studies, 4 (2), (1984) 197-204.

56) Kaplan, A. The conduct of inquiry : Methodology for behavioral sciences. New York : Chandler, 1964.

is given a hammer. The child finds everything s/he encounters needs hammering. The implication of this goes beyond the over-use of a particular method. An observational instrument conceptualized in the context of single-step phenomena (e.g., hammer) is fundamentally inappropriate for multi-step phenomena. A hammer might work well on nails but a hammer won't work on human beings. The 'hammers' employed in user studies are system oriented at the philosophical and conceptual levels and totally inappropriate at an observational level.

5. Problem with Matching Paradigm of the Traditional Approach

As discussed, in the traditional approach, information is seen from the objectivist's point of view and seen from the 'mechanical model of man' of the behaviorists. An information system is intended to get 'relevant' information to users, to satisfy their information needs. This is essentially equivalent to giving "meaning" to another person in a communicative interaction. In this, the main purpose is a best match between the users' queries and document surrogates. This model has been very productive, and has promoted our understanding of information retrieval in many ways.

Some scholars, however, raise the problem of 'matching' in information retrieval and propose an alternative approach in system performance.^{57) 58)} Oddy, for instance, has designed an interactive system whose purpose is not to retrieve all and only the relevant documents in

57) Belkin, N.J. & Croft, W.B. Retrieval techniques. Annual Review of Information Science and Technology, 22, (1987) 110-145.

58) Oddy, R.N. Reference retrieval based on user induced dynamic clustering, Ph.D.thesis, University of Newcastle upon Tyne, 1974.

the system, but rather to allow the system-user a browsing capability without having to formulate any specific request.⁵⁹⁾ Swift, et al.⁶⁰⁾ also criticize the 'aboutness' model as a serious oversimplification of the retrieval process with consequences which will become increasingly apparent and unacceptable. Ingwersen⁶¹⁾ also criticizes the exact match principle or technique as a "system-driven" viewpoint which is implemented with Boolean logic and in which searching for information entails a reductivity in our way of understanding and practicing IR. These are well known and well documented.⁶²⁾

As will be discussed, moreover in the social sciences area, this model does not work as well as the designers might have assumed it would. We need alternative approaches to transfer information from knowledge resources to the users in need. Information seeking under the traditional paradigm assumed that humans reason logically as depicted in formal systems of logic.

Information retrieval systems were designed around Boolean algebra, using formal systems of reasoning. It is assumed that with instruction, humans can use these systems comfortably. This traditional paradigm of information retrieval research, where document descriptions are matched with carefully formulated queries is inadequate to describe unfocused information seeking, such as browsing.^{63) 64) 65)} Bates and

59) Oddy, R. N. Information retrieval through man-machine dialogue.

Journal of Documentation, 33 (1), (1977) 1-14.

60) Swift, D.F., Winn, V.A. and Bramer, D.A. 'Aboutness' as a strategy for retrieval in the social sciences. *Aslib Proceedings*, 30 (5), (1978) 182-187.

61) Ingwersen, *op. cit.*

62) Bookstein, A. Probability and fuzzy-set applications to information retrieval. *Annual Review of information Science and Technology*, 20, (1985) 117-151.

63) Ellis, D. Theory and explanation in information retrieval research. *Journal of information Science*, 8 (1), (1984) 25-38.

Ingwersen, among others, have discussed the exact matching paradigm. They touched upon the interpretation problem, which is essentially a problem of meaning, in text representation as well as for the user of the intermediary mechanism.

As we discussed in terms of the nature of information and a model of man, Swift et al.⁶⁶⁾ also criticize the matching paradigm, especially in the social sciences, in that:

Information science has accordingly built upon the hard view of users and information. Standard procedures are required of users in searching. In this way matching has become established as the method of retrieval. Indeed, retrieval is often defined as matching. Similarly, because retrieval is thus defined, agreed upon definitions of concepts become necessary conditions for retrieval. Concern for appropriateness takes the form of imposing hardness, drawing boundaries, and so on, even if arbitrary. In other words hardness has come to be regarded as a pattern to which all subject fields should be made to conform.

Marchionini and Shneiderman also raise an issue in the same vein, as they state:⁶⁷⁾

...their analysis usually focuses on the facets of a request for infor-

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- 64) Bates, M.J. An exploratory paradigm for online information retrieval. In B.C. Brooks (Ed.), Intelligent information systems for the information society (pp. 91-99). Amsterdam, North-Holland:Elsevier Science Publishers, 1986.
- 65) Bates, M.J. Subject Access in Online Catalogs: A design model. Journal of the American Society for Information Science, 37 (6), (1986) 357-376.
- 66) Swift, D.F., Winn, V.A. and Bramer, D.A. A sociological approach to the design of information systems. Journal of the American Society for Information Science, 29 (3), (1979) p.216.
- 67) Marchionini, G. and Shneiderman, B. Finding facts vs. browsing knowledge in hypertext systems, Computer, 20 (1), (1988) 70-80.

mation, not on the problem that motivated the question or the possible application of the answer.

Another criticism comes from sociologists; in their conclusion they also call for a new indexing scheme :⁶⁸⁾

an adequate indexing system should provide an opportunity for the user, through interaction with the system, to construct his own perspectives. Information scientists will note that this position is very different from the matching process assumed by the majority of existing systems in which a user's orientation and the system orientation are seen as being explicit, explicable and compatible.

One of the problems of the matching paradigm could be, as McAlesse⁶⁹⁾ claims, the way in which personal knowledge structures are often at variance with public knowledge structure, for example in databases.

In this, 'experts' knew what was best and, by extension, users were the problem, particularly when the field turned toward information retrieval. Still another problem is, as discussed, really a conceptual issue focusing on the difference between prescriptive information use and information as it is used by human beings, especially in the humanities and social sciences. Under the shifted paradigm, the anchoring point is indeed the user. Current studies in cognitive psychology have provided

68) Watson, L.E. Sociology and Information Science. Journal of Librarianship, 5 (4), (1973) p.281.

69) McAleese, R. Some problems of knowledge representation in an anchoring environment: Exteriorization, anomalous state meta-cognition and self-confrontation. Programmed Learning and Educational Technology, 22 (4), (1985) 299-306.

some empirical evidence about natural human reasoning. Humans form mental models and manipulate these models to analyze problems.

6. Alternative Paradigm for Information System Design

Traditionally, research has focused on observable externals rather than cognitive internals. The importance of this internal processing in information science has been stressed.^{70) 71) 72)} This is what is missing in the behavioral model of learning: "The missing conditions are to be sought within the individual," rather than in the external environment. The cognitive approach to 'information behavior' centers upon the idea of meaning. As we will see, all alternative approaches proposed about the construction of meaning are based on an individual's situation specific information seeking. In this Thomas Wilson states :⁷³⁾

meaning is involved not only in all aspects of information generation, transfer and use, but also in the way people define themselves, their lives and their action. The cognitive approach, therefore, draws attention to the need for a bridge between the meanings of everyday life and the information that may have relevance for everyday life. In this sense, of course, 'everyday life' is different for every person.

The following 5 approaches have been proposed as alternatives.

70) Ingwersen, P. Online man-machine interaction facilities: A cognitive view. In H. J. Dietschmann (Ed.), Representation and exchange of knowledge as a basis of information processes. B.V., North-Holland: Elsevier Science Publishers, 1984.

71) Wilson, T. *op. cit.*

72) De Mey M. The Cognitive Paradigm Dordrecht: Reidel, 1982.

73) Wilson, T. *op. cit.* p.197.

These are, in one way or another, based on the assumption of the non-objective nature of information, user-defined, situation-specific, dynamic, individualistic information seeking.

6. 1 User-Modelling Approach

According to Ingwersen⁷⁴⁾ the crucial problem of retrieval is to interpret the user's request for information by building up a model of the actual information problem situation interactively. This notion, it is hoped, incorporates patterns of user behavior (e.g., types of information problem, or need which depends on the user's cognitive conditions, goals and expectations in the actual problem solving situation) into methods of organizing information and information system design, which the field has not yet accomplished. He presents three types of information needs:

1. verification information problems, i.e., the user wants to verify or locate specific items -e.g., a list of employees.
2. conscious topical information problems, i.e., the user wants to clarify, review, or pursue a subject area, including retrieval of facts within a known subject matter.
3. muddled topical information problems, i.e., the user wants to explore some new concepts or concept relations outside the known subject matter.

He insists that each type ought to be treated differently by the Information Retrieval system, in particularly by the intermediary mechanism. The main ideas behind the proposals are to improve the re-

74) Ingwersen(1989). *op. cit.* p.21.

trieval effectiveness of smaller local information systems by enhancing the representation of knowledge imbedded in texts. He presents a table representing the relationship between types of information needs and IR techniques.

6. 2 Hypertext Systems Approach

Hypertext systems are an approach to information management in which fragmented or chunked information is stored in a network of nodes, connected by links. Since an individual's knowledge structure is unique, based upon his or her own set of experiences and abilities, the ways that individuals prefer to access, interact with, and interrelate information is also distinct. Many authors especially call for this new paradigm of information retrieval. In the humanities field, Smith⁷⁵⁾ argues that the multi-dimensionality of information is perfectly suited to a nonlinear structure like hypertext. Hypertext can make it easier and faster to find things and absorb ideas. Instead of having to specify specific keywords or search strings, you simply browse through a database by jumping from link to link.⁷⁶⁾ Indeed, with the advent of powerful microcomputers, graphics software and communications technologies, Vannever Bush's "Memex" dream⁷⁷⁾ is becoming reality.

Hypertext systems differ from existing on-line information retrieval systems, in that they encourage informal, individualistic, information seeking strategies.^{78) 79)} It seems to be a heuristic as opposed to a linear

75) Smith, K.E. Hypertext-Linking to the future. Online, 12 (2), (1988) 32-40.

76) Shneiderman, B. and Kearsley, G Hypertext hands-on!: An introduction to a new way of organizing and accessing information. Reading, Ma: Addison-Wesley, 1989. ix.

77) Bush, V. As we may think. Atlantic Monthly, 176 (1) (1945) 101-108.

78) Marchionini and Shneiderman. op. cit.

approach to information retrieval, and thus more in line with “natural” information seeking behavior.⁸⁰⁾ Vandergrift notes that hypertext offers an opportunity to both add to the meanings a reader brings to a text and to track the nature of queries inspired by a text. Mick, et al.⁸¹⁾ also claim the notion of hypertext systems in that “we feel information-producing and-seeking behaviors are closely linked and that one reason most information systems are not better accepted is that they fail to provide linkage between the two activities.” They cite Bush’s Memex as an application of this linkage concept. Conklin⁸²⁾ also introduces the concept and some applications. Croft and Turtle⁸³⁾ introduce a number of approaches to the integration of query-based retrieval strategies and browsing in hypertext networks.

6.3 Berrypicking Approach

Bates⁸⁴⁾ suggests some possibilities and conceptual designs of information retrieval systems that more fully reflect actual searching behavior. She explains the limitations of “the matching paradigm” of traditional information research and proposes the “exploratory” paradigm, or recently her “berrypicking” techniques.⁸⁵⁾ The point is, as she

79) Larson, R. Hypertext and information retrieval: Towards the next generation of information systems. Proceedings of the 51st Annual Meeting of the American Society for Information Science (1988) (pp. 195-199). Atlanta, Georgia, October 23-27, 25.

80) Borgman, C. L. and Henstell, B. Hypertext-What’s in a Name. Bulletin of the American Society for Information Science, (1989) 5 (5), p.22.

81) Mick, et al. *op. cit.* 212-222.

82) Conklin, J. Hypertext: An introduction and survey, Computer, 20 (9), (1987) 17-41.

83) Croft, W., Bruce and Turtle, H. A retrieval model for incorporating hypertext links. Hypertext '89 Proceedings. (1989) 213-224.

84) Bates, M. J. (1986) *op. cit.* 91-99.

85) Bates, M. J. The design of browsing and berrypicking techniques for the online search interface. Online Review, 13 (5), (1989) 407-424.

asks, "why [is it] necessary for the searcher to find a way to represent the information need in a query understandable by the system?" In other words, why must we be forced to be "good.?" We've been forced into the system.

She also notes that human beings have two kinds of information needs: a need for goal oriented information for carrying out goal defective behavior; and undefined needs for new information that we don't yet know we need. She notes that no mapping exists for the second type of information. To obtain the second type of information, people randomly expose themselves to information, and their behavior cannot be programmed because it is "random and unpredictable." In the second type of search, the process of searching for information is more important than the match between user information need and document.

6. 4 Multi-Model Approach

Many authors discuss a fundamental problem in indexing and classification in the social sciences and propose a solution.^{86) 87) 88) 89)} The problem is that different people have different ways of 'carving up' the literature. Consequently they see different things in documents. Their differing views of documents must all be indexed if they are not to miss relevant material. Established methods of indexing are based on the assumption of a single way of 'carving things up,' consequently

86) Watson, L.E. *op. cit.* p. 270-283.

87) Swift, D.F., Winn, V.A. and classification. International Classification, 4 (2), (1977) 90-94.

88) Broxus, P. F. ASSIS: Applied Social Science Information. International Forum on Information and Documentation, 14 (1), (1989) 8-11.

89) Brittain, J.M. Information and its users: A review with special reference to the social sciences. Bath: Bath University Press, 1970.

they are inappropriate in the social sciences. Indeed, the authors point out that not only do human beings not behave in machine-like ways, they also have a variety of different interpretations for the same "piece" of information.

In this regard, one could choose the word "window." While we may agree on its spelling and upon its location in a house, it may mean a source of light if we are in a dark room; it may mean an escape route if we are in a burning room. The topicality of the word "window" (i.e., spelling, location, etc.) is only one half of the relevance of information-in-use: what it means to the individual or how that individual uses a "window" in a particular situation is the "comment." Note that topicality can remain constant, but "comment" attributions change over time. Because comment attributions are a perception of the user, what researchers need to focus on is the user's cognitive comment behavior in the context of time and space.

The alternative approach is, as Swift et al. described, a 'multi-modal' approach which is similar to the discussion of "topicality" and "comment" .⁹⁰⁾

Crudely, the principle is that we describe material systematically from a range of different standpoints, which are then made explicit in the organization of the index. The point of organizing the index according to standpoint is that documents are interrelated in complex ways.

In theoretical terms, they see themselves as having rejected an objectivist position. At the same time, they avoid a slide into relativism by adopting what may be called a pluralist position. Those holding an

90) Swift et al. *op. cit.* p.90.

objectivist view of knowledge will tend to assume that denial of the selfevident nature of document subject matter entails operating in terms of users idiosyncratic views of the world. Consequently in the social science field, Swift et al. argue that "information systems must operate in the social sciences as they are, rather than as we think they ultimately will or ought to be. The variety and multiplicity of views of the world cannot be ignored."

6. 5 Expert Systems

In terms of dynamic, active, non-linear information retrieval, expert systems have a leading role to play. Expert systems increasingly moved into the library and information field, both as a tool for library applications such as technical services and reference, and as a potential information medium. Indeed, as an information medium, expert systems offer not only new ways of storing and retrieving information, but also the potential for the stored information to take on a dynamic rather than a passive role, which is a potentially very attractive characteristic of the medium. The professionals involved in creating expert systems have targeted skills increasingly needed to be developed among their cadre, some of which dramatically overlap with long standing interests of library and information professionals.

Expert systems are used to create tools which can assist in many functions, those which are part of the library's ongoing functioning and those which involve the skills of the information professional whether or not in a library. Major areas which could be used in library and information science fields are, in the first category: cataloging, indexing, database searching, and the reference function; and in the second category: knowledge representation, knowledge acquisition, the user

interface problem, and information problem solving and search strategies. To remain comprehensive information professionals within a society which makes increasing use of these new technologies, librarians and information scientists must recognize and be aware of expert system applications as potential tools for aiding in library processes.

7. Summary

By pointing at the decline of behaviorism and the rise of cognitivism, an attempt has been made to distinguish between the two different approaches to behavior. In the traditional approach, reality is unchanging, fixed, absolute. Human beings are passive. Behavior is said to be linear, mechanistic, bricks of information, which can be moved around from place to place, like tossing bricks into an empty basket. However in alternative approaches, reality is not absolute, it is relative and constantly changing. Human beings are active, creative, sense-making beings.

To conclude, each alternative approach is focused on situationality and cognition. Each has moved toward non-objective information assumptions by not demanding that a best match be made by the system to user needs. In fact, traditionally, focus has been on the technical task of acquiring relevant information and making it available to users through low-noise channels. Now, in addition, we have to recognize the cognitive task of generating useful knowledge from that information, knowledge that is adequate for the purpose of the users. We have to build a system which helps users facilitate cognitive process. The success of information services is more likely to

be achieved by adjusting the services to meet the specific needs of an individual, rather than trying to adapt the individual user to match the wholesale output of an information system. Thus, the system based on technology and content-driven should shift to a system that is user-driven, or user-centric.

Given that sort of basic knowledge, it seems we can better understand how to design information systems that may better assist the individual in that process. Systems should be designed to conform to the user's rules, rather than the other way around. Attempts should be made to be congruent with the user's natural way of doing things. In other words, the system should be built on the way human beings are, rather than the way we wish they would be.

Indeed, at a broader level, we make a call for a change in paradigm to one that recognizes the need to incorporate the traditional "third element" (the user) into the framework. The paradigm envisaged is similar to what Dervin and Nilan⁹¹⁾ call for: "seeing people as constantly constructing... understanding information use in particular situations... focusing primarily on the user and examining the system as seen by the users"; or more simply, the user-centric approach.

We need also to develop conceptual models of the user through better understanding of cognitive processes. As Norman put it :⁹²⁾

...it is our duty to develop conceptual models that will aid the learner to develop adequate and appropriate mental models. As scientists who are interested in studying people's mental models, we must develop appropri-

91) Dervin & Nilan (1986), *op. cit.*

92) Norman, D. A Some observations on mental models, In D. Gentner & A.L. Stevens (Eds.), Mental models. Hillsdale, NJ:Lawrence Erlbaum Assoc., 1983. p.432.

ate experimental methods and discard our hopes of finding neat, elegant mental models, but instead learn to understand the messy, sloppy, incomplete, and indistinct structure that people actually have.

Often the behavior does not correspond to the designers' perceived notions of correct behavior. The awareness that users may not share the designers' world view or level of development may, in the end, make a better designer.

Finally, as Sprague concludes "one should not throw out the baby with the bath water."⁹³⁾ Adopting a cognitive perspective does not mean the rejecting of most major elements of the information system design model which was originally built on the traditional paradigm. It does mean incorporating new insights about information users into information retrieval systems, enabling to better accommodate actual user needs.

93) Sprague. *op. cit.*

초 록

정보검색에 있어서 두 패러다임의 비교분석 : 이용자에 대한 새로운 인식을 중심으로

조 명 대*

정보검색 시스템을 대하는 대부분의 이용자의 대답은 '이용하기에 어렵다'라는 것이다. 기계적인 정보검색을 기본 철학으로 하는 기존의 matching paradigm은 정보 곡체를 여기 저기 내용을 옮길 수 있는 물건으로 간주한다. 그리고 기존의 정보시스템은 이용자가 시스템을 구성한 사람의 의도 (즉, indexing, cataloguing rule)를 완전히 이해한다면, 즉 완전하게 질문식(query)을 작성한다면, 효과적인 검색을 할 수 있는 그런 시스템이다. 그러나 어느 이용자가 그 복잡한 시스템을 이해하고 정보검색을 할 수 있겠는가? 한마디로 시스템을 설계한 사람의 의도로 이용자가 적응해서 검색을 한다는 것은 아주 힘든 일이다.

그러나 우리가 이용자에 대한 인식을 다시 한다면 보다 나은 시스템을 만들 수 있다고 본다. 우리 인간은 아주 창조적이어서 자기가 처한 상황에서 이치에 맞게끔 자기 나름대로의 행동을 할 수 있다(sense-making approach). 이 사실을 인식한다면, 왜 이용자들의 행동양식에 시스템 설계자가 적응을 못하는 것인가? 하고 의문을 던질 수 있다. 앞으로의 시스템이 이용자들의 자연스러운 행동 패턴에 맞게끔 설계된다면 기존의 시스템과 함께 쉽게 이용할 수 있는 편리한 시스템이 설계될 수 있을 것이다. 그러므로 도서관 및 정보학 연구에 있어서 기존의 분류, 목록에 대한 연구와 이용자체에 대한연구(예를들면, 몇시에 이용자가 많은가? 어떤 종류의 책을 어떤 계층에서 많이 보는가? 도서 및 잡지가 어떻게 양적으로 성장해 왔는가? 등등의 use study)와 함께 여기서 제시한 제3의 요소인 이용자의 인식(cognition)을 시스템설계에 반드시 도입을 해야만 한다고 본다(user-centric ap-

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proach). 즉 이용자를 중간 중간에서 도울 수 있는 facilitator가 많이 제공되어야 한다.

이용자의 다양한 패턴의 정보요구(information needs)에 부응할 수 있고, 질문식(query)을 잘 만들 수 없는 이용자를 도울 수 있고(ASK hypothesis: Anomalous State of Knowledge), 어떤 질문식 없이도 자유롭게 Browsing할 수 있는(예를들면 hypertext) 시스템을 설계하기 위해서는 눈에 보이는 이용자의 행동패턴(external behavior)도 중요하지만 우리 눈에는 보이지 않는 이용자의 심리상태를 이해한다면 훨씬 나은 시스템을 만들 수 있다. 이용자가 “왜?” “어떤 상황에서,” “어떤 목적으로,” “어떻게,” 정보를 검색하는지에 대해서 새로운 관심을 돌려서 이용자들이 얼마나 우리 시스템 설계자들의 의도에 미치지 못한다는 사실을 인식 해야한다. 이 분야의 연구를 위해서는 새로운 paradigm이 필수적으로 필요하다고 본다. 단지 “user-study”만으로는 부족하며 새로운 시각으로 이용자를 연구해야 한다. 가령 새롭게 설치된 computer-assisted system에서 이용자들이 어떻게, 그리고 어떤 분야에서 왜 그렇게 오류(error)를 범하는지 분석한다면 앞으로의 computer 시스템 설계에 큰 도움을 줄 수 있을 것으로 믿는다. 실제로 많은 방법이 개발되고 있다. 그러면 시스템 설계자가 가졌던 이용자들이 이러이러한 방식으로 정보검색을 할 것이라는 예측과(즉, conceptual model) 실제 이용자들이 정보검색을 할 때 일어나는 행동패턴 사이에는(즉, mental model) 상당한 차이점이 있다는 것을 알게 될 것이다. 이 차이점을 줄이는 것이 시스템 설계자의 의무라고 생각한다.

결론적으로, computer에 대한 새로운 지식과 함께 이용자들의 인식을 연구할 수 있는, 철학적이고 방법론적인 연구를 계속해나가면서, 이용자들의 행동패턴을 어떻게 시스템 설계에 적용할 수 있는 지를 연구해야 한다. 중요하게 인식해야 할 사실은 구 Paradigm을 완전히 무시하라는 것은 아니고 단지 이용자에 대한 새로운 인식을 추가하자는 것이다.

그것이 진정한 User Study가 될 수 있는 길이라고 생각하며, 컴퓨터와 이용자 사이의 ‘원활한 의사교환’이 필수불가결한 지금 우리 학문이 가야 할 한 연구분야이다.(Human Interaction with Computers)