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User Meaning in Interpersonal and Technology Mediated Information Need Specification

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"Users' meaning in interpersonal and technology mediated information need specification"

Abstract

This study examined interpersonal information seeking interactions between a user and a source person (e.g., reference librarian, advisor, etc.) and analyzed users' articulations of information need. The central conceptual framework was the concept of topic and comment from the Prague functional linguistic notions of the two necessary dimensions of any linguistic meaning. The objective was to gain insight into the linguistic meaning of users' information need by exploring the functional roles of topic and comment employed in their articulation of need. A total of 28 user-source interactions were recorded to generate transcripts of the interactions and then users were interviewed to obtain user explanations of the meaning of recorded utterances from the interactions. The utterances were content analyzed, clearly showing the essential roles of topic and comment in such interaction. Results showed that topic functioned to describe a subject area briefly as a set of discrete keywords which appeared in the early stages of the interaction. Comment functioned to elaborate what users knew about their need specifying elaborations of context well beyond topic. The discussion here focuses on the utility of comment for the topic-dominant information search technology and system design. Topic has long been considered the main criterion in information organization and retrieval systems which has been carried over to search engines. According to topic-based information search logic, content can be represented as topical terms or keywords to be matched with user query terms. Comment, on the other hand has been neglected in information search logic even though it is the other essential dimension of meaning. The role of comment is seen as a *necessary* complement to the specification of the user meaning and functions to contextually situate the topical elements which define a more specific concept of the user's information need.

Keywords: Information seeking, Information retrieval, Topic and comment

Introduction

In an abstract sense, information seeking is an interpersonal, linguistic interaction between a user and a source person where the user is seeking information from the source about a problem, situation, or need that the user perceives. The interaction involves linguistic articulations geared towards creating (or negotiating) the meaning associated with the user's information need and information resources to address that need. The meaning of information is communicated to the source person and the source person provides information resources based on his or her understanding of the user's need. This is done through language - linguistic attempts to arrive at a mutual understanding of the user's need, which is embedded in the utterances of the user and the source person.

Current information search technology such as Internet search engines and information retrieval systems are based on the keyword matching principles where a document is represented as a "bag of words" in the surrogate (i.e., index) as a list of words appeared in the text without any semantic relationships among them (Croft et. al., 2009). In the keyword matching paradigm, a user's query is searched by the individual term occurrences rather than their semantic meaning. The topical keyword or "aboutness" of a document is the only criterion for document representation and for user query formulation. The intention of this paper is to examine the evolution of meaning (or "negotiating") of a user's information need articulation in an information seeking interaction by utilizing the paired linguistic concepts of topic and comment rather than topic alone so that implications of human interaction can be drawn into the information systems to improve technology mediated information seeking (1).

Conceptual background

The notion of topic and comment originated with the Prague functional linguists (e.g., Jakobson, 1963) as the two *necessary* components of any meaningful expression. Both topic and comment are essential dimensions of human perceptions of the ontological conditions necessary to form a coherent and meaningful description of the user's information need. The concept of topic and comment were proposed as two distinct and observable dimensions inherent in the articulations which constitute information seeking behaviors (Nilan, 1992).

"Topic" refers to the aspect of the user's situation or a problem about which the interaction is focused as specified by the user, i.e., *what* the user is talking about (Van Dijk, 1979). When the notion of topic and comment applied to information science, topic was emphasized as a relatively static and generic theme of the whole text to represent the universal conceptual idea of the text and became the dominant aspect of document classification (Begthol, 1986). The institutionalized information systems such as the major library classification schemes are an extended manipulation of topic-based representations and have provided the conceptual basis for topical access to information resources in the retrieval system as well as for the physical location of materials in the library (Larson, 1992).

The topic-based matching as the underlying assumption in information retrieval logic (Belkin, 1980; Green & Bean, 1995) is also the logic behind full text approaches to retrieval although specific distinctions between the *functions* of topic and comment are ignored (2). In information seeking, topic is an aspect (e.g., keyword) that a user employs to specify *what* the user is talking about rather than how the topic relates to the user's need. The keyword matching conception has been criticized for its uni-dimensional and generic characterization of topic in the field of information science (Tuomenen, et. al., 2003; Froehlich, 1994; Park, 1994) but term matching has remained the major criterion in representing user meaning. There is clearly a semantic similarity to notions of keywords (e.g., subject) currently at the fore of conceptualization of the "aboutness" of both user queries and the ways we have organized information resources for information retrieval (e.g., search engines).

Comment addresses those aspects of the user's situation which are more specific to the user's context for seeking information such as the problematic conditions which gave rise to the information need (e.g., WHY the user perceives the information need), conditions optimally desired by the user once the situation is resolved (e.g., what things would be like AFTER resolution), the potential or envisioned utility of the information (HOW the information sought can help the user address his/her situation), etc. (Dervin & Dewdney, 1986) described how information use (for example) clarifies how the information helps the user do or understand something that is simply not captured in topical representations of the user need. While not invoking "comment" *per se*, their use of information use clearly functions as comment. In essence, comment elaborates on what it is about the topic that is problematic or in need of clarification and attempts to articulate perceived situational conditions much more specific than mere elaborations on topic -- comment provides insight into the nature of the information sought that cannot be specified by topic alone. In order to explore the comment dimension the user utterances need to be further elaborated for establishing user meaning (Jakobson, 1963; Nilan, 1992).

Unfortunately, with the exception of the few instances noted above, the notion of comment has not been pursued by existing retrieval paradigms, perhaps because it has been seen as too complicated or irrelevant). We must note also that comment carries with it an epistemological requirement that the user's meaning is the focus (i.e., is user-based) as opposed to the assumption that the content itself (as represented by the procedures inherent in any particular retrieval mechanism) is sufficient. By better understanding the functional role of comment, we hope to provide some insight that will lend itself to incorporating comment into existing retrieval approaches or that will facilitate the development of new approaches. This will certainly engender more complex man-machine interaction than mere term matching.

In this study, the paired concepts of topic and comment were empirically examined for their function in specifying user meaning in the context of information seeking interaction as a means to analyze patterns in the user's linguistic articulation of information need. In our view, the user behaviors associated with information seeking are attempts to share both cognitive and communicative meaning inherent in the user's information need. At the cognitive level, the user creates a representation of his or her information need in terms of his/her cognitive state of knowing or not knowing something. Given the flood of content generated through the global electronic network, most of which is noise with respect to any individual query, more precise specification of user need would seem to be necessary to help precision AND recall. Information seeking encompasses the user's need to satisfy the cognitive state of uncertainty (not knowing) which is in contrast to certainty (knowing). To help frame our examination of the functional role of comment in specifying users' meaning, we also incorporated the concept of what users know (certainty) and what they don't (uncertainty). In a face-to-face context, the user's need is communicated to the source person and information is searched and sought as a result of iterative linguistic exchange of meaning. Functionally, we see this scenario as the ideal because it provides for negotiation of meaning as opposed to mere term matching. Face-to-face communication is a linear exchange of utterances, the linguistic meaning of information and need is addressed by topic and comment in sequence at different stages of the information seeking interaction. In this sense, "information seeking stage" was devised as another conceptual variable to help analysis of the topic and comment employment.

Objectives

The goal of the study is to expand our understanding of information seeking as a behavior through the concept of topic and comment with an eye towards their function of specifying user meaning in information seeking situations. In particular, we want to identify functional characteristics of comment in contrast to topic and to articulate the ontological notion of topic and comment and the role of each in information seeking and retrieval in order to provide insights into improving upon the current topic-centered system logic.

Data gathering

The study adopted a user-based epistemological approach to understand user meaning of information need in the natural settings of interpersonal interaction of information seeking. Topic and comment were analyzed with other conceptual variables inherent to information seeking interaction: The user's cognitive state of certainty and uncertainty; the information seeking stages in the interaction process; and the functions of comment.

Topic was operationally defined as any elements of user description that point to what the user's problem was about or terms specifying what the information would be about. Comment was defined as any elements other than topic that the user perceived as useful in specifying his/her meaning. The user's certainty and uncertainty in information seeking was defined as what users knew and what they were aware as not knowing, respectively. The information seeking stages consisted of the sequential temporal patterns in users' need description, the source's understanding of that need, the source's information providing and user's subsequent use of the information provided (Yoon, 2002; 2007). The categories of the functions of comment were inductively derived from the content analysis of user utterances to further explore the comment dimension by examining its function in the interaction.

For data collection, university students' information seeking was chosen as a context of information seeking interaction. Respondents were recruited from the university libraries' reference desks and at a graduate school's academic advising and career planning services at Syracuse University (3). We assumed that the *functions* of linguistic behaviors were similar across individual differences and employed a convenience sampling strategy.

However, the information seeking situation certainly impacts which functions might be employed so we looked at two contrasting settings: one with reference services and the other with the actual content given. A total of 28 interactions were observed. Of the 28, thirteen were from advising and fifteen were from the library setting.

The data gathering began by tape recording users and sources as they naturally interacted with each other. The interactions were transcribed and used in the subsequent user interviews and content analysis. Users were “debriefed” by having them elaborate on and explain their own utterances in the interaction with the sources. This debriefing interview was also recorded to facilitate content analysis. The transcripts of the interactions were first unitized into individual utterances as a unit of analysis. The unit of analysis focused on seeking empirical evidence of the concept (i.e., topic and comment) at the interaction-level rather than at the more micro sentence-level. An utterance was operationally defined as a single turn of speaking by a user or a source person in the interaction. Sometimes, for example a unit encompassed several literal “turns” which served merely to clarify a single idea before the other person responded to the idea.

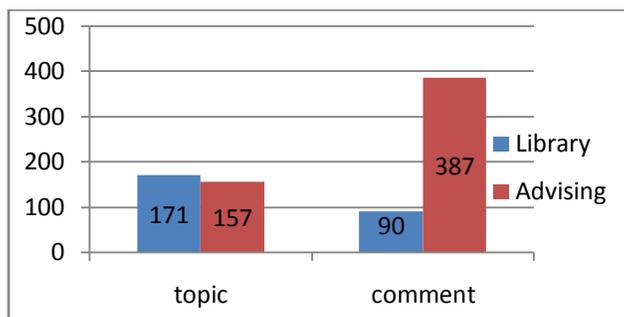
Coding of utterances was carried out for each of the conceptual variables of the topic and comment, the certainty and uncertainty, and the information seeking stage. The coding decision was based on the user meaning or the communicative thrust from the user’s perspective rather than any textual or syntactic structure. The communicative thrust was determined by employing both the transcripts from the original user-source interactions and the transcripts of the user debriefing to reduce ambiguity (4).

Data analysis and results

Topic and comment in utterance counts

The initial analysis compared frequency counts of utterances employing topic versus comment. The frequency of utterance was taken as a crude measure of the overall employment of topic and comment in users’ articulations. Figure 1 shows the frequency of utterances as either topic or comment in the two settings (Yoon, 2002). Comment was more frequent in advising settings where it occurred as a series of utterances rather than a single utterance to elaborate on the user’s perception of self and of the information-seeking situation. Topic was seen slightly more in the library setting. Informally examining the length of the utterances in the transcripts, topic utterances tended to be short and brief whereas comment utterances were longer, seemingly due to elaborations.

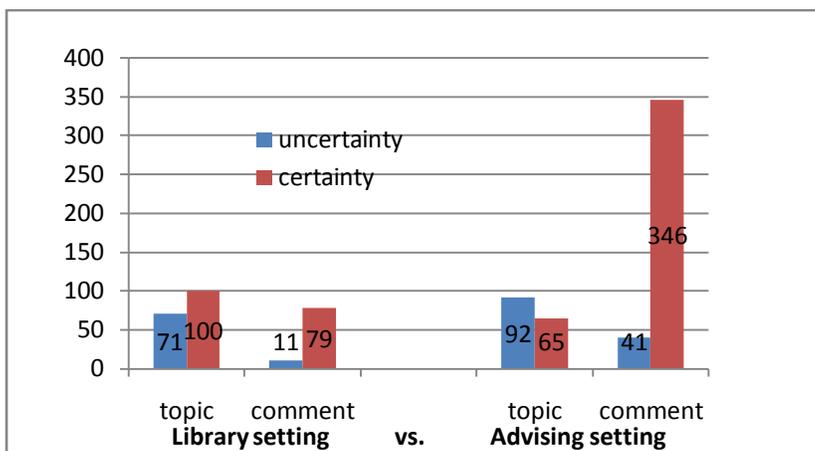
Figure 1. Topic and comment by frequency count in different settings



Topic and comment in relation to uncertainty and certainty

Next we looked at the distribution of topic and comment relative to the user's certainty and uncertainty. This was to see whether and how topic and comment were related to articulating a user's certainty and uncertainty states. Comment was mostly related to user's certainty: 87.8% in the library setting and 89.4% in the advising setting. The distribution of topic into certainty and uncertainty ranged between 41.5% and 58.5% in the library setting and between 58.5% and 41.5% in the advising setting. Figure 2 shows the frequency counts of utterances of topic and comment in relation to the user's certainty and uncertainty (Yoon, 2002). Overall, comment was clearly employed to express known aspects (i.e., certainty) of a user's information need or information need situation.

Figure 2. Topic and comment by uncertainty and certainty in different settings



Topic and comment in relation to IS stage

Next we looked at the distribution of topic and comment by information seeking stage. Information seeking stage was an ordinal variable that was inductively derived from a standard content analytic depiction of the activities that occurred in a similar time sequence as the interaction progressed. Table 1 shows the list of information seeking stages that described the temporal and logical progression of an information seeking interaction (Yoon, 2007).

Users began the interaction with a specification of topic (i.e., "Initial need description"). This was often followed by a further elaboration of the topic (i.e., "Subsequent description"). Comment utterances most frequently occurred later on in the user's need description in conjunction with the user's certainty through specification of their information need. In other words, users tended to start their interaction by pointing to the topic-uncertainty utterances which were then elaborated in terms of topic-certainty and comment-certainty.

Comment rarely appeared in the very beginning of the interaction. Often, comment occurred when users were answering the source's questions, which supported the idea of comment as elaboration beyond topical specification and as necessary for "fleshing out" the information need specification. Comment was also employed at the "Encountering/Learning" and "Evaluating" stages. Especially for expressing positive feedback in the "User's evaluating information" stage, utterances were articulated more frequently as comment.

Table 1. Description of the primary use of topic and comment by information seeking stage

Information seeking stages	Descriptions and examples	Topic and comment employment
User's need description Initial need description Subsequent need description	User describes information need	Mostly uncertainty related topic Certainty of topic and comment
Source's understanding of need Source questioning Source understanding	Source attends and responds to the user need	
Search process (Specific to library setting)	Both user and source attend to the search process e.g., search plan, scope, resources and evaluation	Both topic and comment related
Sources' information giving Giving answer Giving advice Explaining situation	Source provides an information or answer to the user need	
User's evaluating information Encountering Evaluating	User attends and responds to the source's information e.g., trying to learn, reason, confirm, and apply to decision	Both topic and comment Rejecting information by topic Accepting information by comment

Function of comment utterances

Because comment was employed largely to express certainty, we decided to look more closely at those specific utterances by developing an inductive content analytic variable to tap the function of the utterance. In the debriefing interview, this usually generated a more detailed explanation from the user about what he or she really meant and included cognitive aspects that were "backgrounded" and might not have been fully expressed during the actual interaction with the source person. Of particular interest here were comment utterances which were elaborations on the original interaction utterances because they clearly had a "pointing to" or "prioritizing" function whenever they were used (hence "stress" and "focus" categories below).

The inductive content analysis yielded a list of categories that describe what the user tried to communicate with the utterance (i.e., communicative thrust) shown in Table 2. The categories found for the function of the comment specific utterances were: 1) information need problem within which the information seeking was anchored; 2) goal of information seeking and perceived use of information; 3) stress on the identity or characteristics of the user her-/himself; 4) interactive focus on the source person or the system to interact with; and 5) focus on information given from the source.

Overall, the categories for the function of comment overlapped with situational dimensions such as the user's goal and information use; task/project of the information seeking problem; and the user's personal preferences and values. The observed categories (especially the first two) seem to be closely related to Dervin's (1983) information use aspect of her model of Sense-Making, "**situation → gap → use**" in the sense that users were trying to describe their need in terms of their past, present and future orientations.

Table 2. Categories found for the function of comment utterances

Function of utterance	Description	Examples
Stress the background of the need problem	States the situational background within which information seeking was anchored;	Background problems of what happened; Task or project that requires the information seeking; e.g., focus on “me;” “what I like to do;” “important to me;” pushing in my way; tailoring the search
Stress the direction of information need and use	Describes the aspects of information needed and perceived use of it	Goal of information seeking; Perceived use of information; e.g., What is important with the need e.g., how to use the information e.g., what to do with it
Stress the interactive components	Interactive components of communication Search related perception	Prior search experience and result ; The previous search and what happened; Trying to fit into the system,
Stress on the identity or characteristics of the user her-/himself	The importance of self in information seeking	Who I am; preference; What I did (my knowledge, qualification); Why I need it in a particular way; e.g., to focus on “me;” “what I like to do;” “important to me;” pushing in my way and tailoring the search
Focus on information given by the source	Encountering Evaluate information	Knowledge on what, and how to evaluate Reasoning; Learning; Deciding

The “information need problem” stressed tasks and projects within which information seeking and need arose. It was often brought up as a clarification of the background of the information seeking situation within which the information need was embedded.

The “information goal and use” emphasized the user’s goal of information seeking and perceived use of the information sought; e.g., for which information would be used and how it would be helpful. Often, users described how the information could be used in attaining their goal, which related to the perceived and projected use of information. It was manifest not only in describing information need but also in evaluating the provided information. Users focused on seeing how the information could be used to address their task/problem when they assess the relevance of the provided information.

The “stress on the identity or characteristics of the user her-/himself” was related to the user’s personal perspectives, preferences and values that he/she insisted on relating to information seeking. The “interactive focus” was related to the communicational aspects of interpersonal interaction with the source person or interacting with a system to search. The “focus on information given by the source” was when users focused on the specific information content given from the source person and trying to understand and make sense of it. Users were trying to figure out the source’s orientation and establish an effective rapport.

Discussion

Here we will discuss the characteristics of comment as compared to topic and attempt to identify the value of the topic and comment together in information seeking and use as well as information retrieval.

Our findings showed that topic was employed more in the library setting and that comment was employed more in the advising setting. Topic-oriented approaches to expressing information need seem to predominate in the library setting in contrast to more comment-oriented heuristics in the advising setting (5). Our interpretation of the difference in the settings is two-fold. First, it would be due to the different social factors and expectations implied by the setting, which also imply different expectations on the parts of both users and sources. Social expectations, based on tradition, culture, and role of the user and the source in a given setting, certainly mediate behavior in an interaction. Similarly, because the information users in the study were students, their information seeking would have been constrained by their social expectations and their roles as students as compared to the “expert” status of the source persons with whom they were interacting.

Second, use of topic and comment seems dependent on different information seeking domains. Information seeking in the library reference setting was dominated by traditional topic-based information organization and searching tools so that the interaction centered on aspects of the logic or rules of information search in the library system itself. Users expected that the interaction would require the use of topic dominated terms and logic in such a formal system (e.g., library). Many respondents in the library setting probably received some bibliographic education at one point or other in their education and were experienced enough to understand something about the classification system and search terms. They tended to communicate their needs in system terms as much as possible maybe because they thought it was expected of them. In many cases in the library setting, users started to approach the librarian by mentioning the topic of their search. In spite of the virtually unrestricted verbal capacity of human language via topic and comment, users seem to assume that communication is based on the logic of the system itself – one goes to the library to get books and articles while advice is less constrained.

According to our findings, users tended to employ topic to describe the need area briefly; they either broadly pointed out the area when they were not familiar with the subject concept or defined the scope more precisely when they knew something about the topic. Topic was often expressed as a set of discrete keywords and phrases in the early stages of the information seeking interaction. It seemed that the user and the source person were establishing the basis for the information seeking by bringing up the subject area and identifying the topic of the need in a generic sense. However, the subsequent interaction was primarily to elaborate on the user’s situation through comment, which tended to include longer utterances and occur more frequently than topic. The negotiation of meaning in information seeking requires iterations of exchange of utterances of comment. Users needed comments to locate the topic within their full meaning - in terms of their projected or desired use of information, their specific goals, purposes and plans, as well as expressing their personal experiences and perspectives.

The interpersonal information seeking interaction is humans attempting to negotiate meaning. The user’s meaning was expressed to the source person via topic and comment, *not* by topic alone. The source person’s ability to understand the user’s need is also realized through *both* topic and comment. Exchanging meaning to retrieve content would be more effective when both the user and the source construct a shared meaning space based on the user’s meaning. Similar negotiating was apparent during the encountering and evaluating stages when users tried to understand the information retrieved and to assess in terms of her/his own use situation. This suggests a human collaborative approach to information seeking where both the user and the source engage in creating the shared view of information need inter-subjectively in spite of institutional settings. Using topic and comment together, the user and the source can contribute to the construction of meanings that can be established as the basis for the next phase of their interaction. Helping human library sources (e.g., reference librarians)

understand how to take advantage of users' comments to understand precisely what the user needs would seem to be appropriate. However, most information seeking these days occurs between users and automated systems (e.g., OPAC or free text search systems like Google) so, understanding how we might employ our empirical findings about humans exchanging or negotiating of meaning in non-human interactions (some might say "inhuman") seems essential.

Currently, information systems such as search engines, information, whether it is for the organization (classification) or for information need specification and subsequent matching to information content, is usually represented as a discrete set of topical keywords. Capurro (2008) points out that information and user queries are thus represented as fragmented pieces. The process basically breaks down the meaning into concepts of the information content by independent terms which can be searched and matched seemingly without explicit regard for human meaning. In traditional information seeking or retrieval conceptualization, a keyword or a set of keywords (as a topical description) is assumed to be a nominal and uni-dimensional subject correspondence and treated as a discrete entity of static and intrinsic value in a context-free setting. Creating a surrogate, even in a highly organized classification system with hierarchical structure and multiple (repeating) conceptual nodes, is by keyword(s) and noun(s) to point to a generic concept. The limitation of the uni-dimensional topic-based matching and the unitary documentary language of traditional noun-based (i.e., topic-based) information architecture has failed to represent the dynamic relations among multiple perspectives integrated into a meaning (Tuominen, et al., 2003). The sheer volume of content available to users today strongly suggests that even with the precision of topical organization and retrieval logic, noise overwhelms. More precise specification of user need (i.e., meaning) would certainly reduce noise.

Meaning can only be expressed to represent the user's specific need through *both* topic and comment which function orthogonally, i.e., meaning conveyed by comment is unique and cannot be expressed through additional topic specifications no matter how elaborate. Comment in this sense is viewed not as a mere elaboration of topic but a unique dimension to represent meaning that provides a necessary augmentation of topic to convey the user's perceived situation. We suggest that comment is a relation, functionally equivalent to "verbing" in contrast to the noun-based information architecture for knowledge production and transfer (Dervin, 1998; Tuominen, et al., 2003). It is important to note that the description of the functions of comment in users' debriefing interview data (in Table 2) demonstrated the use of verbs to describe the comment related meaning. In this verb-like manner, comment seems to help users communicate the dynamic aspects of his or her information seeking context. It enables the user to articulate the meaningful relationships between the topical generalization of need and his or her perspective on the situation.

Implications

Current search systems may already be doing a great deal with topic but we see the need to incorporate user comments as an additional scheme in the mix to improve precision and thus reduce noise. Some recent research experiments with interactive information retrieval (Rutheven, 1999; White, 2006) and multiple perspectives of information representation (Sauperl, 2004; Larsen & Ingwersen, 2005) seem to address the importance of the dynamic user meaning with iterative relevance feedback or multiple levels of representation. However, they are still in the framework of topic based retrieval approaches. So iterative negotiating seems essential. The findings of this research suggest that incorporating user comment to build a dynamic and flexible information searching scheme according to the user's focus in the information need description can provide more precision. Increasing the complexity of specifying the user need seems necessary. Given the consequence of excessive noise in the results of searches in today's globally networked environment, one strategy (of perhaps many possible strategies) that can improve the signal to noise ratio can be done by filtering the search results based on the semantic relation

of topic and comment of a user need. This can be done by providing users with a way to establish relations among keywords when it is necessary and searching via multiple levels of concept relations.

Conclusion

The study confirms the appropriateness and utility of the Prague Functionalist conceptual definition of topic/comment: A meaningful interaction *must* include both topic and comment, each of which provides aspects of meaning that are NOT redundant. In this sense, comment presents additional specifications necessary for a gestalt understanding of the other person's intended meaning. Although other linguistic features may be present and may function for different purposes, topic and comment are both necessary and sufficient for an effective exchange of meaning. In other words, comment is not merely a possible dimension for expanding into multiple dimensions for information organization/retrieval - it is a *necessary* one.

The role of comment in complementing and completing meaning in information seeking, as in all other aspects of human exchange of meaning, was demonstrated to function as an inter-connecting framework blending discrete topics with the user perceived foci of her/his information seeking context. The role of topic functions to establish a generic subject concept of the information need by providing a common ground for the subsequent refining. Topic and comment reside in the user's perception and can be observed from the linguistic evidence within the user described aspects of information seeking as a meaningful elaboration of information need. We must note the necessary user-based epistemological perspective in establishing this understanding which stands in stark opposition to the assumptions inherent in a content-based approach. The value of topic and comment was proposed as a useful construct for studying information seeking interactions and as a way to improve information organization and subsequent retrieval.

Abstractly, information is an artifact of a linguistic description of a past solution to a past problem. Looking at information seeking interactions through the lens of topic and comment shows how this past temporal orientation can be applied to present and future use of that information. We believe that our conceptual analysis places comment within the broader discussion of information seeking with enough rich description to guide further research. Through further research we believe we can follow our understanding of comment which is linguistically manifest to the real-time negotiation of what a user's situation is and then to the retrieval of similar past problem/solution descriptions (i.e., what we call information).

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Notes

- (1) This was a part of a doctoral dissertation (Yoon, 2002) and some of the results have been reported earlier elsewhere (Yoon, 2007) but this paper focuses on the examination of comment.
- (2) Keyword search may allow users to address both aspects of topic and comment but with no distinction in the role of how each term is related with the others.
- (3) Most of respondents were students but three respondents came from outside the university community to use the library.
- (4) The inter-coder reliability was measured .929; .906; and .917 respectively for cognitive certainty and uncertainty; topic and comment; and information seeking stages.
- (5) This is given the fact that the comment dimension of the user articulation accounted for one third (34.5%) of the utterances in the library setting.