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Toward a Reconceptualization of Information Seeking Research: Focus on the Exchange of Meaning

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Running Title: Reconceptualizing Information Seeking

* Requests for reprints should be addressed to Kyunghye Yoon, School of Information Studies, 4-284 CST, Syracuse University, Syracuse, NY 13244. The authors would like to acknowledge the assistance of graduate students in Prof. Nilan's Behavior of Information Users course who helped with data collection and analysis.

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Abstract

This paper reports the results of a preliminary study of interpersonal information seeking interactions between a user and a human information source. The study showed that users specify their information needs (uncertainty) largely in terms of what they know (certainty) during the interaction. The articulated certainty and uncertainty in the interaction can be classified as utterances focusing on either the topic (what the user is talking about) or comment (how that topic fits in with the user's situation or problem). We suggest that user studies in information seeking research should conceptually realign from an emphasis on user's uncertainty- and topic-based matching to the inclusion of user's certainty and comment dimensions in order to develop a more linguistically robust, multi-dimensional approach to matching for information retrieval.

1. Introduction

Information seeking (IS) is viewed as a dynamic process of a user making sense that involves cognitive behavior at the level of individual perception and an associated communicative behavior at the level of the social context when insight is sought via linguistic means from other sources. The cognitive behavior centers on the certainty and uncertainty aspects of a user's perception in the IS situation, which can be described as what the user is aware of knowing as well as not knowing respectively regarding a particular need situation. Taken together, certainty and uncertainty represent a gestalt of the user's perception of an information need. The user initiates the IS process by realizing a need in these terms and creates meaning defining her situation. The communicative behavior is an attempt to share this meaning linguistically in a social context so that the user can share her need with another person as a potential information resource.

This study is specifically focused on the case of interpersonal interaction between a user and a human source. Human-to-human interaction as a type of IS process is the most universally available and original form for human communication. In fact, the latest technological advancements do not attain a state of interactive system function that is as robust as in human communication. The interaction between a user and a human source provides a model of IS interaction where meaning is shared more directly with little mediation or functional limitations inherent in current automated interactions.

There are two major objectives in the study. One is to explore the cognitive aspect of information seeking by looking at how users employ certainty in the IS interaction. We argue that uncertainty is specified in terms of certainty of what a user perceives regarding the perceived need situation. Certainty is what a user knows in relation to her information need whereby the user describes her information need using what she already knows. Because information seeking involves a discourse between the user and a source, the concepts of certainty and uncertainty should be understood in terms of linguistic interaction in human communication. The other objective of the study is to explore a new dimension of the linguistic interaction between the user need and a source's understanding of that need. The concept of comment is conceptualized as a supplementary notion in addition to the traditional subject- or topic-based matching logic in order to look at the linguistic IS interaction as a means of relating a topic to specific contextual attributes of an individual's perceived information need situation. Comment is seen as the user determined relation between the topic of the information need and the user's specific situation and perspectives so that comment helps to "locate" a topic in a contextually specified user need.

2. Conceptual Background

The cognitive and linguistic levels address both individual and social factors salient to IS that form a theoretical context for this study. One aspect is the paired concepts of

certainty and uncertainty. The other is the paired concepts of topic and comment. In this section, the definition and the background of these concepts will be presented.

2.1. Certainty and uncertainty – point of departure

2.1.1 Overview

The cognitive level in IS involves the concepts of certainty and uncertainty in an individual user's perception of a need situation. Certainty refers to what a user knows or what she thinks she knows such as her experience, knowledge, beliefs, goals and plans. Uncertainty refers to what the user is aware of not knowing and thus needs to find out, that is often called an information need or a cognitive gap (Dervin 83). Both certainty and uncertainty "exist" only in the user's perception. Human perception is the basis for not only the cognitive but also the affective and interactive aspects of the IS situation. But we will focus more on the cognitive aspect because information is first understood as a cognitive resource to help an individual to make sense of her situation.

Most research on cognitive aspects of information seeking in the field focuses on the uncertainty aspect of user cognition to represent the concept of information need. Information need has been defined as uncertainty (Dervin 83), (Kuhlthau 93); an anomalous state of knowledge (Belkin, Oddy & Brooks 82); a cognitive gap (Dervin 83), (Dervin & Nilan 86); or a visceral need (Taylor 68) with an assumption that the human user's cognition is a dynamic, constantly changing condition. The driving force in IS has been conceptualized in terms of uncertainty, i.e., what users do not know and the awareness of lacking the cognitive resources or knowledge. These all represent the concept of uncertainty.

The concept of uncertainty, however, can not stand alone without the concept of certainty. Human beings can only define what they do not know in contrast to what they do know. In IS, because the impetus is in the context of a specific situation, there are elements of certainty in a user's perception of the situation. These certainty aspects also affect information seeking and the interaction. Users employ certainty in order to point out what they don't know and thus need to find out, uncertainty. In many cases, users start with what they already know when they describe the need, and then use their gestalt perception for criteria to evaluate information. For example, users make decisions on the documents retrieved, whether each document would be relevant and useful or not is based on what they know about the their need, their situation and the document description. The criteria used for the relevance judgments are those pertaining to the user's previous experience and background knowledge, including beliefs and preferences (Barry 94) associated with the user's perception of her situation.

Given the same question (uncertainty) of "How can I get to the City Hall?" there are many different answers depending on the context of the user and her certainty. The answer depends on the user's certainty, e.g., where she is coming from, and how familiar she is with this city, and so on.

1. U(user): How can I get to the City Hall?
S(source): Do you know how to get to the hotel we are staying at here?
U: Yes,
S: Then it is a few blocks away on the same street, the entrance is on the other side.
2. U: How can I get to the City Hall?
S: City Hall?
U: I am going to be driving my car from the New Jersey Turnpike
S: Ok I will give you directions from the East of the city
3. U: How can I get to the City Hall?
S: Where are you coming from?
U: I am going to arrive at the airport in the evening with my family. I wonder if there is a bus or shuttle available.
S: Yes, they do have a shuttle bus but it doesn't come often and you have to change buses. How about a taxi?
U: I am afraid it is too expensive.
S: Well it will be around 20 dollars. If you have a family, it wouldn't be too bad.
U: Good, I will take a taxi. I thought it would be more. It was 60 dollars in New York City.

In the first case, the person knows where the hotel is. If she did not know where the hotel was the answer would include the directions to get to the city hall from the place where the person was. The user's knowledge of where the hotel is made the answer simpler.

In the second case, the person knows about her plan that she is coming from the East. The answer would be different if the person was coming from West, South or North.

In the last case, the useful answer is not which direction but is choosing the mode of transportation.

2.1.2. Certainty and Uncertainty - definitions

Certainty is fundamental to human cognition and defines the impetus for IS behavior and the criteria for evaluation of information seeking results. Some researchers agree that it is necessary to incorporate user knowledge (certainty) into cognitive research in order to understand "the development and structure of individual (user's) image of everyday life" (Belkin 90) in relation to IS. In a review of cognitive research, Allen provided a comprehensive review of various research in the field (Allen 91). There were many studies that addressed aspects of certainty such as user knowledge and cognition, but from different perspectives and research assumptions. In spite of a general consensus on the importance of the user's knowledge, perceptions and beliefs (Belkin 84, 90), (Wilson 81, 84), there is still little existing literature nor agreed upon conceptual definition of

certainty that empirically accommodates user cognition. When employed, the concept has been applied in different ways in different research. Therefore it is necessary to empirically investigate the concept with a coherent and systematic conceptual definition at a higher level of abstraction. One of the objectives of this research was to define the concept of certainty from what users perceive and how they employ it in the process of IS.

In this study certainty refers to what a user knows, in contrast to uncertainty. Uncertainty is what a user needs to find and everything else is considered as certainty. In the interaction with a source person, the user brings in what she thinks she knows (certainty) even if she is not 100% certain if it will help in enhancing the provision of information. Certainty exists in the user's perception that the user brings to the IS situation.

The concept of certainty primarily addresses what users already know regarding their need situation. The closest example would be the redundancy corollary (Kulthau 93). Kulthau explained her uncertainty principle using a redundancy corollary that the user's knowledge or experience enables a user to identify relevant information in terms of whether it is redundant or unique. The concept of certainty encompasses not only the user's knowledge and experience but also their perception of the need situation and perspectives to view the world. That is, certainty represents the user's perception at the time of IS interaction. It depends on differences in perspectives and anticipation of the future as well as background knowledge and previous experience. In this study, the concept underlies an individual user's context of life in terms of her temporal denotation of past, present and future (Nilan & Rosenbaum) and the user's perceived ability to "move" towards resolution of her goal. First, user's past experience includes what a user has gained from the past, i.e., "general world knowledge, domain knowledge, task knowledge and system knowledge" (Allen 91) and "candidate answers" (Pomerantz 95) that the user already knows are relevant to her need. Another aspect which underlies what the user brings into IS process includes what is important, why it is important, what is preferred, why it is preferred, etc. The other aspect of certainty lies in the future of the user, where the user anticipates as she is moving toward such as a plan or a goal.

2.2. Topic and comment - communicating an information need

The communication between a user and a source is the next step once the user realizes a need and decides to resolve the situation by seeking external information. Certainty and uncertainty aspects of the user need have to be communicated to the source. The communicative domain of information seeking is constituted by the use of language wherein the user need is matched to the information content. That is, the perceptions of a user are communicated to the source through linguistic articulation that is intended to enable the source person to understand the need and provide information in accordance with the user need. It is necessary to look at the linguistic articulation as a way to understand some aspects of the internal user perception of her information need situation. Linguistic articulation is a means to connect the user need to information content by

sharing meaning between a user and a source. Meaning is of paramount significance because what users try to communicate in seeking information is the meaning surrounding their situation and the resolution of the situation.

2.2.1. IS interaction - a negotiation of matching terms

IS interaction is viewed as a negotiation between a user and a source. When users interact with a source, they tend to take different perspectives from each other; one who has a need to know and the other who tries to provide information to meet the need. This starts with the user trying to explain what she needs. If this is successful, then they interactively engage in negotiating for information seeking. It is a dynamic process of interaction between the two to reach an agreement from different cognitive orientations or viewpoints. Language enables people to exchange and share the meaning that they perceive in an attempt for mutual understanding. This is by no means a straightforward process but there are patterns in the interaction that can be of use to researchers striving to understand and explain the user's and source person's behavior.

The negotiation is a set of interactive behaviors "narrowing down the distance" between the user's need and the source's to find a fit between the need description and information organization and representation. This leads to the issue of how to organize and represent the resources in the system for interaction between a user and a system. It is not useful however, in determining what existing systems do or don't do because it will not tell us definitively how we should improve our query negotiation procedures nor, at least initially, how to better organize the content in our systems. Instead, this study examines IS negotiation without perpetuating limitations in current systems, i.e., it explicitly looks at interactive negotiations for information need that are interpersonal to see what behaviors are employed by users in informal (i.e., non-institutional, non-organizational, or non-automated) situations. Therefore, the focus in this study is on 'negotiation for information need specification.' If we get a better idea of what users actually "do" and how these behaviors facilitate the exchange of meaning between a user and a source, we may be able to understand what other things we need to get from users (beyond the topical specifications) and, ultimately, how to augment our topical organization of content for information systems and interfaces.

2.2.2. Problem of matching

The theoretical basis of matching in information retrieval and information systems in general has been derived from the fit between the need and information content, i.e., topical matching on which representation of the need as well as information content has been based. In traditional information retrieval (IR), the topic component has been employed to represent information content as the primary matching criterion, i.e., for the purpose of "matching" a user need with content. Information is represented in terms of what it is about, such as a keyword or subject heading and retrieved via the topic aspects of a user query. In other words, topic refers to any textual phrase (keyword) that "points" to what the information is.

Keyword-based matching assumes that a keyword or a set of keywords in a nominal and uni-dimensional subject correspondence (e.g., Library of Congress Subject Headings) is the appropriate, efficient and effective basis for IS and IR before the user evaluates content. That is, each keyword term is treated as a discrete entity in a context-free setting, which underlies the static and intrinsic meaning of a term rather than, for example, a dynamic and contextual description of the user's information seeking and use situation.

With topic-based representation (i.e., keyword description), some aspects of information cannot be pointed to because the information representation has been limited to a topical base (i.e., aboutness) to describe the information resources. That is, the user's meaning is not and indeed, cannot, be effectively or completely exchanged with existing systems' representation of the system's words. In a topical matching, meaning is not effectively shared with the system because topic is only one of the two logically necessary aspects of a representation of the user's meaning (see below). This is because current systems are designed only on the basis of uni-dimensional subject keywords for information resources where information is located by the relative description of general subjects (context-free) in the collection. Setting the certainty aspect of the user's need aside, the aspect of how to organize and represent the resources in the system and how to incorporate salient aspects of the user's contextual description in other than topical terms seems like a logical and useful approach to be taken into consideration to improve the effectiveness of IR. This is particularly the case where there is no human intermediary to "translate" the user's need into system terms.

In this sense, there has been a mis-alignment in the research in system design and user studies in general because one is centered on what is known about content whereas the other is focused on what is not known by the user. Given that certainty is involved in the user perception of information need, the ideal would be that both the user's uncertainty and certainty be associated with the information in the collection or database. However, the certainty of the user's need, even if it were being captured by a system, can not be directly accessed to match the information content in the current system logic of topic-based organization.

Topic matching has been characterized as insufficient for effective information retrieval (Mizzaro 97), (Green & Bean 95). In fact, many relevance studies have pointed out that topical relevance alone is insufficient and have suggested other criteria such as user-based, situational, and psychological relevance, most based on the user's perception of the need situation (Park 94), (Bruce 94), (Barry 94), (Schamber 92). Therefore, there is a need to explore IS interaction to provide alternative matching criteria to supplement the topical dimension. We are looking for this new dimension of information in linguistic interaction because IS occurs in the context of linguistic negotiation. This is certainly the case on the user's side and is also the case in interpersonal IS interactions.

2.2.3. Topic and comment – overview

In relation to the linguistic aspects of information seeking as a way of sharing meanings, Roman Jakobson's notion of topic and comment (Waugh & Monville-Burstion 90), (Hymes 74) will be introduced to suggest a theoretical basis for the two distinct and necessary aspects of meaning in information seeking. The terms topic and comment have been adapted from early functional linguistics as the two necessary components of a meaningful linguistic utterance (Dijk 79). According to the Prague and other functional linguists, any meaningful linguistic articulation is composed of two necessary aspects, "topic" and "comment." Topic here refers to what a person is talking about. It is the subject about which the person wants to communicate. Comment refers to what relates or situates the topic to an individual perspective and context. Taken together, topic and comment constitute a meaningful utterance.

The notion of topic and comment as two necessary components of meaning are taken here to represent two dimensions of an information need based upon the user's articulation. Similar to the gestalt nature of the certainty/uncertainty concepts in defining a user's perception of an information need, topic and comment are paired, logically necessary concepts that allow us to examine the user's articulation of that information need.

As with the previous example of how to get to the city hall, the same question requires different answers depending upon the user's situation (or context). The following examples have the same question topic but in different information need contexts.

1. U(user): How can I get to the City Hall?
S(source): Do you know how to get to the hotel we are staying at here?
U: Yes,
S: Then it is a few blocks away on the same street, the entrance is on the other side.
U: Actually I am going to the theater near there.
S: Oh, then it's a block to the South from the hotel.
2. U: How can I get to the City Hall?
S: City Hall?
U: I am going to be driving my car from the New Jersey Turnpike.
S: Ok I will give you directions from the East of the city.
U: Is it there much traffic in the afternoon? I will be getting there around 5 o'clock.
S: No, it is not busy from where you are coming.
3. U: How can I get to the City Hall?
S: City Hall?
U: I am going to drive my car from the New Jersey Turnpike.
S: Ok I will give you a direction from the East of the city.
U: Is there a short cut? I have an appointment at 9:00 in the morning.
S: Then you better park the car and take a subway.

2.2.4 Topic and comment – definitions

Topic (aboutness) represents one of the two necessary aspects of human linguistic articulation (which is used as the matching criterion in information seeking interactions as well as in information systems, i.e., the subject, title, author, publisher, year of publication, etc.). Comment is the other necessary aspect which relates and situates the topic according to the speaker's context or situation.

Even though a topic is relatively easy for two people to agree upon, there may still be some significant interaction between individuals before the topic of the interaction is clearly specified. It is impossible, however, for topic, which points to what the speaker is talking about to fully specify what she needs, it is simply what the speaker is talking about, a necessary first step.

Subsequent to the agreement on a topic, the role of comment can be seen as a specification of the speaker's situation, problem, context, etc. that is conceptually orthogonal to topic in establishing a basis for the exchange of meaning. Comment aspects specify how the topic is to be used, what the topic does, what it is about the topic that fits in with the user's situation. Included here are the user's situated values, attributes of the task or problem being addressed, stages in the resolution process, and other situational or contextual factors.

A probable first impression is that comment represents an idiosyncratic, and therefore chaotic, aspect of the user's information seeking situation. An example will help show that this is, in practice, not the case. We can look in a dictionary and find a definition of "window." We will probably agree with the description of this near-universal architectural feature of architecture found world-wide. The definition specifies what a window is. However, if I situate this topic (window) in a context of darkness, the window becomes a source of light; in a context of boredom, a source of distraction; in a context of poor air quality, a source of fresh air; in a context of fire, an avenue of escape; and so on. There are three important implications here. First is that these situated specifications indicate clearly what it is about the window that is useful to the speaker. These situated specifications represent the range of uses that people have for windows. Each use represents a context which must be specified in order for the topic "window" to have any meaning. Window without this context is virtually meaningless.

Second, the range of uses for windows is not infinite. In fact, the list of contexts in which a window plays a central (topical) role is probably quite short. This list will be longer than the topical dictionary definition and therefore more complicated, but by no means will the list be infinite or chaotic. One need not talk to very many people in creating this list before no new contexts are discovered. The resulting range of situational contexts would be quite manageable.

Third, the list will work around the globe to represent the range of comments that people have for the topic "window." The fact that human beings' experiences include an understanding of these uses of window is a critical factor in our understanding of the exchange of meaning - humans already share an understanding of the basic problems,

situations or contexts. In the course of an individual's life, she encounters the same range of problems, situations, etc. as do other individuals. Granted this occurs at an abstract level, but we argue, at precisely the level of abstraction that makes the linguistic exchange of meaning possible in the first place. We have always acknowledged the flexibility of language in conveying meaning but we have not focused on how and why language is able to do so.

According to these definitions, topic plus comment are both necessary to exchange meaning. While it is possible to obtain content in response to mere topical description, particularly in these days of rapid growth of content (through creation as well as through a network linked content collection), the ever-increasing volume of content must be "filtered" by the user for relevance. Particularly in an information system context, most of the content constitutes noise. However, rather than see the relevance judgement process as a necessary behavior subsequent to information need specification (and in the context of information systems, information content characterization), we propose that the notion of comment be incorporated into our conceptualization of an information need specification.

Therefore, we propose that attention to comment in the articulation of a user's information need specification will serve to clarify our model of information seeking and, ultimately, our approach to information retrieval systems.

This study intends to illustrate that users' articulations during information need specification rely heavily on both topic and comment. By showing this to be the case, we suggest that the inclusion of comment will provide evidence for an additional, necessary criterion (i.e., in addition to topic) for our collective view of information, information seeking, and information retrieval.

This study intends to illustrate the utility of the dimension of comment from the users' descriptions of their need that can be employed as an alternative criterion to topic on which the traditional matching between a user need and information content has been based.

3. Research scope and objectives

3.1. Scope

The premise of this study is that information seeking is a type of human interaction characterized by communication procedures and strategies on the part of users and sources that constitute the IS interaction. Interaction is one of the essential human functions of making sense where external information is perceived by the user as being potentially useful. The essence of human interaction lies in the sharing of meanings between human beings who constantly make sense of their environment in the context of life (Nilan & Rosenbaum 90). People need to be informed about their environment in order to survive (Carter 80). Carter's notion of information-based social Darwinism fits in with Dervin's Sense-Making view of information seeking as a dynamic human

function and conceptually supports the claim that interpersonal interaction can be seen as a primary example of making sense associated with external sources of information.

3.2. Objectives

This study is an attempt to bridge the gap between research in system design and in user behavior by specifically looking at the dimension of comment as a source of supplementing topical matching criteria for information retrieval. While certainty and uncertainty are specific and subjective to an individual user, topic and comment are intersubjective at the level of social and communicative behavior (and therefore NOT idiosyncratic). This intersubjective nature of topic/comment can provide a coherent basis for system design.

The general research objective of this paper is to empirically describe users' articulations of information need specifications in an interpersonal information seeking interaction incorporating both cognitive (i.e., user perceptions of certainty and uncertainty) and linguistic (i.e., topic and comment aspects of user articulations) aspects of information seeking.

Specific research questions are:

- Question #1 – Does certainty play a role in the specification of information need in an IS interaction?
- Question #2 - Does comment play a role in the specification of information need in an IS interaction?
- Question #3 – Are there any patterns in the sequence of utterances made by users in IS interaction?

4. Method

4.1. Methodological assumptions

The nature of this study requires a user-based descriptive approach to obtain a naturalistic description of the user's perception of her information seeking interaction. The methodology takes a Sense-Making approach incorporating a modification of Dervin's time-line method in an attempt to understand users' cognition and perceptions from their points of view (Dervin 83). The user-based approach allows the researcher to create a perspective constructed from descriptive accounts of users from their own perceptions and behavior. This study stands in between "exploratory descriptive" and "organized descriptive" studies (Simon & Burnstein 85) as it is based on a working conceptual framework but also relies on inductively exploring of the concepts and relationships among them.

4.2. Study design

The methodological design for this study relies on indirect observation of users' internal perceptions from observable articulations of information need. The researcher can make a reasonable inference of a user's internal cognition based on utterances users provide throughout the IS interaction. An utterance is what a user is saying in an IS interaction with a source person. It is observable to the researcher and allows the researcher to generate a reasonable view of the user's internal cognition. But an utterance may only represent a part of a perception because not all of the user's meanings are articulated at once. Some important meaning may remain unstated in the interaction. These withheld meanings can be further articulated by “debriefing” questions after the interaction. That is, the researcher can interview the user after the interaction employing a transcript of the user's utterances in the interaction to clarify and expand upon the transcript. Figure 1 shows a simple graphic denotation of the method design of this study.

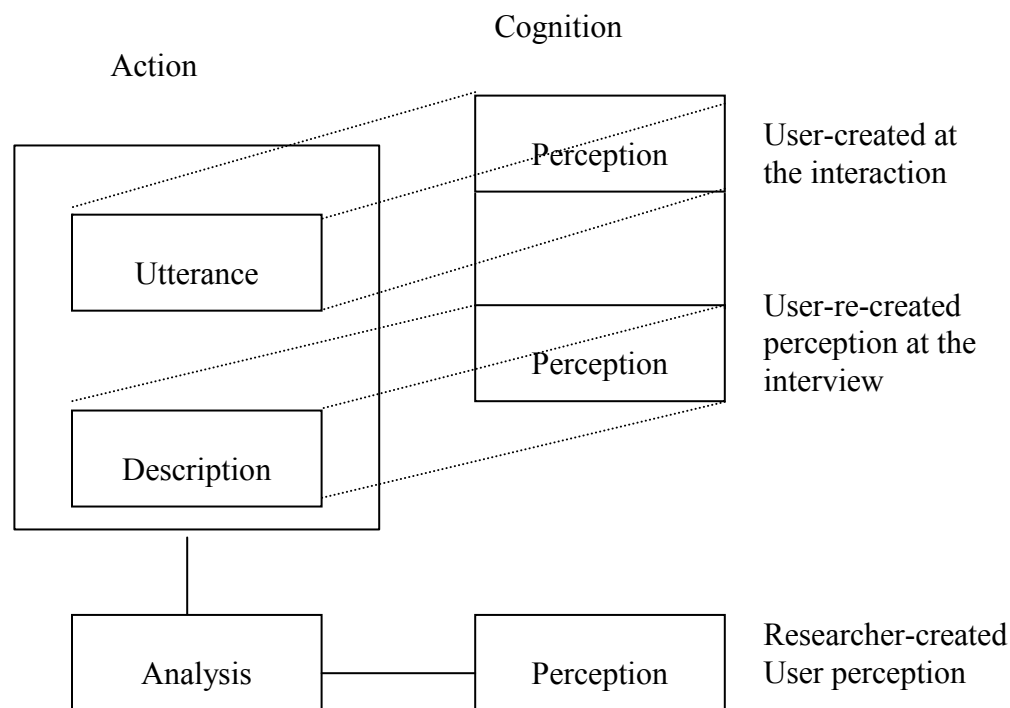


Figure 1

An utterance was operationalized as what was said by a user in between what the source person said in the interaction. Since the focus of this study is on individual perception and the articulation of that perception, the unit of analysis is an utterance. Note: The reader is cautioned not to assume that an utterance is the same as a sentence.

4.3. Fielding

The setting for this study was a face-to-face IS interaction between a user and a source person in a real situation. A real situation was chosen because IS should be understood as

a natural human behavior which occurs in daily life. We felt it was more important to obtain unobtrusive data in a more naturalistic way for this type of exploratory study rather than to control associated factors in a more artificial context. Respondents were recruited from a variety of settings including a large university library, university classrooms, and a public library. The sample consisted of seven university library users, six public library users, and six graduate students working on class projects. In the library setting, the sources were reference librarians in the main reference desk and the interaction was about reference questions. In the class projects, the students interviewed human resource persons; i.e., a politician for three cases, and users of computer software for the other three cases. The length of interaction ranged between three and fifteen minutes.

Generalization of the results of this study is, of course, limited to the population of the study, but the implications for human behavior can be applied more widely because the concepts of certainty/uncertainty and topic/comment are fundamental to human behavior and valid for any kind of context. As an exploration of IS, we were concerned with the role of these concepts and it is hard to imagine at this level of abstraction that information seeking as observed here is fundamentally different from other IS situations. Therefore, generalization of these results needs to wait until more data is collected in a wider range of IS situations.

4.4. Procedures for data collection

Data gathering consisted of 3 phases:

4.4.1. Phase 1 - user utterances in an IS interaction

Phase 1 was an audio recording of the user and source interaction. The interaction was audio taped and then transcribed. The data from phase 1 provided a recorded tape and transcripts of the IS interaction that were used as the basis for the in-depth interview with the user in phase 2. An example transcript is in the appendix.

4.4.2. Phase 2 - modified time-line debriefing interview

Phase 2 was a “debriefing interview” with the user after the interaction. The purpose of this interview was:

- 1) to clarify the user’s utterances,
- 2) to get any aspects of meaning which were not articulated in the interaction but important to account for the user’s cognitive behavior, and
- 3) to have the user classify her utterances in terms of certainty and uncertainty.

The user was first asked about the IS situation in general terms. Then the user was asked a set of items for each utterance so that she clarified the utterance by classifying it as either certainty or uncertainty and described her internal situation at that moment. The transcript from phase 1 was used as a reference to help the user recall the interaction

process and organize the description. At this stage, the researcher relied on the transcript and the user's ability to recall the interaction to provide an accurate description. In a time-line interview in the Sense-Making approach, respondents are asked to build a story based on their retrospection. In this study, the transcribed set of user utterances was used as a time-line. The debriefing interview allowed us to clarify the utterances and classify them into certainty versus uncertainty based on users' clarification. Since this classification was performed by the respondents themselves, we see this as a further operationalization of our user-based approach.

4.4.2.1 The debriefing interview instrument - certainty vs. uncertainty

The debriefing allowed the researcher to provide additional description of the user utterances such that respondents were not encouraged to make up rationales for their behavior or justify their actions. The questionnaire was designed to structure the interview but to allow respondents to provide their own content. The first part of the interview asked the respondent about the general situational description of the interaction. The rest of the interview was conducted employing a set of items repeated for each utterance. The operationalization of the concepts of certainty and uncertainty were based on the user's classification of knowing and not knowing. The utterance was classified as uncertainty if it pointed to what the user didn't know or a description of what the user wanted to find out. To operationalize certainty, a temporal denotation of past, present and future was used. The utterance was categorized as certainty if the utterance referred to the user's past experience or knowledge of what she already knew, what she did, or what she perceived in the past; if the utterance was a projection into a future direction such as a goal or a plan; or if the utterance referred to the user's present value.

4.4.2.2 Examples from data as coded by users

- I found a book about it, but I didn't find the actual text. → Certainty (past experience)
- These books don't tell you what it's worth. → Certainty (present evaluation/ by criteria)
- This is for an individual project... I am going to do a video presentation. → Certainty (future plan)
- What I as looking for (was) some paper or journal about AIDS or the HIV virus and I didn't know where to look or where to start. → Uncertainty

4.5. Data Analysis

The data analysis included content analysis of users' utterances to classify them on the topic/comment dimension and a descriptive data analysis. There were a total of 265 utterances from 19 user-source interactions. Among these, many "interactional" utterances were not included in the analysis, such as "Yeah," "ok," "right," and so on that were not meaningful for the content of the interaction. Some adjacent utterances were combined when the user indicated they were repeating the same meaning. Sometimes, an utterance contained both certainty and uncertainty components or topic and comment

components and were divided into two utterances. After these operations, we had a total of 171 utterances for analysis. The utterance was divided into two utterances in phase 2 if the user indicated it was both certainty and uncertainty. But in the phase 3, if there were both topic and comment aspects, the utterance was coded as either topic or comment based on the interpretation of the researchers of the dominant meaning in the interaction.

4.5.1. Phase 3 content analysis - topic vs. comment

Phase 3 was a content analysis of the data gathered in phases 1 and 2. In this phase, each utterance was coded as being either a topic or a comment. The operationalization of the concepts of topic and comment was not as easy to communicate to users as was certainty and uncertainty. The primary reason was that topic/comment is a much more abstract notion. Topic and comment need to be assessed at a functional discourse level rather than at a sentence level, i.e., they cannot be seen as equivalent to noun/verb or subject/predicate. Therefore, content analysis was seen as the most reliable and valid way to examine users' utterances for communicative focus. The content analysis scheme for topic and comment was developed based on an inductive analysis of users' utterances with the open-ended items in phase 2. Rules of interpretation were established based upon a reading of all user utterances and descriptions in the interview. If the utterance presented the subject or aboutness of the need, it was categorized as topic. Other utterances that elaborated on the information need, directed the interaction, described the importance of the subject, or determined the information requirements other than subject of the need were coded as comment. The intercoder reliability for the topic/comment content analytic scheme was 87.5%.

4.5.2. Examples from data

- I found a book about it, but I didn't find the actual text. → Comment
- These books don't tell you what it's worth. → Topic
- This is for an individual project... I am going to do a video presentation. → Comment
- What I am looking for (was) some paper or journal about AIDS or the HIV virus and I didn't know where to look or where to start. → Topic

4.5.3. Analysis

The data were entered into a statistical application and crosstabulations of the certainty/uncertainty and the topic/comment dimensions were run. Table 1 shows the results of this analysis of user utterances across all IS situations.

5. Results and discussion

5.1. The employment of certainty vs. uncertainty and topic vs. comment in IS interaction - Research questions 1 and 2

Table 1 presents the results of a comparison of user utterances depending upon whether they were classified by users as certainty or uncertainty and depending upon whether they

were content analyzed by the researchers as topic or comment. A total of 171 utterances were employed in this analysis. First, utterances classified as certainty by respondents accounted for just over half of the utterances in the study ($n = 92$ or 54.3% of all utterances). 79 utterances (45.7% of all utterances) were classified as uncertainty. In the same manner, utterances coded as topic accounted for 36 utterances (21.1% of the total number of utterances) and 135 utterances (78.9%) were coded as comment. In uncertainty utterances, 18 out of 79 utterances (22.8% of all uncertainty utterances) dealt with topic whereas 61 out of 79 (77.2%) were focused on comment. For certainty utterances, 18 out of 92 (19.6% of all certainty utterances) were topic and 74 (80.4%) were comment.

Table 1. Classification of respondents' utterances by certainty/uncertainty and topic/comment.

	Uncertainty	Certainty	Row Totals
Topic	18 (22.8% col)	18 (19.6% col)	36 (21.1% total)
Comment	61 (77.2% col)	74 (80.4% col)	135 (78.9% total)
Column Totals	79 (45.7% total)	92 (54.3% total)	171 (100%) Grand Total

5.2. Patterns in IS interaction - Research question 3

The dominant pattern we found in the sequence of users' utterances was that initial utterances were topic (after the interaction setting was established – see below). That is, the interaction between user and sources began with a specification of what the user was talking about. Subsequent utterances were comments on that topic. This is one of the reasons why we found such a large proportion of comments in our data (i.e., 21.1% of all utterances were topic and 78.9% were comment). Symbolically, the sequence of utterances tended to look like this: topic, topic, comment, comment, comment, comment, comment.

We found our data too diverse to find specific, stable patterns across cases given the small sample size. A suggestion of a pattern emerged, however, in those IS situations where users were in a library reference context. Users began with utterances focusing on topic and uncertainty (i.e., questions - upper left-hand quadrant of Table 1), moved to topic and certainty (upper right-hand quadrant of Table 1) or certainty and comment later (lower right-hand quadrant) until the information need problem was resolved. So, users started with topic/uncertainty, then they would shift to either topic/certainty or comment/certainty but they had a definite propensity to focus on the latter.

In other contexts, the initiation of the interaction setting started with certainty/comment to specify their context and only then expressed their uncertainty in either topical or comment terms, again, with a propensity for comment.

Many respondents specified the point in the interaction process where they got an answer to resolve their information need during the interaction. It was clear that within this period, both uncertainty and certainty were employed in terms of both topic and comment. Uncertainty was favored when the interaction went back to some previous point and was repeated if the interaction was not proceeding in what the user perceived as a fruitful manner. It was almost as if the user would revert to the system expectations (topic/uncertainty) as an attempt to get the source person “back on track” (see U:17 and U:18 in the appendix).

5.3. Discussion - certainty as a new concept in IS

The data confirmed that the use of certainty and comment are frequently employed in interpersonal IS interactions. Table 1 clearly shows that an overwhelming number of utterances play a role that is outside traditional emphasis on uncertainty and topic in IS. If we are not to assume that the remainder of users’ utterances is simply noise, we must develop a way to employ this additional specification in a systematic manner. In traditional library reference situations, the users’ initial interaction starts with uncertainty and topic, perhaps as an artifact of the very system that users are coming to - the reference librarian expects a topic and a query and so users lead off with what is expected. In other more natural situations, users tended to lead off with certainty and comment which we interpret as a way of specifying the interaction setting where it was not institutionalized (as it is with library reference desks). After this, the pattern went to a “topic, topic, comment, comment, comment, comment, comment, comment” pattern described above.

The study results showed that the users’ utterances in IS interaction include certainty aspects as well as uncertainty aspects of the user’s need. Certainty was described as:

- User’s previous knowledge (domain knowledge, redundancy, candidate answer)
- Users’ experience (task knowledge, perceived stages in IS process)
- User’s criteria (information use requirements)
- User’s value (situational constraints and other values)
- User’s projection (Users’ projected use of information for a specific plan or goal in the future where the plan or goal is decided)
- Interactional certainty (knowledge learned through the interaction)

Certainty involving the introduction of the user’s information need and the evaluation of information provided by the source is consistent with Khulthau’s idea of redundancy and uniqueness (Khulthau 93).

Uncertainty was described as:

- The initial need (what users were aware of not knowing)

- The interactional uncertainty (what was introduced to the user during the interaction which the user did not know of) NOTE: This category was not obvious until the analysis stage of this study but was mentioned by users several times.
- User's projection (when the plan or goal is not decided)

5.4. Discussion - comment as a new concept in IS

We see the concept of comment as a way users relate a topic to a situation rather than as an additional elaboration on topic *per se* - users saw comments as integral aspects of both their perceptions and their attempts to communicate with sources. Comment was used as a contextual specification to link the topic with the user's perceived and intended meaning. In most cases, comments were related to the individual's perceived use of information.

Comment was dependent on the individual's state of certainty and uncertainty as well as the her context. This supports the notion of multiple representation schemes in matching processes as Jacob stated: "...the competing contexts are not forced to accept a single representational... or universal classificatory structure..." (Jacob 98). In other words, the representation of information need and information content should occur on multiple dimensions and we are suggesting comment as a classificatory dimension which can augment the current topical dimension. The comment dimension as an inherent aspect of individual meaning not only supports our argument that its intersubjective nature is a foundation for the exchange of meaning but our results encourage us to pursue this matter further in the future.

5.5 Discussion - For the further research

The findings from this study provide a basis for the future research in the area of interactive information seeking. The plan for the next step in our research is based on these findings. First, the dimension of comment was explored as a useful attribute for communication and matching processes. The development of the comment dimension seems promising for system design both at a theoretical level as well as in specific information seeking contexts. Because this was an exploratory study, we believe that initial research efforts should focus on specific contexts in order to coherently facilitate more theoretical understandings and empirical design implications. A larger sample would facilitate this effort.

We also need to do some work on controlling the effect of verbosity on simple frequencies of utterances for classification. It was clear that our unit of analysis (the utterance) was not ideal in developing a coherent understanding of the roles of certainty/uncertainty and topic/comment in interpersonal information seeking. The methods employed here were sufficient to demonstrate our conceptual framework but more detailed descriptions need to control for verbosity. Further, we are not completely satisfied with user classification of certainty/uncertainty or with the researcher coding of topic/comment. While it was clear that the respondents understood our intent, we have

some concerns about reliability. We plan to employ both user and researcher classification methods and compare the two. Ironically, we expected a bias towards uncertainty and topic because this is the “norm” in current practice. This was, however, clearly not the case.

This study looked at the user side only since the research questions addressed users’ perceptions in information seeking as a step in making sense of the users’ situations. However, understanding the interactive process for negotiating and matching the need to the information resources occurs in the source’s mind. Therefore, future research should account for both user and source sides. We did not focus on or analyze the source side and we believe that a dialogic model might provide additional insight into information seeking interaction.

Appendix: Sample IS interaction script

U1: Where do I find a book on Kormachja Kniga? Russian or Czech

S: Can you write that down for me?

(Write down)

U2: Rudder or pilot man.

S: I understand.

U3: It's a cannon law book.

S: ok

U4: I found a book about it but I didn't find actual text.

S: Do you want it in Russian or Czech?

U5: Yes, either of them. Preferably around 1654 edition. There are hundreds of editions and manuscripts.

S: Fifteen what?

U6: Around 1650

S: 1650 edition. First thing that we should do is to check and see what we haveYou know how to search Summit?

U7: I did one book. I think there are some more notes like "have it," "text."

S: c...

(Searching database)

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U16: Kormachya , that looks good.

S: Key word searching.

U17: There is just one book, has all about it. That's the book.

S: Yeah. It's all about it.

U18: It's all about it. I need the actual text.

S: Do you need the actual text? Ok.

U19: Even in century that I'm doing it, there are many manuscripts and many editions.

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U22: Actually I have a copy of raw book, particular edition or revised, revised, looking for...

S: You want the old one?

U23: I want the old one...

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S: Which one do you think it is?

U26: See this one, see this one Kormachya edition, Joseph. That's one of the volumes one of them. That's one of the editions, one I want perhaps.

S: Do you think so?

U27: This is the one.
 S: This is 1653.
 U28: That's the date.
 S: That's what you want.
 U29: Yeah
 S: There is only one holding They don't cooperate with ILL (inter-library loan) very well.
 U30: But it exists
 S: But it exists. That's why you can find it.
 U31: Very good.
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