Interaction in Information Retrieval: Discourse Analysis and the Identification of an Elicitation

by Mei-Mei Wu

Associate Professor, Graduate Institute of Educational Media
& Library Sciences, Tamkang University, Taipei, R.O.C.

e-mail: meiwu@twnmoe10.bitnet

Abstract

This study is under the large project initiated by Professor Tefko Saracevic at Rutgers University with the concern of the interactive nature of information retrieval activities, their users (patrons and intermediaries), use, and the interactive processes. One concern of the current author is the patrons and their Elicitation behavior. For example, what are the purposes of these Elicitations? Does patron Elicitation behavior occur randomly, or are there patterns to be sought? This paper reports the initiative efforts of the study -- the process of applying the method of Discourse Analysis to identify an Elicitation. An Elicitation is considered as a request for information in conversation. However, such a "request" can not be recognized by merely its grammatical form. For example, "How are you doing today?" is an interrogative in form, but it is not an Elicitation. This paper addresses the theoretical foundation of human Elicitation behavior; discusses Discourse Analysis as a proper methodology to identify an Elicitation; and finally, provides examples as decision making process of identifying an Elicitation.

1. INTRODUCTION

Research in the area of information retrieval, whether it studies the intermediary, the patron, the system, or the interaction between any of these components, has ONE aim: to improve the quality of information provision services to the patrons. The center of the whole business of information provision services is the patron. The salient goal for the study of information systems improvement, intermediary, or interaction all intends to meet the needs of the patrons. As for patron studies, the paramount concern is to identify useful patterns and attributes to better understand the patrons' information needs, search questions, information seeking behavior, etc.. This knowledge can help to improve the functions of new information interfaces, through the training of human intermediaries or the design of intelligent user interfaces.

One major concern of the current researcher is the patrons and their Elicitation behavior. An Elicitation is considered as a request for information in conversation. A request for information is a voluntary way to reveal one's interests, concerns, perplexity, or problems. This paper reports the initiative efforts of the study -- the process of applying the method of Discourse Analysis to identify an Elicitation. It addresses the major concepts and the prior research on Elicitation and Discourse Analysis; and illustrates the decision processes in identifying patron's and intermediary's Elicitations.

2. ABOUT ELICITATION

Elicitation is also termed "questioning", "question-asking", and "questioning-answering" in most literature. The study of this issue had not caught researchers' attention until the 1960s when the logic of questions and answers became a focus of interest. A bibliography compiled by Egli & Schleichert in 1976 reveals that in the 1960s when the concept of artificial intelligence and automatic query systems were introduced, the primary concern of Elicitation research was the logic of questions and answers. Studies regarding this concern emphasized the connection between a question and an answer "in order to ask and answer questions in an orderly, fruitful way." The fundamental assumption of the logic of questions is that "A question, Q presupposes a statement, A, if and only if, the truth of A is a logically necessary condition for there being some true answer to Q" (Belnap & Steel, 1976). This assumption, however, does not work for the empirical situation. For example, Goffman (1976) and Stenstrom (1984), by investigating mundane conversation, challenge the circular logic necessary when a question and a response are assumed as criteria for each other.

Until the late '70s and early '80s, the psychology of questions as well as the empirical research on Elicitation behavior in various social contexts was the major concern of researchers (e.g., Dillon, 1990; Belkin & Vickery, 1985; Graesser & Black, 1985). For example, the comprehension of a question and the provision of a proper answer -- the internal cognitive process -- represent the main concern of this approach (e.g., Galambo & Black, 1985). Besides, taxonomies for question forms and functions based on empirical

observation were suggested (for example, Kearsley (1976) proposed taxonomies for question forms and functions, and suggested that they should work hand in hand). Dillon (1990), in a survey of empirical studies on Elicitations, proposed three elements for an Elicitation: assumptions, question and answer. In other words, prior to the act of asking a question, the speaker has presupposed that the listener knows the answer or should know the answer, which is the first element, the "assumption". Then, the question, the second element, regards the process of formation and the act of expression. An answer is the third element of an Elicitation.

In this current study, an Elicitation is defined as a question-asking activity in conversation. Its explicit function is to request information, be it a request for new information, verification, or repetition. Implicitly, an Elicitation can function as a search of self-identity, a symbol of authority or power, an effort to establish a relationship with the other, or a way to keep the conversation going. That is, an Elicitation can be driven by a need for information as explicitly identifiable (e.g., through information content), or by other implicit motivations as mentioned above. In fact, the explicit and implicit functions do not necessary exclude each other. For example, Kearsley's taxonomy (1976) suggests four major question functions: "echoic", "epistemic", "expressive", and "social control". "Echoic" questions request repetitions. An "epistemic" question requests either "evaluative" (yes or no; right or wrong) or "referential" (what, why, etc) information. These two functions are similar in that they are information-content based. "Expressive" and "Social control" questions are independent from the information content. These functional categories, however, do not necessarily exclude one another.

A conceptual framework for the Elicitation process (Figure 1) is proposed to highlight the major components and their relationships based on the above literature review. An Elicitation is driven either by a self-inquiry -- arising from information need -- or, by situation, for example, to identify one's social power, to seek for self-identity, to improve a relationship, or to keep the conversation going. A second step is to formulate an Elicitation which relates to personal knowledge and experience. This is followed by the act of expressing the Elicitation. Studies in this area focus on either the syntactic structure, or functional categories, or the pragmatic meaning of an Elicitation. The next process is the comprehension of an Elicitation by the other party, leading to a reply or answer. An optional act is the feedback to the reply or a subsequent Elicitation driven by another self-inquiry or situation. The concern of the current study is to identify patron's and intermediary's Elicitations.

3. DISCOURSE ANALYSIS

Discourse analysis (DA) is a method for collecting and analyzing verbal (linguistic) data, written or spoken. Traditionally, discourse is a synonym for written text, as used by Van Dijk and in the European tradition. Scholars in the U.S., however, tend to refer to discourse as spoken text or conversation. The argument of discourse analysis (DA) is, then, whether it relates more to (written) text analysis (TA), or to conversation analysis (CA).
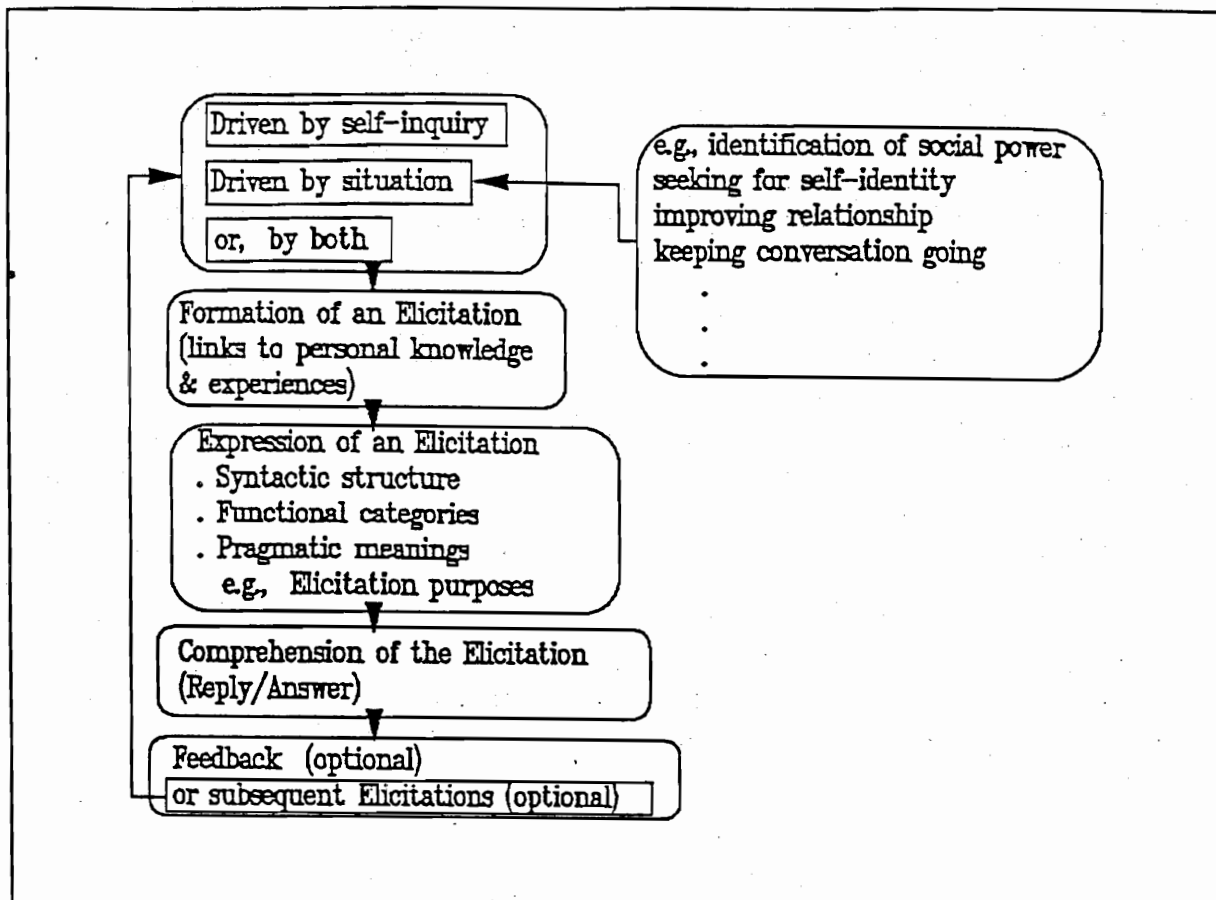
Figure 1. A Conceptual Framework of Elicitation Process (Wu, 1993a, p.20)

Indeed, TA and CA may represent different approaches of research focus. Text analysts focus on the textual structure, while conversation analysts emphasize the conversational phenomena, such as exchanges and conversational turns. Discourse analysts, apparently, are concerned with a more comprehensive framework of spoken language and consider both approaches of textual structure as well as conversational features as appropriate aspects of discourse.

One of the purposes of DA is to identify the regularities of coherent conversation. Brown & Yule (1983, pp.26) depict the function of DA as to describe "regularities in the linguistic realisations used by people to communicate those meanings and intentions." Note that four major concepts comprise this definition: regularities, linguistic realizations, meanings, and intentions.

By regularities, Brown & Yule mean to distinguish it from the word "rules" which tends to be "fixed and true 100% most of the time." Regularities, on the other hand, are based on the "frequency with which a particular linguistic feature occurs under certain

conditions in the discourse data." As such, DA is not looking for rules or laws of language being used; rather, it is a method to describe the possible pattern of language features being used in certain situations.

"Linguistic realizations in use" stresses the function of language and how language is being used to achieve the speaker's goals. Therefore, DA explores the patterns of certain linguistic features that people communicate with to transmit their meanings and intentions.

The two most difficult techniques in applying DA are considered as (1) the perception and interpretation of the "meaning", and (2) the identification of the unit of analysis.

3.1 Meaning and Intention

Language is used to communicate meaning and intention. Extensively, it is also how the listener decides this meaning and interprets the speaker's intention. Intention is the internal meaning of a speaker's wish in producing an utterance. As in the domains of philosophy, communication, linguistics, and cognitive psychology, meaning and intention have been argued to be complicated issues. Brown & Yule (1983) have suggested four mechanisms for the discourse analysts to decode what the speaker and hearer are transmitting. The four mechanisms are reference, presupposition, conventional implicatures and inference. Reference is the act or the ability of "referring"; presupposition is the "understanding of the common ground of the two parties"; implicature is "the ability to account for what the speaker can imply"; and, finally inference is the process whereby the listener arrives at "an interpretation of utterances or of the connections between utterances". The internal meaning of a speaker's intention may not be easy to grasp, through human's ability of referring, implying, presupposition, and inferring, a speaker's intention can possibly be interpreted.

Gumperz (1982, p.204) also writes, "The notion of cognitive processing, which argues that human understanding rests on meaning assessments in which physical reality is selectively perceived, transformed and reintegrated with reference to pre-existing background knowledge is by now generally accepted." Hollnagel provides a similar model of communication that in order for the participants to understand each other, some mutual background knowledge is required.

3.2 Unit of Analysis

Another dilemma in applying DA is the determination of the unit of analysis. Different research projects with different purposes, of different research approach, define the unit of variedly. Table 1 illustrates the units and their definition chronologically.

===

Researcher	Unit	Definition
Bloomfield, 1946 (Goffman, 1976)	utterance=turn	Goffman cited Bloomfield, and states that Bloomfield "apparently also used 'utterance' to refer to talk done during one turn.
Harris, 1951	utterance	A stretch of talk, by one person, before and after which there is silence on the part of the person.
Sack, Schegloff, & Jefferson, 1974	adjacency pair	Identify two-turn unit, eg. question-answer
Sinclair & Coulthard, 1975	system of analysis: Act, Move, Exchange, Transaction, & Lesson	Act is the smallest unit of the system.
Goffman, 1976	utterance	Utterance is a spoken unit to specify the term sentence used in written text.
Goffman, 1976	move	There may have different "doings" in one turn, thus move is the basic functional unit.
Duncan & Fiske, 1977	turn	Identify 11 definitions of turn recognition
Grosz, 1977	focus space	A focus space is formed out of a number of utterances with a dialogue referred to a single task or subtask.
Reichman, 1978	context space	A context space is a group of utterances referring to a single episode or issue that forms the basis for a context space.

Crouch & Lucia, 1981	contribution	A contribution is a speech sequence by one participant during the conversation. A contribution is not broken off by any unsuccessful interruption.
Brown & Yule, 1983	topic	Topic is a stretch of discourse 'about' something.
Stubbs, 1983	exchange	An exchange includes an initiation, response, & feedback
Coombs & Alty, 1985	system of analysis: Act, Move, Exchange, Transaction, & Communication	Act is the smallest unit
Litman, 1985	Utterance	An utterance refers to both a speaker's complete turn as well as individual sentences within a turn.
Daniels, Brooks & Belkin, 1985	utterance	An utterance can be defined as a speech sequence by one participant during the conversation. It may or may not comprise of complete grammatical entities, and may be terminated by a contribution made by the other participant. If the contribution of one participant takes the conversational turn, the previous speech sequence is regarded as completed utterance.
Brooks, 1987	utterance	Basically follow the same definition as Daniels, Brooks, & Belkin, 1985, however, further elaborated as two models. Method U-1 defines an utterance as not terminated by overlapping that does not take the floor. Method U-2 defines an utterance that any interruption of one participant by the other, even though the

| Clark & Schaefer, 1989 | contribution | interrupter does not take the turn, should be regarded as completing the previous speech sequence.

Contribution is a collective unit that includes a presentation phase and an acceptance phase. |

Table 1. Overview of unit of analysis in various studies   (Wu, 1993b, pp.346-347)

Researchers defined unit of analysis depending on their research purposes and hypotheses. Although many terms and definitions were applied, there were two kinds of "unit" as can be identified from Table 1, namely the structural unit, and the functional unit. For example, "utterance," "contribution" (Crouch & Lucia), and "turn" are the basic structural units of conversation. And "Act", "Move", "topic", "context space", as well as "focus space" are obviously functional units. For the purpose of this study, a structural unit is suggested. The following section discusses the determination of the unit of analysis and the identification of an Elicitation.

4. IDENTIFYING ELICITATIONS

Two major phases took place to collect the required data: the preparatory, and the identification phases. The preparatory phase including preparing the transcripts; identifying and numbering the utterance units. The Elicitation identification phase including deliberating the definition and criteria for identifying Elicitations, and demonstrating the examples of decision making to illuminates the identification process.

4.1 Preparatory Work

a. Preparing the Transcripts

All 38 interviews were transcribed, in both printed and machine readable forms. The length of interviews varied, ranging from thirty minutes to two hours. Most transcripts were read by a second person. Some were checked more than two times. As many researchers have suggested, transcribing is extremely laborious and a never absolutely complete process. The level of detail of these transcripts, however, fulfills the criteria for identifying Elicitations, and describing and interpreting their purposes.

b. Identifying and Numbering the Utterance Units

Utterance unit

An utterance is defined as a speech sequence by one participant during the conversation. In terms of its syntactic structure, an utterance can be as long as several sentences, or as short as a subject-predicate structure, lexical or elliptical phrases, clauses, or even false starts with incomplete thoughts, including words like "uh" and "uh huh".

In real conversation, simultaneous talk and interruption are common phenomena. Brooks (1987) delineates two treatments -- U1 and U2 models -- for the determination of the boundary of utterance units. U1 model defines that an overlapping utterance does not take apart the ongoing utterance, but this overlapping utterance itself is counted as an utterance unit. U2 model yields a simplified method that any interruption breaks the ongoing utterance, thus making the utterance unit smaller. In this study, U2 model is applied for two reasons. Firstly, as Daniels (1987, p.38) pointed "it ensures that most utterances are shorter and thus ensures that each utterance mainly deals with only one topic or subtopic" which provides the same advantage for the identification of the Elicitation and their purposes. Secondly, this treatment facilitates a convenient technique to assign utterance numbers automatically by applying Wordperfect's paragraph numbering function.

The following are two extracts from corpus. If a participant tries to interrupt, whether it is successful or not, the other participant's talk is broken into two utterance units and numbered separately.

1.   I: okay um what happen online is that we say select search for (.) Index Medicus is the big medical database. It's using the term heart arrest instead of cardiac ⌈arrest
2.   P: ⌊o::h good okay. that's ⌈helpful⌉
3.   I: ⌊uh hum ⌋ that's just the term that they happen to go with (Q015)

1. I: Okay and it's specifically for this [this protein
2. P: [for this protein
3. I: for this protein only? aequorin? (Q029)

If a participant does not intend to take the floor, but gives some continuing signals for attentiveness and responsiveness (such as "right", "okay" "uh hum" etc.) to the other participant's message, the signals are counted as a unit. And the other participant's speech is segmented into utterance units by these back-channels. The following extract explains as an example.

231

1.	I:	okay we got the intersect now we'll see where those two intersect and see how much is there
2.	P:	okay
3	I:	then because we have two big ones at that point
4.	P:	yeah
5.	I:	we'll see what's in there
6.	P:	uh hum
7.	I:	and if if there's high enough number (Q015)

4.2 Identifying Elicitations

a. Definition of an Elicitation

An Elicitation is a verbal request for information. The piece of information could be facts or opinions. When one requests for information, one intends to change or transform image, or to reduce uncertainty. This kind of Elicitation behavior is, in fact, the micro-level of information seeking behavior that one seeks information to fulfill the gap of one's internal state of knowledge. It can also be referred to as the epistemic functions. Epistemic functions intend to dig the facts, to obtain clarifications or confirmations. Besides, by asking questions, one is able to maintain or to control the conversation, which can be considered as the social functions. This framework provides us with a model that Elicitations are verbal requests for information for epistemic or social purposes, or both. Epistemic purposes are explicit and can be determined from the Elicitation utterances themselves. For example, "Do you know what time it is?" is an Elicitation asking "about" the time. It is hard to determine though, even from the context, that it conveys a function of maintaining or controlling the conversation. The point is, social functions in terms of maintaining or controlling the conversation is indeed difficult to determine without interviewing the speakers themselves. Nonetheless, from the utterance and the context, the explicit purposes of "what the requesting information is about" can be determined. Due to the limitation of the data, the study focuses only the explicit purposes of an utterance.

In grammatical terms, an *Elicitation* can be an interrogative. But rhetorical questions to which no answer is expected or required are excluded. On the other hand, an imperative that demands linguistic responses rather than overt action or behavior, such as "you can tell me what it is," is considered an Elicitation. In conversation, incomplete utterances or elliptical utterances are very often used to elicit responses, for example, "and that goes to--" (Q002); "and it will go to-" (Q004). Those cases are "alternatives" (Dillon, 1990) or called indirect questions in contrast to formal grammatical question forms, such as intonated, wh-questions or Auxiliary questions. Generally speaking, an Elicitation can take a number of forms, for example:

> . *indirect*/alternative, ("well, let's make a decision" Q002)
> . *intonated*, ("look at another five?" Q003),

- *wh-questions*, ("what what you're doing" Q004; "how far are we now" Q005), and,
- *Auxiliary*, ("is that all that all came out?" Q010)

Goffman (1976) and Stenstrom (1984) have pointed to a circular problem when a question and a response are defined as criteria for each other (e.g., the logic of questioning). Stenstrom suggests alternatives to avoid this ambiguity by "going from function to form". For example, the researchers should ask such questions as: "What does the speaker say?", "Where does he say it?", and "How does he say it?" (Stenstrom, p. 24)

The criteria for this study to identify an Elicitation is the speaker's <u>intention</u> to invite or to request some information from the other party. In Figure 2, the speaker, S, in her internal state, has something unknown, S(x'), and makes an assumption that the Listener, L, has the piece of information L(X) to match S(x'). In this situation, S's utterance is an Elicitation for L. A second situation is when S, the speaker, in her internal state, has something to be confirmed or verified, S(y'), and makes the assumption that L is the source for that confirmation, L(Y). In this case, S's utterance can also be recognized as an Elicitation for L.
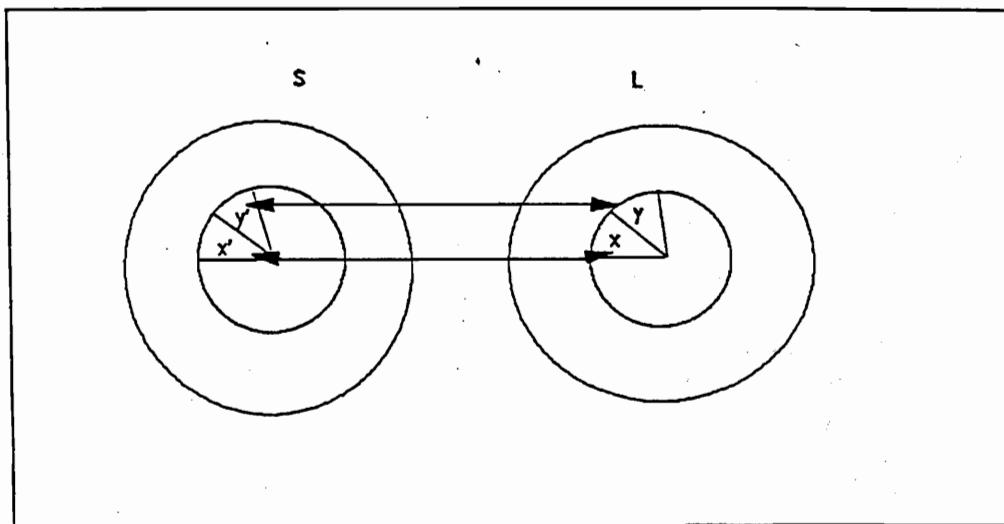

Figure 2. Presumption as Criteria for an Elicitation (Wu, 1993a, p.35)

b. Examples and Decision Making

Besides the criteria addressed above, the decision making depends also on the context, the pragmatic meaning but not merely the propositional meaning of a single utterance. The following examples further illustrate the criteria used for determining whether an utterance or part of an utterance is an Elicitation. More difficult than easy to identify cases are presented and justified. In all examples, "I" identifies the intermediary, and "P" represents the patron.

P: Okay. When all the computer stuff came up, was that through the business?
I: No, that was in the Psych one.
P: Oh, it was in the Psych one?
I: Uh hum. (Q040)

(Example 1)

In example 1, both of the patron's utterances are Elicitations. The patron's first utterance asks the intermediary whether the source of the printouts is from a business database. The patron's second utterance is also an Elicitation for the purpose of confirmation. Its intonation (signified by a question mark) suggests its function as an Elicitation.

P: If we took out pregnancy in adolescents, you wouldn't have very much, would we?
I: No, I've got a couple more.
P: Do you. (Q041)

(Example 2)

The patron's first utterance in example 2 is an Elicitation asking the intermediary about the removal of a term and the possible effect on the search result. The patron's second utterance, although in the form of a question, is not to elicit but an acknowledgement to the intermediary's reply, it can be interpreted as "I see."

P: Oh, that's the price, is that?
I: F-9, --
P: How much did that costs on there?
I: This, the last one was $14.51.
P: That's all?
I: That's all.
P: You're kidding? (Q040)

(Example 3)

In example 3, the patron uses question forms in all four utterances. The first is an Elicitation seeking confirmation. The second is an Elicitation asking for facts. The third can still be seen as an Elicitation for confirmation although it also expresses some degree of astonishment. The fourth one is either an Elicitation or a rhetorical question, depending on the degree of the speaker's intention. In this case, "you're kidding?" is interpreted as "it's amazing." It is not considered as an Elicitation.

I: It's probably more a monochlonal antibodies, or there's a lot of, umm. stuff with AIDS that's related to monochlonal antibodies

P: right

I: Uhhho

P: What I'm doing is a bit more injury related, because it has to do with separating the antibody from the cell, the hypernoma that produces it as well as the culture mediums, so if monochlonal antibodies would have reproduced on large scale, (.) for example (.) (then, umm) then, if what I'm doing is going to work, that might be applied (.) you know to be able to produce something to purify them (.) (Q030)

(Example 4)

In example 4, the intermediary offers what he knows in the first utterance. The intermediary's second utterance (actually a back-channel) is an Elicitation, requesting a verbal response; it is an invitation to the patron to talk more about what s/he has in mind.

I: Okay. And you're only interested in nighttime eating, only nocturnal. (Q028)

(Example 5)

Another form of Elicitation compares the internal models of the individuals by means of a reflective restatement. In example 5, I's utterance is a comparison of his/her understanding of P's search question to P's internal model through an indirect question. It is an Elicitation.

P: Pesticides, pesticide plants, -- (pause) -- fertilizer, -- I guess pharmaceu --- pharmaceutical, well --

I: Pharmaceutical companies?

P: I guess so, maybe. (Q032)

(Example 6)

An utterance which fills in an ellipsis, such as I's utterance in example 6, and thus compares the speaker's understanding with the listener's internal model, is also an Elicitation.

P: ((User laughing)) I know. Now this database has books on journal articles and
        --

I: No, just journals and dissertations, no books. This is the problem. Now there's
        a new publication that's just come out. I don't know where there are copies
        downstairs yet which deals with books. Okay. (Q033)

                                                                    (Example 7)

P's utterance in the above example is an Elicitation. P has an assumption that I is the
source for the knowledge of the content of databases. Although P's utterance is in the form
of indirect question, s/he obviously intends to obtain verification of some facts.

The following examples demonstrate those utterances that are in the form of
questions, but not Elicitation according to the criteria described above.

I: Okay, Hi Kevin, how are you doing? (Q028)

                                                                    (Example 8)

Greeting utterances are not elicitation because the speaker's intention is to say
"hello". It is not necessarily to request a verbal response.

I: And the ones on adolescents and labeling you have in the socio and psych,
        there are only those four, okay? (Q031)
                                                                    (Example 9)

In example 9, I explains the search outputs to P. "Okay?" following a statement does
not always indicate an Elicitation. In this example, I's utterance is a rhetorical utterance,
informing the patron of one of the retrieval results of "adolescents and labeling" has four
articles only. The speaker does not intend to request for a confirmation nor an invitation to
talk.

I: so we're going to try to get everything on writing. [writing skills,
P: [Right
I: writing process, writing [instruction]
P: [uh hum]
I: I'll keep it to elementary school students
P: Right
I: and then combine it with attitude
P: Right

236

P: Right
I: or positive attitude
P: right (Q008)

(Example 10)

In example 10, none of I's utterances are Elicitation because I does not compare or verify his/her understanding of P's search question to P's internal model. Rather, I informs P of the plan and the search strategy for the subsequent searching process; I talks about matters which both participants assume are not in the patron's knowledge domain, such as the combination of terminologies, the strategy of search.

P: Okay, now what about counseling, cause multimodal counseling is, -- (Q040)

(Example 11)

Example 11 gives another instance in which an utterance is not an Elicitation even though it is in the question form. P's intention is to suggest a new term "counseling". Such a case can be identified by the presence of a subsequent explanation.

I: You know what we'll do. Let's see, see what do we got. I just want to do a couple at a time so we can see it. What the heck, -- okay. Banking technologies, -- is that any good, -- not really. (Q037)

(Example 12)

If a speaker answers his/her own question, the question is not an Elicitation. In the above example, ("is that any good, -- not really") I does not intend to invite P to speak.

I: Whoops, they've changed the name and number? No wonder, I'm looking at it and thinking. My vision just isn't what it was. See that's, this is one of those we'll be on line with. (Q040)

(Example 13)

Example 13 provides another instance in which a self-answered question is not an Elicitation. It does not intend to invite the other party to talk.

I: We'll see, yeah. (Pause) I have to sign this. Plants production, plants
        production, plant production, let's see, we should find one that's physiology
        and biochemistry of. Okay, select set 1 and, SH equals, F600, -- that's
        horticultural, but now we have to get, we have to get forests. Where are the
        forests hidden? (Q038)

                                                              (Example 14)

Questions asked to oneself (the so called self-talk, or more precisely self-questions)
are excluded in this study because the speaker neither intends nor expects a response from
the listener. In example 14, I reads a manual and talks to herself: "Where are the forests
hidden?" The Intermediary interacts with a manual but not the patron. Therefore, P has no
obligation to respond because both parties share the assumption that P is not the source for
that piece of information.

P: It could have, -- but it just may have happened to bring up the file, -- it was
        the last one, remember there was one more. That's it, see the word endocarp
        in there?
I: Uh hum.
P: That's part of the fruit. (Q038)

                                                              (Example 15)

Questions calling for attention (such as "see the word endocarp in there?") are not
Elicitation. In the above example, the patron informs the intermediary of a key word which
is appearing on the screen.

5. CONCLUSION

        This paper reports the initiative work of a research project of which the overall goal
is to explore patron Elicitation behavior in the domain of information retrieval interaction.
The initiative work includes the delineation of the theoretical concepts of human Elicitation
as well as the methodological issues of Discourse Analysis. It argues that the recognition of
an Elicitation is not merely through its grammatical form but also through pragmatic
meaning. The paper provides examples as well as justification for the decision making of an
Elicitation. The potential impact of the current paper is two-fold. On the research level, it
shares methodological techniques in the determination of Elicitations in conversation. On the
practical level, it may enhance the knowledge in the intelligent interactive interface design.

References

Allen, B.L. (1991). Cognitive research in information science: implications for design. *Annual Review of Information Science and Technology* 26:3-37.

Belkin, N.J. (1981). Models of dialogue for information retrieval. In: Friberg, I., (Ed.) *Proceedings of the 4th International Research forum in Information Science*, pp. 15-36.

Belkin, N.J. (1984). Cognitive models and information transfer. *Social Science Information Studies* 4:111-129.

Belkin, N.J., & Vickery, A. (1985). *Interaction in Information Systems: a Review of Research from Document Retrieval to Knowledge-Based Systems*. England: Cambridge University.

Belkin, N.J., Brooks, H.M.,& Daniels, P.J. (1987). Knowledge elicitation using discourse analysis. *International Journal of Man-Machine Studies* 27:127-144.

Belnap, N., & Steel, T. (1976). *The Logic of Questions and Answers*. London: Yale University.

Brooks, H. (1987). *An Intelligent Interface for Document Retrieval Systems: Developing the Problem Description and Retrieval Strategy Components*. Ph.D. Thesis, The City University, London.

Brown, G., & Yule, G. (1983). *Discourse Analysis*. New York: Cambridge University.

Clarke, H. & Schaefer, E. (1989). Contributing to discourse. *Cognitive Science* 13:259-294.

Coombs, M.J. & Alty, J.L. (1985). An application of the Birmingham discourse analysis system to the study of computer guidance interactions. *Human-Computer Interaction* 1:243-282.

Coulthard, M. (1977). *An Introduction to Discourse Analysis*. London: Longman.

Crouch, W., & Lucia, J. (1981). *Analysis of Verbal Behaviors in the Presearch Interview*. Report of the Presearch Interview Project. Syracuse Univ., N.Y. School of Information Studies. (ED 205 184)

Crystal, D. (1987). *Cambridge Encyclopedia of Language*. Cambridge: Cambridge University Press.

Daniels, P.J. (1987). *Developing the User Modeling Function of an Intelligent Interface for Document Retrieval Systems*. Ph.D. Thesis, The City University, London.

Daniels, P.J., Brooks, H.M., & Belkin, N.J. (1985). Using problem structures for driving human-computer. *RIAO '85*. I.M.A.G., Grendle, pp. 645-660.

Dervin, B., & Dewdney, P. (1986). Neutral questioning: a new approach to the reference interview. *RQ* 25:506-513.

Dillon, J.T. (1990). *The Practice of Questioning*. New York: Routledge.

Duncan, S. & Fiske, D. (1977). *Face-to-Face Interaction: Research, Methods, and Theory*. NY: John Wiley & Sons.

Egli, U., & Schleighert, H. (1976). Bibliography of the theory of questions and answers. In: Belnap, N. & Steel, T. (Eds.) The Logic of Questions and Answers. New Haven, CT: Yale University Press, pp.155-200.

Eichman, T.L. (1978). The complex nature of opening reference questions. *RQ* 17:212-222.

Galambos, J., & Black, J.B. (1985). Using knowledge of activities to understand and answer questions. In: Graesser, A.C., & Black, J.B. (Eds.) The Psychology of Questions. Hillsdale, NJ: Erlbaum, Chapter 5.

Goffman, E. (1976). Replies and responses. *Language Society* 5:257-313.

Graesser, A., & Black, J. (Eds.) (1985). *The Psychology of Questions*. Hillsdale, NJ: Erlbaum.

Grosz, B.J. (1977). *The Representation and Use of Focus in Dialogue Understanding*. Ph.D. thesis, University of California, Berkeley.

Grosz, B., & Sidner, C. (1986). Attention, Intentions, and the Structure of Discourse. *Computational Linguistics* 12(3):175-204.

Halliday, M.A.K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.

Hollnagel, E. (1979). The relation between intention, meaning and action. In: MacCafferty. M., & Gray, K. (Eds.) *Informatics 5: The Analysis of Meaning*. London: Aslib, pp.135-147.

Horne, E. (1990). An investigation into self-questioning behavior during problem-solving. *Proceedings of the 53rd Annual Meeting of the American society for Information Science*. 27:86-90.

Kearsley, G.P. (1976). Questions and question-asking in verbal discourse: a cross-disciplinary review. *Journal of Psycholinguistic Research* 5(4):355-375.

Litman, D. (1985). *Plan Recognition and Discourse Analysis: An Integrated Approach for Understanding Dialogues*. Ph.D. dissertation, University of Rochester, Rochester, NY.

Reichman, R. (1978). Conversational coherency. *Cognitive Science* 2:283-327.

Sacks, H., Schegloff, E., & Jefferson, G. (1974). A simplest systematics for the organization of turn-taking for conversation. *Language* 50:696-735.

Saracevic, T. (1978). Problems of question analysis in information retrieval. *Proceedings of the 41st Annual Meeting of the American Society for Information Science* 15:281-3.

Searle, J. (1969). *Speech Acts -- An Essay in the Philosophy of Language*. London: Cambridge University Press.

Sinclair, J.M., & Coulthard, R.M. (1975). *Towards an Analysis of Discourse: The English used by Teachers & Pupils*. London: Oxford Univ.

Stenstroem, A-B.(1984). *Questions and Responses in English Conversation*. Malmoe, Sweden: Gleerup.

Stubbs, M. (1983). *Discourse Analysis: The Sociolinguistic Analysis of Natural Language*. Chicago: University of Chicago Press.

Van Dijk, T.A. (ed.)(1985). *Handbook of Discourse Analysis*. London: Academic Press.

Wu, M.M. (1993a). *Information Interaction Dialogue: A Study of Patron Elicitation in the Information Retrieval Interaction*. Doctoral Dissertation, Rutgers University, New Brunswick, New Jersey.

Wu, M.M. (1993b). Discourse analysis and information retrieval interaction. Journal of Educational Media & Library Sciences 30(4): 340-350 (in Chinese).