

"User revealment" - a comparison of initial queries and ensuing question development in online searching and in human reference interactions

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ABSTRACT

This paper compares user's opening queries and their search progression in two sets of data: logs of end-user online searches and user-librarian reference interactions. The two sets of opening queries have common characteristics, in particular they are both too general in relation to the user's search intention. Search progression is very different in the two settings, and the human-mediated searches have a far higher success rate than the online searches.

A communication model, based on theories of conversations between strangers, is applied to explain how users are induced to reveal their search intention in the dialogue with the intermediary. Establishing and maintaining contact, creating trust and ensuring understanding are essential elements in these dialogues, and play a larger role than the intermediary's questions. Suggestions for introduction of such elements to achieve user revealment in the online searches are discussed.

1. INTRODUCTION

Rapid technical development over the last few years has revolutionized the way libraries present the content of their collection to their users. Access to the distribution channel for electronic information is becoming general and ubiquitous with the spread of PC's with communication facilities and Internet access. Library catalogs in machine-readable form are made accessible via both intranets on an institution-wide and the Internet on a world-wide basis. The catalog, previously a medium which for all practical purposes was available only in one place and in a non-distributable form, has in principle become available for

anyone, anywhere. At the same time both content and format of the catalogs are changing as document content, not only document representations, become available in machine readable form.

Traditionally, library catalogs have to a large extent served as tools for a *mediated* information retrieval system. In the library, a human intermediary has been available, and often indispensable, as mediator in cases where the catalog's language or world model has not matched the user's. With library catalogs in machine-readable form being made accessible via both intranets on an institution-wide and the Internet on a world-wide basis, we are now well on our way towards a situation where such human mediation will often be impossible, or at least unavailable. The fact that the term "library" itself is beginning to lose its old connotations of a physical building with a physical document collection does not resolve this problem. "Digital libraries", where documents are directly available to the user in electronic form, may to an extent eliminate the need for catalogs in their traditional form. They will certainly not eliminate the need to bridge the terminological and cognitive gap between the producer and the user of the information. On the contrary, studies of users searching information in electronic document collections, for instance on the World Wide Web, to a large extent report the same search patterns and the same problems as do studies of online catalog searches. Prevalent results from such studies are that unassisted online searching is difficult for end users, with a failure rate often approaching 50%; end user searches of all kinds are predominantly simple, comprise few search terms and rarely employ search refinement methods; topical searches fail most frequently (between 1/2 and 3/4 of the time in different studies); and users have difficulties both in choosing search terms to represent their problem and in redefining search terms in case of failure [4,6,13,20,21].

In the search for approaches towards improving the alarmingly low success rate of end user online searches, it has been suggested that in order to construct more effective retrieval systems there is a need for more knowledge on how users communicate with human intermediaries when they search for information [2,8,24]. Despite an ongoing discussion over whether interaction between humans constitutes a good model for human interaction with machines [18(p18-20), 25(p547f)], it is

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clear that any information retrieval process, whether involving a machine or not, is basically an act of communication and as such inherently interactive in nature [23]. Accordingly one of the central issues for retrieval system design is to support effective interaction between users and other components of the system. Evidence supporting the fruitfulness of a conversational approach to the information retrieval process is offered by researchers such as Yerbury & Parker [28], who found the ability to maintain a pattern of conversational interaction with the interface to be the primary factor which decided whether an online searcher felt satisfied with the search outcome or not.

The findings reported in this article are based on data collected as part of a comprehensive study of user behavior during information seeking in the public library, with the purpose of providing empirical background for an interaction-based, conversation-analytic approach towards the development of more user-adapted online catalogs. Public libraries are chosen as the setting for the study both because they are underrepresented in previous, related studies, and because the broad user basis and the relative irregularity of use causes most users to remain "permanent novices" in relation to the online system. This makes user-adaptation of the catalog an even more critical concern here than in academic or other institutional libraries where approaches such as user education may remedy system shortcomings.

The study comprises an analysis of user / librarian interactions based on observation and audiotape recording of reference interviews, and an analysis of logged protocols of unassisted user interaction with an online public access catalog (OPAC). These analyses show that online searching and reference interactions are communicative situations with many common features, particularly in the kind of queries users present and in the way they approach either the system or the librarian with their query. A major difference lies in the success rates of the two situations: for topical queries the failure rate is approximately 45% for the online searches, vs. less than 10% for the user / librarian interactions. This should be a clear indication that for system designers, there may be lessons to be learned from reference librarians.

One similar trait in particular is apparent from both the online and the reference interaction data: the generality of the users' initial question as opposed to the "real" level of specificity of the query as it evolves during the interaction. In the online search situation one of the most frequent causes of problems for topical searches is that the user is unable, or perhaps unwilling, to use search terms which match the specificity of their problem. This is in accordance with findings of other OPAC search studies [13] and also, interestingly, both with old studies of card catalog search behavior [19], and with very recent studies of Internet searches. In the human / human interactions the data show the same tendency towards a general initial query formulation which need disambiguation, specification or both to express the underlying information problem; more than 60% of the users change their topic during the interaction. Nor is this a new discovery in reference interaction research, indeed, early authors like Katz [12] and Lynch [17] speak of this kind of user behavior as "a truism in reference work". However, there

are few investigations of the similarity of user approach in the two situations, and few attempts to compare the consequent development of the respective searches. This article looks at possible reasons for this similarity and attempts to point to possible consequences for online system development.

2. DATA AND METHOD OF STUDY

The online catalog search analysis is based on data collected from users of the online public access catalog at the Deichmanske bibliotek (Oslo public library). The OPAC system in question has the basic functionalities of search for proper (particularly authors') names, keywords from titles, and controlled subject headings, and offers Boolean term combinations and search term truncation. The data for analysis were collected at one of the five search terminals available to the public in the main library over a period of four weeks. The data collection terminal was equipped with a program which presented the users with a questionnaire before and after searching, and which logged to a file all data presented to the user by the system and all user input to the system during the search session. The transcribed logs have been analyzed on three levels: single **requests**, i.e. the input of a search term and the activity which follows; **search objectives** which consist of the number of requests which constitute the user's inquiry into a theme of interest; and **sessions** which are the total activity of each user at the terminal in one sitting. Determined as described above, the data for the study comprise 173 sessions, containing 351 searches, with a total of 1002 separate queries.

The interactions between users and librarians were collected in a medium-sized Norwegian public library (serving a user population of approx. 50 000 people) during five days over a 14-day period. The collection took place at the library's combined reference and information desk in the adult department. Interactions were audiotaped and supplemented with unobtrusive observation in order to record both the verbal and the non-verbal communication between user and librarian. Librarians carried the recording equipment to record the substantial part of the interaction which took place away from the reference desk. Users were notified of the recording by posters prominently displayed on the desk and told that they could require the tape recorder turned off at any time. Nobody in fact required this, indeed none of the users seemed inhibited by the recording in any way. A total of 170 interactions, involving six different librarians, were recorded. Of these 170 interactions, exactly half were topical inquiries, 50 of these were selected for transcription and analysis. The criterion for transcription was that some interaction was taking place between user and intermediary, apart from the initial question and the final negotiation of the retrieved item(s). This interaction might for instance take the form of one or more question / answer sessions, or of unsolicited additional information from the user and the intermediary's response to this.

Since the two sets of data were collected at different times and with different users, through unobtrusive recording and without any follow-up interviews of the subjects, the legitimacy of drawing comparisons between them may be questioned. Obviously, interaction with a terminal and

interaction with a human intermediary are two quite different communicative situations, and conceivably users might bring quite different questions to the terminal and to the intermediary. This does not seem to be the case, however. Neither thematically nor in terms of level of complexity is there any consistent difference between the two sets of queries. On the contrary, they are remarkably similar, even with respect to the classification and distribution of search purposes, where these can be ascertained through the online questionnaires or through analysis of the reference interviews. Such similarities justify an inquiry into the progression of the two kinds of searches, in search of an explanation of the difference in success rates.

3. RESULTS

3.1 Online Searches

Failure analysis of the online search sessions shows that nearly 2/3 of all single requests and 1/3 of all search objectives fail. If topical searches, as opposed to searches for known authors or titles are considered separately, the failure rates for requests and objectives rise to 70% and 45%, respectively. The following analysis will focus on these topical searches, where errors are both more frequent and more difficult for the user to repair in the course of the search. Topical searches cause problems on three different levels: users make **lexical** errors in spelling or typing, **syntactic** errors which violate the formal demands which the system imposes on the input, and **semantic** errors when they fail to express their information need in terms compatible to those used by the system to represent the potential information sources. More than 50% of all failed searches are caused by semantic errors, and experiments with automatic error correction (spell checking, syntax check etc.) show that although a number of lexical and syntactic errors may be detected and corrected, many of these corrected errors would transmute to semantic errors and still cause the search to fail. In an online catalog search, such semantic failure may occur on two different levels: the user may fail to match the terminology and level of specificity used by the system to describe the

documents, or he may fail to choose terms which match the "real" level of specificity of his problem.

In the study's 137 topical search objectives, 25% of users' initial search terms were too broad in relation to the system's terminology, 25% too narrow, and 50% matched the terminology level. These figures are not, however, representative of the users' ability to match their expression to the real content of their information need. A further examination of the group of terms on the "matching level" shows that less than half of these requests actually retrieve a satisfactory search result. Judging from the development of the searches it appears that nearly 60% of the "matching" terms are in reality too general compared with the user's real needs. Even in the cases where the user's initial term is more specific than the corresponding system terminology, there is a consistent tendency to choose a more general expression than would really be representative for the search objective. The initial term seems to match the specificity of the users' interest in the topic at hand in only about 1/4 of all topical search objectives. The problems caused by this discrepancy between apparent intention and terminological behavior are aggravated by several factors observed in the study:

- the system's facilities for query refinement (Boolean combinations, truncation ...) are rarely used, and almost never used correctly
- the system's help functions are almost totally ignored
- users' attempts at repair of initial failure are very unsystematic
- the most frequent cause of search abandonment is a too large set of retrieved references
- users' search experience seems to have very little influence on search behavior.

Despite the users' failure to choose a "correct" initial level of querying, and their apparently unsystematic way of proceeding with their search, an outside observer can in most cases determine user intention from the totality of the search progression. This indicates that despite initial generality, the user did indeed have a specific purpose for his search. Both the initial generality and the underlying purposes are illustrated by the following, somewhat abbreviated examples:

Interaction 004.614/3:

"**Storbritannia**" [Britain] (545 refs)

"**Witan**" (0 refs)

"**Kronråd**" [Crown council] (0 refs)

"**Monarki - Storbritannia**" [Monarchy - Britain] (1 ref)

"**Parlament**" [Parliament] (0 refs)

"**Monarki - Storbritannia**" (as above)

Interaction 005.612/5:

"**Pilgrimmer**" [pilgrims, misspelt] (0 refs)

"**Pilgrimsreiser**" [pilgrims' travels] (0 refs)

"**Pilgrimsled**" [pilgrims' path] (0 refs)

"**Nidaros**" [Norway's main goal for pilgrimages] (8 refs, none about Nidaros as a goal for pilgrims)

[several attempts at synonyms to "**Pilgrimsreiser**", all yielding 0 refs]

"**Arkeologi**" [archeology] (77 refs, none pertaining to pilgrimages)

Interaction 001.620/1:

"**Poliklinikk**" [polyclinic] (0 refs)

"**Kjønnsykdommer**" [sexually transmitted diseases, misspelt] (0 refs)

"AIDS" (83 refs)

"Kjønnsliv" [sexuality, sexual behavior] (130 refs)

These cases indicate, respectively, a user's interest in medieval British government ("**Witan**" was a pre-Norman noblemen's council), in the pilgrims' route to Nidaros, and in the polyclinic treatment of AIDS. The last example also shows that it may not always be precise to speak of the "generality" of the initial terms; both "polyclinic" and "AIDS" may be considered equally specific, it is the relationship between the terms which the user fails to express.

There may be various reasons for this failure. One set of explanations may pertain to the nature of the catalog and its subject descriptions, or the users' experience or expectations of it. Subject headings are not primarily intended as a precise representation of the specific factual content of a document, but rather as indications of the type of content presented in a document. Thus a subject heading search is better suited for users who approach the collection to get an overview of a topic than for those seeking an answer to a specific question. Large and Beheshti (1997) note that as OPAC's are primarily confined to references to monographic material, users may need to match a very specific information request against a highly generalized description of a book's content. Knowing or experiencing this, the users may be trying to accommodate their terminology to their expectation of the level of subject description in the OPAC.

The necessary structuring of user queries is often complicated and not intuitively obvious for the non-professional searcher, particularly in cases where subject headings may represent aspects of complex topics. A specific user question often involves the need to express such aspects. Simple search terms like "**selskapsleker**" [party games], "**stepping**" [tap dancing] or "**nordlandsbåter**" [a traditional Norwegian boat type] will probably provide a sufficiently precise answer to the user's need, while "**husleie**" [rent (for housing)], "**Oslo og utdanning**" [Oslo and education], or "**ernæring**" [nutrition] followed by "**mat**" [food] probably represent futile attempts to find the answer to some underlying specific question.

In such cases as above the users are probably led astray by the nature of the subject headings, in other cases they misrepresent their problem either because they fail to recognize the ambiguity of their search term or because they choose an abstract concept to represent a concrete need. Terms like "**tobakk**" [tobacco], "**aksjer**" [stock/shares] or "**sex**" represent concepts which have a number of different aspects which will probably be treated in separate documents, even if the system's subject vocabulary does not provide a sufficient degree of specificity. The subject tobacco can be treated from several points of view: medicine, public health, law, religion, industry, agriculture, economics, recreation, domestic sciences etc., and the user will most probably have one of these aspects in mind. Terms like "**forskning**" [research] and "**symboler**" [symbols], on the other hand, are too abstract to be helpful in a search. In both cases we find from the progression of the search that the user had

something more concrete and specific in mind. In the first case the search continues with the equally abstract term "**kvalitative**" [qualitative] which in combination with its predecessor clarifies the user's intention, while in the latter case the user continues with "**abraxas**" [denotes a term used as a charm], demonstrating a very specific intention.

Even in the cases where the request which initiates a topical search is more specific than the system's representation of the concept in question, the users' terminology is often ambiguous or abstract in relation to the probable search purpose. Terms like "**ozon**" represent a narrow concept which still has a number of aspects, while "**batch**" or "**stereotypier**", while certainly not general, are both examples of terms which are too abstract to retrieve any references. In the latter case, the search proceeds with the terms "**fordommer**" [prejudices], "**dialog**", "**stigma**", "**rasisme**" [racism], "**fiendebilder**" [conceptions of the enemy], and variations like "**forutinntatt**" [preconceived] and "**fordom**" [a prejudice] before ending up with "**sosiologi**" [sociology] and finally the more concrete expression "**innvandringsdebatt**" [immigration debate]. This illustrates the fact that in cases where the single search terms are too specific, ambiguous or abstract, the human observer can make a reasonably accurate guess at the user's intention early in the search sequence, based on the sum of the attempted terms, whereas the system is not able to provide the user with increasingly meaningful assistance based on the progression of the search.

As stated in the introduction, this study of OPAC interactions confirms that the most frequent and most consequential problem with topical end-user online searches is the users' reluctance or inability to reveal their real search intention to the system, and the system's inability to elicit this intention from the users. In other words, the basic problem seems to be a failure in communication. In the light of the similarity of the queries, it seems natural to seek models for system improvement in the human communication processes which take place in libraries when users seek intermediary assistance with their topical searches.

3.2 Reference interactions

The study's observed reference interactions are of fairly long duration, averaging approximately five minutes, and they follow a remarkably consistent pattern. Three phases can be identified: a brief initial phase of problem presentation and clarification, lasting approximately 15 seconds; a catalog consultation phase, also fairly brief, in which the librarian seeks to match the problem with the organization of the collection; and a problem solution phase which on the average occupies approximately 75% of each interaction, and which in all cases consists of the librarian going with the user to the shelves to negotiate a search result. The outcome of the interactions is overwhelmingly positive. In more than 90% of the cases users are successful in their search, judged by the fact that they actually leave with one or more documents and some

expression of satisfaction. This does not mean that the interactions are unproblematic. The most obvious problem is that the users' opening queries share many of the characteristics of the initial query terms found in end user OPAC searches. They are normally brief, most often consisting of one sentence in which the problem is stated as a single term or expression, they are in at least 60% of

the cases less specific than the user's real information need, and they often need disambiguation. The following examples illustrate the discrepancy between the initial problem statement and the negotiated user need as it is expressed later in the interaction (only the user's contributions are included, and some intervening turns are excluded):

Interaction 41 (male, 40):

**Jeg er på utkikk etter litteratur - en bok om
- drageskip og stavkirker -**

=====

**Det er en sånn avslutning - en sånn
{utydelig} avslutning med sånn spiralform -
jeg tenker på i forbindelse med en sånn
dragebåtfestival, om det finnes noen bilder
som viser disse - hva kaller man disse
figurene i fronten av skipet -**

Interaction 49 (female, 30):

**Du, jeg lurte på - har du noe stoff om ting
som skjedde i året 1895?**

=====

**Ja, vi skal ha hundreårsdag, skjønner du, så
da er det liksom året hun ble født, da - hva
som hendte da, bare sånne korte ting -**

I'm looking for literature - a book on - dragon
ships and stave churches -

It is a kind of end-piece - an {inaud.} end-
piece with a kind of spiral shape - I'm thinking
in connection with a dragon ship festival, if
there are any pictures which show these - what
do you call these figures in the front of the ship
-

Say, I wondered - do you have any material on
things that happened in the year 1895?

Yes, we are celebrating her 100th birthday, you
see, so that's like the year she was born - what
happened then, just some short pieces -

It is most significant for the search outcome that the user / librarian interactions enable this development of the user queries, be it from a request for books about stave churches to the real problem of finding a model for the design of an entrant for the local Viking ship regatta on the harbor, or from an initial question for material on a specific year in history to the problem of adding spice to a speech for a great-grandmother's birthday. In the latter of the above cases the librarian set out to look for general books on 19th century history, and the user eventually left with photocopies of relevant issues of the local newspaper's 1895 edition. This significance has been acknowledged in the literature on reference interviews several times, for instance in Dewdney & Michell's [5] explication of the necessity of asking the user "why"-questions throughout the interaction in order to get from the general to the specific.

4. DISCUSSION

The generality of the opening query has been variously explained in the literature. Taylor [27] and his followers in the cognitive tradition will maintain that the users do not know what kind of information they need, only what their problems are (if that), and that they therefore will have difficulties in expressing their need in a form acceptable to the library. This view has been seminally expressed in Belkin's "ASK hypothesis" of the user's "anomalous state of knowledge" which he seeks to repair [1]. Ingwersen [8] refers to Taylor to explain what he calls "the label effect": the users "compromise" their need in the form of a label which consists of one or several concepts out of the context which forms their real, formalized need. Ingwersen finds this labeling in effect even when users are thinking aloud during their own, independent search, with no librarian present. The reason for choosing a label on a

general terminological level may be that the users "hold an incomplete system model"; they seek to apply a terminology which matches their internal idea of the system they are searching, and thus express themselves in the language they expect the librarian to be speaking. Alternatively the label may really represent the level of expression of their problem they have been able to reach on their own.

Eichman [7] attribute initial generality to "attitudes deriving from the sociocultural interpersonal psychological situation" and applies communication and speech act theory to show that an act of communication can have several functions, in accordance with a model first introduced by Jacobsson [11]. Jacobsson's model is based on the notion that six situational components are constitutive in any communication event: an addresser and an addressee, a message and its context, a contact or physical and psychological connection between the two parties, and a common code for the encoding and the decoding of the message. These components correspond to, respectively, the *emotive*, *conative*, *poetic*, *referential*, *phatic* and *metalinguistic* functions of language. Eichman maintains that at least three of these functions, namely the emotive, the phatic, and the referential, may pertain to the opening speech act in the reference situation, and emphasizes particularly its phatic or contact-establishing function. Dewdney & Michell [5] apply this understanding: if the function of the opening query is to establish contact, then conversation analytic studies of politeness may explain how the user chooses to place his query on a level where he is reasonably certain that he and the librarian will find common ground. Svennevig [26], in an analysis of conversations between strangers, invokes Social Penetration Theory from psychology, in which the degree of self-disclosure is considered a measure of the closeness of a relationship. According to this view, the

development from a request for a book which describes important events in the year 1895 to an explanation about preparations for a speech on the occasion of the 100th anniversary of a great-grandmother, may be a leap in the degree of self-disclosure which a user may be reluctant to make at the outset of an encounter with a stranger, in this case a reference librarian.

These theories may be more relevant to ordinary conversations between strangers than to service encounters. In a doctor-patient relationship, for instance, the patient's degree of and willingness towards self-disclosure is probably high from the outset of the encounter. However, it may be argued that the user-librarian interaction is not a typical encounter between an expert and a client, such as most service encounters would be. In the library, the two interactants may each represent their own expertise, the librarian concerning the system and its functions, and the user, at least in many cases, concerning the subject matter of the query [10], and the user may well value his own expertise higher than that of the librarian. It may thus be that the reference encounter more closely models ordinary conversation than service encounters between users and professionals.

It is not simple on the basis of the interactions recorded in this study to single out one of these approaches as the model to explain the generality of initial queries. Neither are the approaches mutually exclusive, so more than one explanation may be in force. One consistently observed pattern is that in the few cases where users make inquiries on behalf of others, they present a much more complete problem description in their first utterance than those who ask on their own behalf, but this may be explained equally well by the absence of fear for a too intimate self-disclosure as by the fact that these queries already have been through a process of negotiation between the original questioner and the messenger. At the same time, these vicarious inquiries are the only cases where the ensuing interactions show that the users, quite naturally, are not really able to specify or clarify the problem they present. In the cases where the users present their own need, there is often very little prompting needed for a more detailed, elaborated and personalized version of the problem to be presented; as the examples above illustrate, it seems clear that the user is conscious of and able to specify a need extending beyond that which is initially presented. This indicates that the reason for the generality of the initial query should be sought in the user's system model or in conversational conventions rather than be attributed to an inability to express the information need.

Since between 60 and 70% of user queries are substantially modified in the course of the interaction, the major concern of the reference librarian, regardless of the cause of the initial generality, is to assist or induce the user to reveal his real intention, to achieve what may be termed "user revealment". A number of observations from the recorded interactions underpin the assumption that this process of revealment and the ensuing problem resolution may be profitably investigated from a conversational perspective:

- The intermediary's frequency and mode of questioning does not seem to decide whether problem revealment takes place. A common assumption and recommendation in the

reference interview literature is that the intermediary should ask open, preferably "why" questions to elicit user purpose (see, e.g., [5]). In our material, librarians ask closed (i.e. yes/no-answerable) questions 85% of the time, and whether they apply closed or open questions has no perceivable influence on interaction results. The number of questions asked by librarians during an interaction vary from none to 13, the number of questions does not correlate at all with the duration or the number of turns in the interactions, and the average number of questions per interaction is 2.4, which must be considered low for conversations which on the average take 4.5 minutes.

- Modification of the initial query occurs just as often on the user's initiative as in direct response to an elicitation from the intermediary. Such user-initiated modification occurs spontaneously in the flow of conversation or is triggered by material which the user is shown during the interaction. The degree of user-initiated modification correlates well with the number of turns in the interactions.

- Librarians' elicitations are primarily concerned with the stated topic of the users, either for better factual understanding or for ambiguity resolution (48%), or with characteristics of the users' needs, such as language restrictions, urgency, amount needed etc. (23%). Only 6% of these elicitations concern user purpose or motivation. In contrast, purpose is the second most frequent theme (occurring 30% of the time) of the users' unelicited contributions, and knowledge of user purpose is the determining factor behind most modifications of search direction.

According to these observations, the process of user revealment does not seem to be primarily dependent on the intermediary being able to ask the right kind of questions. It is not so much the questioning activity, but rather the process of communication between user and intermediary itself, which is instrumental in bringing such revealment about. It is significant that the librarian in the sample who, on average, asks the fewest questions, is at the same time involved in the interactions which last the longest and which are the most substantial in terms of turns and utterances. The level of detail in the final expression of the user's problem, and the level of user satisfaction, is at least as high in the interactions of the librarian who asks questions least often as in those of the librarian who asks the most. Characteristic of the conversations of the librarian with few questions is a great involvement in the user's situation, an eagerness to provide help and a willingness to discuss the user's problem. When this attitude is conveyed, questions do not seem necessary.

What we find to be happening during these interactions is that a state of trust, of meaningfulness or of credibility is established between the users and the intermediary. This state of trust may be established in a number of ways, either by the intermediary asking the kind of questions which makes users reveal themselves, or by the intermediary engaging in a conversation which creates an atmosphere in which the users feel free to reveal themselves and their problem. Instrumental in creating this atmosphere are elements such as involvement in the conversation, explanation of reasoning, demonstration of a common level of understanding, i.e. the employment of Jacobson's emotive, metalinguistic and phatic functions of

communication. Once these functions are in effect, it is possible to achieve the kind of self-disclosure which is involved when the user speaks of his hobby, his family obligations, his lack of knowledge to complete his schoolwork, or whatever else need to be revealed for the interaction to be satisfactorily completed.

5. CONCLUSIONS

The kind of meaningful conversation described above is the exact opposite of what is observed in the user-system interactions. There is no metalinguistic interaction: the system does not have explanation facilities to inform the user of the reason for the occurrence of messages like "no documents found", or equally frustrating, "1017 documents found". There is no phatic attempt by the system to try to interpret the user's input or suggest alternative ways of querying. There is no emotive encouragement of the user to modify queries, provide relevance feedback or take other kinds of renewed action. Significantly, the OPAC search data show that the situations where users are most likely to abandon their unassisted online searches are the situations where the system's response seems least helpful and most indicative of lack of meaningful interaction or lack of understanding of the user's problem, that is, situations where the system either provides a far too large amount of references, or where an "obviously correct" query term result in no hits.

The purpose of our study is to attempt a conversation-analytic explanation of some of the most commonly observed problems in user interaction with online catalogs, in order to build a firmer foundation for improvement of these interactions. Other authors have suggested functionalities which address these user problems, and which to an extent incorporate "user revealment" encouragement of the kind sketched above. Both Lynch [16] and Larsson *et al.* [14], for instance, suggest a heuristic rather than algorithmic approach to searching, which will allow systems to make assumptions about user intentions, suggest alternative approaches in "zero hits" situations etc. Similar suggestions may be found in [4], [21] and elsewhere, and there are systems in use or under construction which incorporate such features. Based on the success factors we identify for the user / intermediary interactions, our study suggests that "user revealment" in the online search situation, and ensuing search success improvement might be achieved through functions which allows the OPAC to

- provide context-sensitive help based on an interpretation of the user's current problem
- assist the users in the disambiguation and specification of their problem statement, for instance by identifying, highlighting and suggesting different aspects of a topic / different topics which is represented in a set of retrieved documents
- develop a set of disambiguating questions, based for instance on thesauri / classification schemes, to help the user focus the query and pose it at the relevant level of specificity

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- present search results in ways that simulate browsing in directions suggested by the system and chosen by the user, and present results with sufficient information for the user to establish relevance based not only on topicality, but on availability, level of difficulty, illustrations etc. etc.

- determine, through input from the user, which of a few factors such as language, intellectual level etc. are involved in determining the relevance of a document, and display results accordingly

- prevent a user request from ever receiving a response of no retrieved records or more than 100 retrieved records, without some suggestion from the system on how the user might extend or reduce the search result.

6. REFERENCES

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