Contextualization of web searching: a grounded theory approach

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Abstract

Purpose – This paper aims to report selective findings of a wider study on interaction of users with web-based search tools to underline the importance of context in information seeking on the web and to introduce some of the contextual elements of web search context.

Design/methodology/approach – A series of intensive and in-depth interviews was carried out with a sample of the Biology Community at the University of Sheffield. Critical Incident Technique (CIT) was employed in the interview protocol and the collected data was inductively analyzed in the light of Grounded Theory approach.

Findings – The results strongly suggest that considering the context of search is a pivotal factor in understanding users’ behaviours, feelings, and thoughts during the period of information seeking in an online environment. Five categories have been identified as the main contextual elements which affect search performance of end users. These categories include web users’ characteristics; type of the employed search tool; search topic; search situation; and features of the retrieved information resources. Each category has its subcategories which have been illustrated in the paper.

Research limitations/implications – This study was carried out based on a relatively small sample of academia and therefore the results cannot be easily generalized to the wide community of web users. The results of this study should be able to make information literacy education more effective by using information seeking behaviour research discoveries. This study demonstrated that the outcome of any information literacy courses would be more efficient if the contextual factors – which have been identified and illuminated in this study – were considered in the educational agenda.

Originality/value – The study possesses three characteristics that make it different from other studies in the related areas. First of all, it took an in-depth insight to the interaction of end users with the web in real situations. Secondly it focused on a specific targeted group, the academic biology community. Thirdly the study adopted a qualitative approach, in contrast with mainly quantitative web research.

Keywords Information searches, Information literacy, Qualitative research, Worldwide web, Search engines, User interfaces

Paper type Research paper

Introduction

Web usage is not limited to a few specific purposes and its functionalities are spreading across different aspects of life. However, among all web-based applications, web searching is one of the most common ones. Web searching has become an indispensable part of the daily life of various groups of society including academia.

Information seeking and information retrieval through the web is a multifaceted process and many visible and invisible elements may affect on it. Some of these elements can foster the process and assist web users to achieve their search goal. In
contrast, some of them can cause some difficulties for the users and stop them to
satisfy their information needs. Nevertheless, our current knowledge about the
complexity of this course of actions is still limited. Particularly, we do not know much
about the human aspects of web searching in the real situations.

This paper reports selective findings of a wider study (Ford and Mansourian, 2006;
Mansourian and Ford, 2007a, b) which focuses on users’ interactions with the web,
explores their search behaviour in general, and examines attitudes and actions after
receiving satisfactory or unsatisfactory results in particular.

The study possesses three characteristics that make it different from other studies
in the related areas. Firstly, it took an in-depth insight to the interaction of end users
with the web in real situations. Secondly it focused on a specific targeted group, the
academic biology community. Thirdly the study adopted a qualitative approach, in
contrast with mainly quantitative web research.

An overview of the related literature
The research study from which these findings are drawn was a multi-dimensional
investigation, related to a number of research areas including information seeking on
the web and information seeking in context. These are rich research areas and it is
outside the scope of this article to present comprehensive reviews. There is instead a
concise overview of to illustrate major trends in each area, and demonstrate how they
are related to this research study, in particular how this study matches some lacunae in
current research evidence.

Research on user-oriented aspects of information seeking on the web began in the
mid 1990s. Catledge and Pitkow (1995) conducted the first study in this new area (Choo
et al., 2000). Since 1995 many studies have been carried out to explore users’ interaction
with the web-based search tools and web-based resources (e.g. Kim, 2001; Kim and
Allen, 2002; Ford et al., 2005; Rieh, 2004).

Up to now, researchers in the area of information seeking on the web have been
exploring a variety of aspects in the interaction procedure between the user and the
web. Increasing number of publications about this area shows there is a substantial
growth in our understanding about web searching comparing what we knew in the
past. However, there are still many unanswered questions in the area which provide
researchers with fruitful grounds for further research.

There are a number of review publications which can provide the reader with more
details about the past and current trends in the area (e.g. Fourie, 2006; Martzoukou,
Mansourian, 2007). Regarding notable successes in the area during the past years the
future of this area has been predicted promising and more interdisciplinary by Spink
and reported by Mansourian (2005) as follows:

It is going to become much more interdisciplinary … a lot of disciplines are interested in
different aspects of web search … so, there are social implications and economic implications
… I think it is going to become more important.

As the area is dominated by quantitative studies we still need to carry out more
qualitative studies. Mansourian and Madden (2007) reviewed the methodological
aspects of the area and concluded that the availability of large amount of transaction
log data has led to the predominance of quantitative research in the area and they
called for more qualitative investigations to illustrate those aspects of web searching, including users’ feelings and perspectives while searching the web, which cannot satisfactorily be researched by quantitative methods.

This study specifically was concerned about users’ feelings, thoughts and actions after having unsatisfactory search results. Although users’ reaction to unsuccessful searches has not been yet studied in the area of information seeking, there are some studies in the related areas which addressed users’ frustration and have identified different sources of frustration. For example, Ceaparu et al. (2004) explored different aspects of users’ frustration and identified some of the main reasons of users’ frustration with computers. Figure 1 is a summary of their work on this issue.

Besides, there is a growing interest among researchers in many areas of information science to pay more attention to the “context” in which information seeking takes place. This trend is evidenced, for example by the series of conferences called ISIC: Information Seeking in Context and the IRiX: Workshop on Information Retrieval in
Context. However, there still appears to be much to learn about the role of context in information seeking and retrieval. Lawrence (2000, p. 25) is one of the researchers who has called for more consideration to context in information seeking studies.

Web search engines generally treat search requests in isolation. The results for a given query are identical, independent of the user, or the context in which the user made the request. Next generation search engines will make increasing use of context information, either by using explicit or implicit context information from users, or by implementing additional functionality within restricted contexts.

Johnson (2003, p. 735) identifies context as a key element in information seeking research but observes that “surprisingly little has been written about context at a meaningful level”. Lack of a widely accepted terminology is a source of confusion for researchers who study on context. In fact, the word “context” might imply differently for different groups of researchers and sometimes different words might have the same meaning of context. For example, Marchionini (1995, pp. 46-47) defines context as “setting”:

Setting here is taken to have physical and conceptual/social components, including whether the task is done in collaboration or alone and the information seeker’s physical and psychological states ... physical setting determines physical constraints such as amount of time allocated, physical accessibility, comfort, degree of distraction, and cost ... economic constraints such as cost and time are situational and influence whether and how tasks are initiated, executed, and terminated.

Johnson (2003) considered context in three different senses. The first approach is situational definition of context in which context is considered as equivalent to the “situation”. He believed this approach is the most primitive sense of context. The second way is contingency approach that moves toward specifying active ingredients that have specific, predictable effects on various processes. This study considered the second approach of context based on Johnson’s (2003, p. 740) categorization of context:

Situational approaches to context seek exhaustive, objective descriptions, but do not typically move to explanations of what the linkage is, if any, between situational factors and the process of interest.

The above discussion and overview of the related areas can be summarized in Table I.

In general, reviewing the literature shows that apart from a few studies which have considered the importance of context in web searching (e.g. Lawrence, 2000; Kari and Savolainen, 2001, 2003) there is little knowledge about the role of context in the process of information seeking on the web.

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<th>Dimension</th>
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**Source:** Based on Johnson (2003, p. 739)
In other words, the area of information seeking on the web is dominated by quantitative studies and lack of sufficient qualitative research and shortage of in-depth understating of end users' feelings, thoughts and actions through the search procedure is somehow obvious. Studies like this would be able to bring more qualitative results into a quantitative area. On the other hand, studies in information seeking in context dominated by situational definition of context with less attention to the individuals' role and interactivity in contextual studies. Therefore, this research is an example of studies which can consolidate more contingency approach to the area.

The study and methodology
This study sought to address the following research questions:

RQ1. What factors might influence different conceptualizations of success/failure?

RQ2. What components do form the context of search and how does each component play a role in the final outcome of a search session?

The study adopted a qualitative approach for two reasons. First, addressing the above research questions was not achievable by quantitative methods as the questions were mainly related to users' feelings and perceptions rather than quantifiable variables. Second, by adopting a qualitative approach it was hoped to bring more qualitative flavour to the area which is dominated by quantitative studies. Data collection tool in the study was semi-structured, open-ended and face-to-face interviews. Interviewing is one of the most common methods of gathering qualitative data in information seeking studies on the web (e.g. Fidel et al., 1999; Slone, 2002; Rieh, 2004).

Grounded Theory (Glaser and Strauss, 1967) has been adopted as the research methodology to inductively analyze the data. There are many resources about the nature of grounded theory which might be helpful for those users who require some explanations about this methodology (e.g. Mansourian, 2006a). The sample consists of 37 volunteers of academic staff, research staff and PhD students of three departments at the University of Sheffield – Animal and Plant Sciences, Biomedical Science and Molecular Biology and Biotechnology.

Interviews were held in the offices of the participants. With their written permission the interviews were recorded by digital voice recorder. The average length of interviews was 45 minutes. After transcription of each interview the transcription text was sent to the interviewee to make any changes in the text if she/he liked to do so. It was specifically useful for two reasons. Firstly, it was a confirmation of the accuracy of the transcribed text and secondly it was an opportunity for the interviewee to make any changes to the text based on what s/he thinks after the interview session.

In the next stage, the transcripts were analyzed inductively in accordance with grounded theory (Glaser and Strauss, 1967). Regarding the grounded theory methodology any emergent theory needs constant interplay between the researcher and the data. Accordingly, the researcher attempted to keep continued interaction with the dataset. In fact, data collection and analysis happened simultaneously and the researcher looked at the data with an analytical view in different stages of data collection including while interviewing, transcribing and reading the transcriptions. During the data collection the researcher kept recording all new concepts in a research log based on a daily interval.
Findings

The results of the study confirmed that web searching like any kind of human computer interaction happens in a “context” which needs to be taken into consideration to understand users’ information seeking behaviour. Moreover, exploring the context of search in terms of users’ reaction to search success/failure led to identification of different elements of the context of web searching.

Five categories have been identified as the main contextual elements which affect search performance of end users. These categories include:

- web users’ characteristics;
- type of the employed search tool;
- search topic;
- search situation; and
- features of the retrieved information resources.

Each category has a number of subcategories. The first identified category, characteristics of the user, includes three subcategories which are feelings, thoughts and actions of the user during the search procedure and after having search results which might be satisfactory or unsatisfactory for him/her.

As an example, Figure 2 shows some identified elements of cognitive and affective reactions to unsatisfactory search results.

Search experience was mentioned as a key factor leading to successful searching. One of the interviewees expressed his opinion about a successful search as follows:

In general, I find it really easy. I usually use Google . . . for example, yesterday I was looking for the scientific name of a plant, Euphorbia Antisyphilitica, and I knew but I wasn’t sure. So, I just typed the common name, Candelilla and Euphorbia, and it just looked up a lot of resources.

Another participant believed that there is a direct link between the ability of selecting appropriate search terms and success in search. He said:

Searching through the net is like playing chess and . . . playing chess stimulate your mind and your mind is sharper because of the chess playing . . . and every time you play better . . . you develop a certain mind to establish a collection of links which are the keywords that actually going to lead you to the place where you are going to be.

The second main category was the features of the employed search tools. Some of the participants found the performance of web-based search tools (e.g. search engines and databases) in a satisfactory level and sometimes they attributed their success to their efficiency in information retrieval. For example, one of them explicitly ascribed his success in a search session to the efficiency of the search tool which he had used:

. . . thanks to Web of Knowledge. I think it is superbly set up. It is very fast. I think Web of Knowledge is extremely well-designed. Only when you fail on it when you are too broad in your search term and you come back with ten thousands possible articles and then you have to learn how to be more specific.

Employed search tools might be general-purpose such as Google or specialized such as PubMed. Another interviewee who used PubMed as a specialized search tool described it as follows:
PubMed is a facility specifically designed to search for papers and it gives you various criteria you can use and you can really narrow down the results. So, you can put in author, journal, year of publication and any keywords as well and so often you can end up with one paper from thousands.

Some of the interviewees reported that since they initially started searching the web they have been trying different search tools to find out which one could provide them with more satisfactory results. Moreover, progress in search facilities on the web encouraged them to select new search tools which offered new services (e.g. progress in Google’s services):

If you had asked me five years ago I would have said Web of Science, Web of Knowledge would be almost the only thing that I used. Now I use Google a lot actually because Google is getting better and coming up with more relevant hits. So, particularly if there are bits of information that I am looking for, I tend to do it on Google it is usually quicker actually.

The third category was the search topic. In a general categorization search topics can be divided into work-related and everyday life searches. Interviewees’ knowledge about work-related topics helped them to carry out their work-related searches more
satisfactorily. In fact, domain knowledge was reported as an element that might help
the user to succeed the search. In fact, when the user is not an expert of the area of
search, therefore, s/he does not know much about the area and it might be somehow
difficult for him/her to develop an efficient search strategy.

In particular, selecting appropriate search terms in an unfamiliar area might be
challenging for the user. For example the following quote shows that the interviewee
needed to carry out an initial search before the main search to find out apposite search
terms:

I give some lectures on mitochondrial genetics and genetics is my area, but some of diseases
with a lot of medical terminology and I don’t know the definition of some of these medical
words ... one of the diseases is called Myoclonic Epilepsies, I know what epilepsy is, but
Myoclonic I did not know. So, what do I do? I always just go to the web; I don’t look for a
dictionary or book or try to find a medical book. I probably go to AltaVista just type
Myoclonic.

Similarly, another interviewee reported that he failed in an everyday life search
because of lack of domain knowledge in that specific area:

I guess probably because I didn’t know the right places to search. So, I just used Google and
I’m sure there are better ways to find it. But I don’t know what they are. I guess it is not the
kind of thing that I search very often. The kind of information [which] I am normally looking
for is published papers and I know how to do that and it works fine. But it was just a strange
request that I don’t normally make.

The fourth category was the search situation including four subcategories which are
place of search, type of search, immediacy and importance of search. For instance, one
of the interviewees said:

It depends on how important I perceive that piece of information to be. If it is something that
would have been interesting, for instance to do with my project, ... not crucial I might just
forget about it ... I’ll probe again through a few weeks time or couple of months time and it
might be there next time because things, you know, appear and reappear. If it is something
that I really need to know I will try different avenues.

Immediacy of the search topic was also an important aspect of search which affects the
search procedure and plays a pivotal point in search context:

Last week I was trying to find a telephone number of a colleague who works at the Sheffield
hospital. I knew her name, I knew her department, I knew her initials but I wanted to get
either a telephone number or an e-mail address because I needed to contact her quite urgently.

In other words, the amount of time that the searcher can allocate to perform a search
play a key role in the procedure of search and inevitably on the search result:

Yeah I was looking for information about a specific strain of E.coli that I was interested in
and probably the main reason that I wasn’t successful because I didn’t have much time. So, it
wasn’t a very thorough search.

Finally, the fifth category was the retrieved information resources which consist of
three subcategories which are searchability, level of provision and presentation format.
For example, the following quote shows that the searcher was satisfied with the
retrieved source because it provided him with detailed information on his search topic:
I was looking for some detailed information on the blood supplier to kidney just a few days ago mainly to confirm what I’ve already read in elsewhere. I am pleased to say that I found from an American site quite a detailed description of it together with some nice pictures.

On the other hand, another participant was dissatisfied with the retrieved item because it did not provide her with sufficient information:

I remember trying to find a protocol for a particular technique which I wanted to do [for] a particular experiment. I tried to find a protocol online and although there was lots of links...they weren’t very detailed or I couldn’t access to the page where I tried to click on the link because it was on a restricted server or we didn’t have access to that particular thing through the library.

Design of the retrieved web site was also reported as an element which can play a role in the final judgment of the user about the search procedure. Sometimes the poor design of the retrieved items may cause dissatisfaction:

Sometimes I will lose my patience and not continue. If I am not getting there in so many stages, then I’ll give up...I mean there are some sites that I avoid because there are too many links within a site which really annoys me...too many links just to get where you want to get...it would take thirty clicks, you know, something crazy and that puts me off.

The five identified categories in this study are supported by previous studies (e.g. Marchionini, 1995, p. 32). However, there are two important points that should be considered. First of all, the five categories presented in the paper are based on inductive analysis of a qualitative and rich dataset in this study and not based on the literature review. Secondly, although some of the identified factors have been reported in the previous studies the author of the paper did not find any study that reported all these five categories as influential elements on the search context. Figures 3 and 4 show the five major components for web context searching.

**Figure 3.**
Five major components of the context in web searching
Figure 4.
Contextual elements of web searching
Discussion and conclusion
Findings of this study help us to reflect on user perspective based on a more in-depth standpoint. In fact, this study showed how the specific context for a web search plays a role in the final search performance and identified the main elements that influence web search procedure during the search procedure on the web. It could be used to focus attention on possible options, appropriate strategies for the context, likely outcomes.

Some elements of the search context like time allocation or search importance are more significant in users’ judgment about success/failure of the search. Furthermore, context is extremely dynamic and changes constantly even for the same user or during the same search session. Besides, end users are aware of the context and prioritize different components in different situations.

The results of this research would be particularly of interest to librarians because they make a visible link between the findings of pure research in experimental situations to the real everyday circumstances of the library environment. The effectiveness of the pedagogical aspects of information literacy training noticeably depends on considering the contextual factors which have not received sufficient attention in previous information literacy research and practice.

Moreover, the results can fit with educational strategies that are focused on developing the learner’s understanding and to develop tools to help the user reflect on what he/she has done in the past. Furthermore, it is believed by the author that results of the study can encourage optimum strategies for different situations. Indeed, this study highlights the fact that the outcome of any information literacy courses would be more efficient if the contextual factors – which have been identified and illuminated in this study – were considered in the educational agenda. Moreover, the results of different information literacy studies will be more reliable if the contextual elements are considered in the research plan.

References


**About the author**

Yazdan Mansourian is an assistant professor in the Department of Educational Technology at Tarbiat Moallem University, Tehran, Iran. He has a BSc in Agricultural Engineering and Plant Breeding from Guilan University and an MA in Library and Information Science from Ferdowsi University of Mashhad, Iran. He completed his PhD in 2006 in the Department of Information Studies at the University of Sheffield. Yazdan worked as a reference librarian and an administrator of information services in the main library of Ferdowsi University from 1998-2001. He also worked as an expert on information services in the Public and International Relations Office of Mashhad municipality between 2001 and 2002. Yazdan's research interests include the invisible web, web information seeking and interaction, qualitative research in LIS in general and grounded theory in particular, information literacy, advanced interfaces for information retrieval, user-oriented aspects of human-computer interaction, and the interaction of end users with the web-based search tools focusing primarily on users' conceptualizations of their unsuccessful searches. Besides publishing several articles in English and Persian, he is co-author of a book about serials management in libraries. He also works as the director of the Research Committee of ILISA (Iranian Library and Information Science Association) since March 2007. Yazdan Mansourian can be contacted at: y_mansourian@yahoo.com

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