

WEB BROWSING: CURRENT AND DESIRED CAPABILITIES

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Keywords: Browse, Browsing, Browsing Mechanisms, Search Engines, Search Strategies, Web

Abstract: Browsing is considered as a rich and fundamental human information behavior. This poses issues concerning how effectively web directories and search engines facilitate users' browsing on the Internet. This study was designed to answer the following research questions: 1) What are the most frequently used search engines and what are users' levels of satisfaction with these search engines? 2) How do browsing features and other reasons influence users' search engine choices? 3) How often do users use browsing functions and what are their levels of satisfaction? 4) Under what circumstances do searchers use these browsing mechanisms? 5) What are the problems users encounter when they use browsing functions? 6) To what extent, do these browsing mechanisms help users use search engines and retrieve relevant information, and most importantly, 7) what needs to be improved? These questions are essential to further understand users' browsing strategies and to design web search engines for effective information retrieval. This study was conducted based upon a survey of 50 subjects who were actively seeking information on the Internet. Open-ended questionnaires were administered to participants, who were asked questions about their experiences with search engines with respect to the existing browsing mechanisms and the desired browsing functions that subjects would like to have available. This study demonstrates that browsing functions have high impact on the easy use of search engines and effective retrieval of relevant information. The results show the existing browsing capabilities of search engines do not offer enough for users to optimally explore and search the Internet. The implications of these results for the enhancement of browsing capabilities are also addressed.

1. INTRODUCTION

Browsing is considered as a rich and fundamental human information behavior, and it is one of the most important search strategies people employ to seek information (1, 2). More researchers recognize the importance of browsing in human information seeking and call for the need to incorporate this approach into system designs (3, 4, 5). As web directories and search engines become the most popularly used information retrieval systems for the general public, this poses issues concerning how effectively web search engines facilitate users' browsing in searching information. However, very few studies have investigated these issues.

Web search engines have implemented browsing capabilities to facilitate users' browsing behavior. Hypertext and directory browsing are identified as the two major browsing approaches on Internet (5). Links in hypertext and hypermedia help users browse and navigate while

directories guide users to specific directories or sub-directories based on their search topic. One of the new search engines, Snap, like Yahoo, employs editors to select and organize links into a table of contents, and supports browsing by category or searching by keyword (6). In the historical overview of web search engines, Trudi Bellardo Hahn summarizes the browse capabilities of display: ranking and relevance feedback to generate output predicting relevance values, zoning to display a key portion of each record retrieved, and highlighting to display the word in retrieved records that match the search terms as well as some surrounding text (7).

There is no standard definition for "browsing." In general, browsing refers to a type of search or looking activity where the initial search criteria or the search goal is only partially defined, and users may change the focus of their search in the information seeking process (4). Terms used for "browsing" might be "navigating," "scanning," "skimming," etc. Research demonstrates that browsing behaviors occur as information seeking strategies as well as information seeking tactics in every stage of the information seeking process (8, 9). In order to understand how browsing capabilities of search engines are used and what needs to be improved, this study attempts to investigate browsing functions involving in both levels, especially on, subject browse, query formulation browse, query reformulation browse and result browse.

2. RESEARCH QUESTIONS

This study was designed to answer the following research questions: 1) What are the most frequently used search engines and what are users' levels of satisfaction with these search engines? 2) How do browsing features and other reasons influence users' search engine choices? 3) How often do users use browsing functions and what are their levels of satisfaction? 4) Under what circumstances do searchers use these browsing mechanisms? 5) What are the problems users encounter when they use browsing functions? 6) To what extent, do these browsing mechanisms help users use search engines and retrieve relevant information, and most importantly, 7) what needs to be improved? These questions are essential to further understand users' browsing behaviors and to design web search engines for effective information retrieval.

3. METHODOLOGY

This study was conducted based upon a survey of 50 graduate and undergraduate students of the School of Library and Information Science at the University of Wisconsin-Milwaukee. Among the 50 subjects, 78% of the subjects were between 20 to 40 years old while 18% of them were over 40 and 4% were younger than 20. Seventy-five percent of the subjects are female. The percentage of subjects who have masters, bachelors and high school degrees are 22%, 68% and 10% respectively. These students have been active users of web search engines. Open-ended questionnaires were administered to participants, who were asked questions about their experiences with search engines with respect to the existing browsing mechanisms and the desired browsing functions. Subjects were also instructed to elaborate upon the reasons and problems of their uses of browsing functions. Both quantitative and qualitative methods were used to analyze the data.

The survey listed all the browsing functions available in the existing web search engines regarding subject browse, query formulation browse, query reformulation browse and result browse:

- Subject browse
- Related words/terms browse
- Search query/question browse (e.g. spy on what queries/questions other people are searching)
- Preliminary result browse (e.g. provide a list of categories based on user's original query)
- Ranking based output
- Highlighting key words
- More like this (find web sites like the one selected)
- Field assistance (e.g. all the words, any word, in the title, in URL, language, image, audio, video, etc)
- Result browse e.g. number of the record, length of the records, portion of the records)
- Sort results (list by URL, etc.)

4. RESULTS & DISCUSSION

The results are divided into seven sections corresponding to seven of the research questions: 1) frequently used search engines and users' levels of satisfaction, 2) reasons influencing search engine choices, 3) frequency of use and level of satisfaction with browsing functions, 4) reasons leading to the use of browsing mechanisms, 5) problems encountered in using browsing features, 6) impacts of browsing mechanisms and 7) desired browsing functions.

4.1 Frequently Used Search Engines and Users' levels of Satisfaction

Question 1. 1) What are the most frequently used search engines and what are users' levels of satisfaction with these search engines?

For this question, subjects were instructed to list 4 search engines they used the most, and also circle the numbers describing their frequencies of use (1=never use, 2=rarely use, 3=occasionally use, 4=often use, 5=use daily) and their levels of satisfaction (1=not at all, 2= a little, 3= some, 4= some more, 5 =extremely).

Table 1 presents the most frequently used search engines and users' levels of satisfaction by summarizing the number and percentage of users' frequencies of uses and levels of satisfaction. Nine web search engines were identified as the frequently used web search engines: Yahoo, Alta Vista, Excite, InfoSeek, Lycos, Hotbot, WebCrawler, MetaCrawler and Netscape. Users' levels of satisfaction with these search engines were reported accordingly. Thirty other search engines were not reported here because they were only occasionally or rarely used by one or two users.

Figure 1 illustrates the top frequently used search engines by combining the percentage of users who circled "often" and "daily" uses of each search engine. Based on the percentage of users who often or on a daily basis use search engines, Yahoo (36%), Alta Vista (20%), Excite (14%) and Hotbot (10%) were identified as the most frequently used search engines by the 50 subjects.

Types of Browsing Functions	<i>not at all</i>	<i>a little</i>	<i>some</i>	<i>some more</i>	<i>extremely</i>
	1	2	3	4	5
Subject browse		6%	38%	40%	10%
		3	19	20	5
Related words browse		8%	54%	18%	
		4	27	9	
Search query/question browse (e.g. spy on what queries/questions other people are searching)	12%	14%	28%	4%	2%
	6	7	14	2	1
Preliminary results browse (e.g. provide a list of categories based on user's query)		10%	44%	20%	4%
		5	22	10	2
Ranking based output	12%	8%	30%	26%	6%
	6	4	15	13	3
Highlighting key words	4%	4%	40%	22%	8%
	2	2	20	11	4
Web site like this	14%	8%	28%	14%	4%
	7	4	14	7	2
Field assistance (e.g. all the words, any word, in the title, in URL, language, image, audio, video, etc)	6%	8%	42%	30%	2%
	3	4	21	15	1
Results display (e.g. number, length of the records, portion of the records)	2%	4%	42%	30%	6%
	1	2	21	15	3
Sort results (list by web site, etc.)	6%	8%	38%	14%	10%
	3	4	19	7	5
Other, please specify _____		2%	6%	2%	
		1	3	1	

Table 4. Level of satisfaction with browsing functions

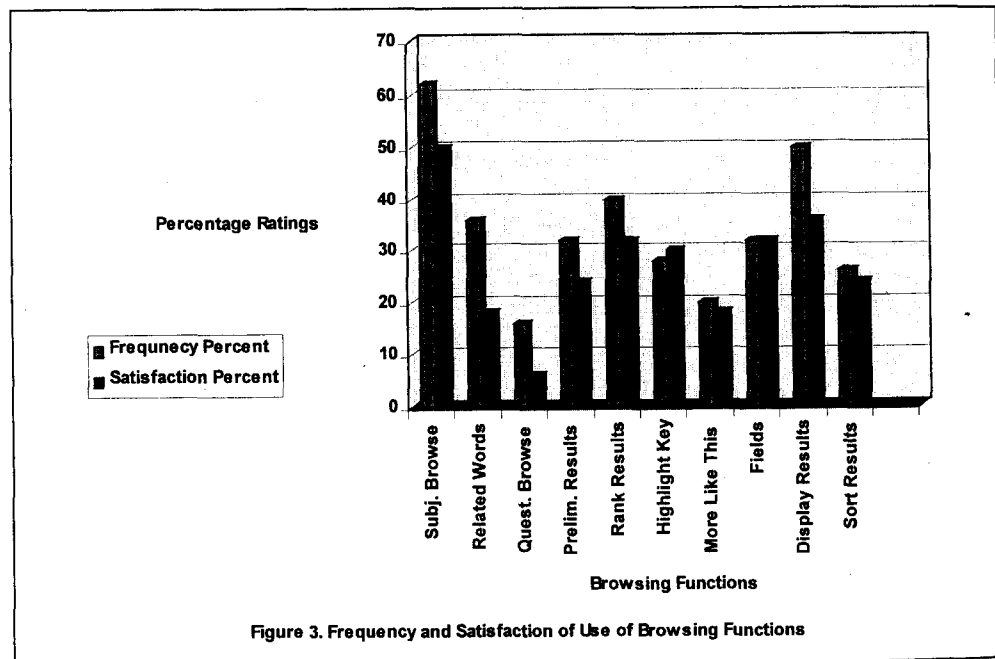


Figure 1 also illustrates the top search engines that users were satisfied with by combining the percentage of users who rated “some more” and “extreme” to each of the search engines. Generally speaking, the more a searcher uses a search engine, the more a searcher is satisfied with it. The results show that those search engines were most frequently used were also the ones that users were most satisfied with. Yahoo (50%), Alta Vista (24%), Excite (22%), and Hotbot (12%) were rated as the top search engines that users were satisfied with.

4.2 Reasons Influencing Search Engine Choices

Question 2. How do browsing features and other reasons influence users’ search engine choices? For this question, subjects were asked to rate to what extent the following reasons influence their selection of a search engine (1=not at all, 2= a little, 3= some, 4= some more, 5=extremely).

Types of Reasons	<i>not at all</i>	<i>a little</i>	<i>some</i>	<i>some more</i>	<i>extremely</i>
	1	2	3	4	5
habit	0%	8%	30%	34%	28%
		4	15	17	14
Search topic/question	6%	6%	32%	36%	20%
	3	3	16	18	10
Random selection	14%	20%	40%	14%	4%
	7	10	20	7	2
Speed	6%	20%	25%	34%	14%
	3	10	13	17	7
Coverage of a search engine	6%	8%	22%	38%	24%
	3	4	11	19	12
Subject browse		6%	36%	36%	22%
		3	18	18	11
Related words browse	6%	14%	36%	28%	8%
	3	7	18	14	4
Search query/question browse (e.g. spy on what queries/questions other people are searching)	38%	18%	18%	14%	4%
	19	9	9	7	2
Preliminary results browse (e.g. provide a list of categories based on user’s query)	8%	20%	32%	32%	4%
	4	10	16	16	2
Ranking based output	10%	12%	36%	28%	10%
	5	6	18	14	5
Highlighting key words	8%	14%	48%	22%	2%
	4	7	24	11	1
More like this	20%	20%	24%	14%	2%
	10	10	17	7	1
Field assistance (e.g. all the words, any word, in the title, in URL, language, image, audio, video, etc)	8%	10%	42%	28%	10%
	4	5	21	14	5
Results display (e.g. number, length of the records, portion of the records)	6%	6%	36%	38%	12%
	3	3	18	19	6
Sort results (list by web site, etc.)	10%	14%	30%	34%	10%
	5	7	15	17	5

Table 2. Reasons Influencing Search Engine Choices

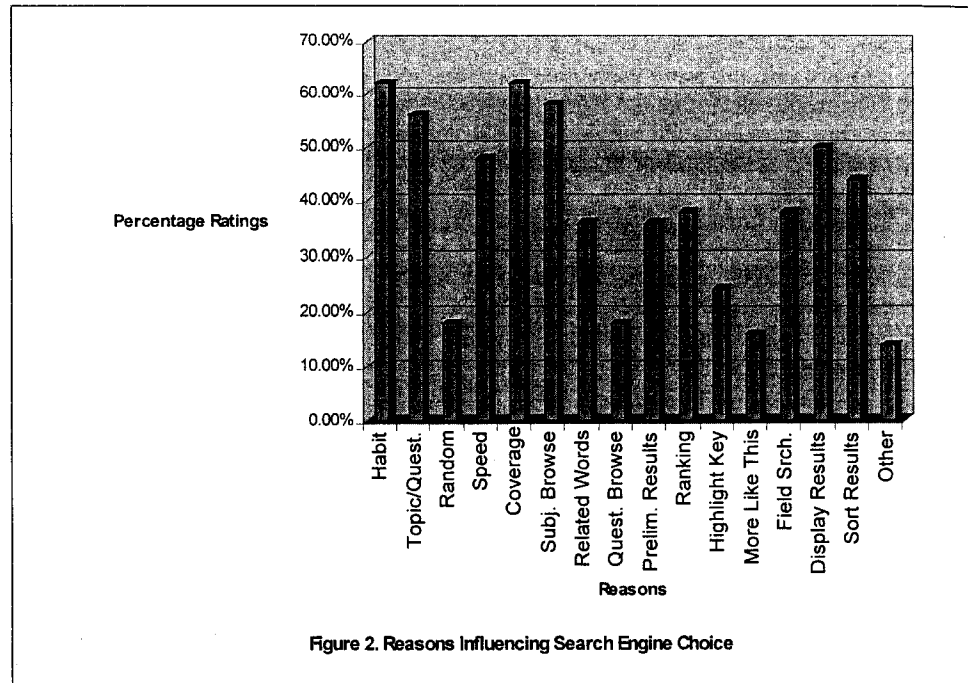


Table 2 presents how habit, search topic/question, random selection, speed of a search engine, coverage of a search engine, most importantly, different browsing features affect users' selection of a search engine.

Figure 2 illustrates the major reasons that influence users' decision to select a specific search engine by combining the percentage of users who rated "some more" and "extreme" to each of the reasons. Among all the reasons, habit (62%), coverage of a search engine (62%), subject browse (58%), search topic/search question (56%) and display results (50%) were identified as the top five reasons that affect users' selection of a search engine based on the percentage of users' extreme or some more ratings.

In terms of the relationships between browsing features and the selection of a search engine, the availability and the structure of subject browse (58%), display results (50%), sort results (44%), ranking (38%) and field search (38%) play important roles in influencing users' selection of a search engine. However, "query browse" and "more like this" were rated as high influences only by 18% and 16% users respectively because they did not care too much about browsing other searchers' query, and they did not quite understand "more like this" or "web sites like this."

Of all the other reasons, more than half of the subjects selected a search engine based upon their habit (62%), coverage of the search engine (62%) and the nature of the search topic (56%). Very

few people (18%) thought random selection had some more or extreme influence on their selection of search engines.

4.3 Frequency of Use and Level of Satisfaction with Browsing Functions

Question 3. How often do users use browsing functions and their levels of satisfaction? Subjects were instructed to circle the numbers best describing their frequency of use (1=never use, 2=rarely use, 3=occasionally use, 4=often use, 5=use daily) and their levels of satisfaction (1=not at all, 2= a little, 3= some, 4= some more, 5 =extremely) of the following browsing functions of search engines.

Table 3 & 4 present subjects' frequencies of use and their levels of satisfaction with each of the browsing functions of search engines.

Figure 3 illustrates the top frequently used browsing functions by combining the percentage of users who circled "often" and "daily" use of each browsing feature. Based on the percentage of users who often or daily used these browsing features, subject browse (62%), results display (50%), rank results (40%), related terms (36%), preliminary results (32%) and field assistance (32%) were identified as the most frequently used browsing functions while question browse (16%) and "web site like this" (20%) were the least frequently used browsing functions.

Types of Browsing Functions	Never 1	rarely 2	occasionally 3	often 4	daily 5
Subject browse		6% 3	32% 16	44% 22	18% 9
Related words browse	12% 6	20% 10	28% 14	34% 17	2% 1
Search query/question browse (e.g. spy on what queries/questions other people are searching)	46% 23	26% 13	8% 4	12% 6	4% 2
Preliminary results browse (e.g. provide a list of categories based on user's query)	12% 6	22% 11	32% 16	24% 12	8% 4
Ranking based output	22% 11	16% 8	20% 10	32% 16	8% 4
Highlighting key words	16% 8	14% 7	40% 20	24% 12	4% 2
Web site like this	28% 14	16% 8	20% 10	20% 10	
Field assistance (e.g. all the words, any word, in the title, in URL, language, image, audio, video, etc)	12% 6	12% 6	42% 21	28% 14	4% 2
Results display (e.g. number, length of the records, portion of the records)	12% 6	8% 4	28% 14	42% 21	8% 4
Sort results (list by web site, etc.)	18% 9	20% 10	34% 17	16% 8	10% 5
Other, please specify _____		4% 2	4% 2	2% 1	

Table 3. Frequency of use browsing functions

Types of Browsing Functions	<i>not at all</i>	<i>a little</i>	<i>some</i>	<i>some more</i>	<i>extremely</i>
	1	2	3	4	5
Subject browse		6%	38%	40%	10%
		3	19	20	5
Related words browse		8%	54%	18%	
		4	27	9	
Search query/question browse (e.g. spy on what queries/questions other people are searching)	12%	14%	28%	4%	2%
	6	7	14	2	1
Preliminary results browse (e.g. provide a list of categories based on user's query)		10%	44%	20%	4%
		5	22	10	2
Ranking based output	12%	8%	30%	26%	6%
	6	4	15	13	3
Highlighting key words	4%	4%	40%	22%	8%
	2	2	20	11	4
Web site like this	14%	8%	28%	14%	4%
	7	4	14	7	2
Field assistance (e.g. all the words, any word, in the title, in URL, language, image, audio, video, etc)	6%	8%	42%	30%	2%
	3	4	21	15	1
Results display (e.g. number, length of the records, portion of the records)	2%	4%	42%	30%	6%
	1	2	21	15	3
Sort results (list by web site, etc.)	6%	8%	38%	14%	10%
	3	4	19	7	5
Other, please specify _____		2%	6%	2%	
		1	3	1	

Table 4. Level of satisfaction with browsing functions

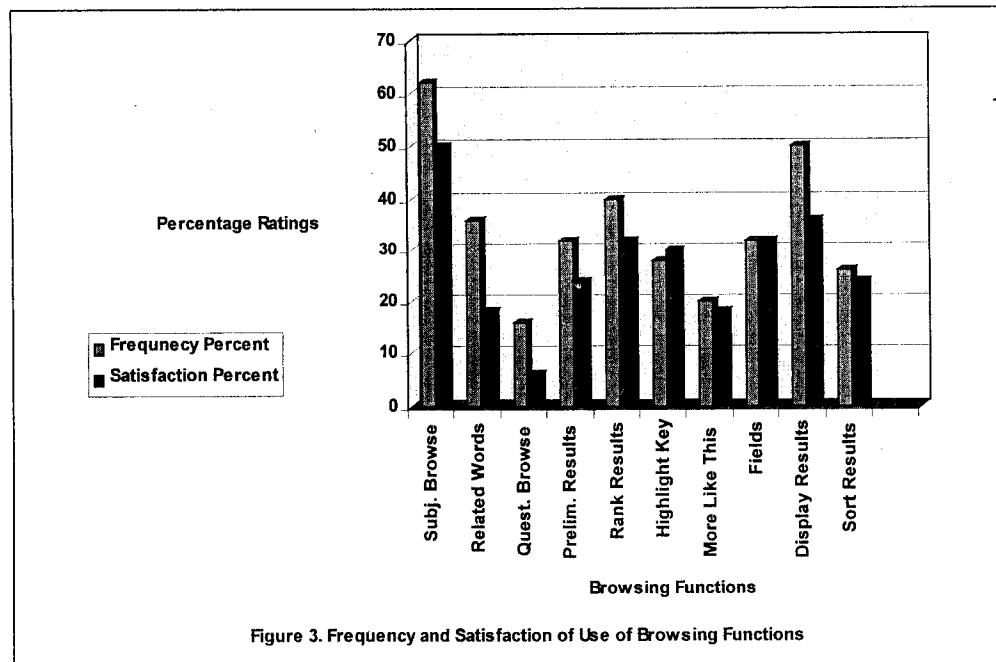


Figure 3 also illustrates the top browsing functions that users were satisfied with by combining the percentage of users who rated “some more” and “extreme” to each browsing function. The results indicate that users were not very satisfied with these browsing functions. The number of subjects who circled “some more” and “extreme” satisfaction with each browsing function were less than those who circled “often” and “daily” use of each browsing function. In a general use of search engines, the more a searcher uses a search engine, the more a searcher is satisfied with it. Unlike users’ general use of search engines, the results show that searchers’ levels of satisfaction is not in the same order as their frequency of use. The top of the browsing functions that users were satisfied with were subject browse (50%), results display (36%), rank results (32%), field assistance (32%) and highlighting keywords (30%) while question browse (6%), related terms (18%) and web site like this (18%) were users’ least satisfied browsing functions. Among the changes, users were especially not satisfied with question browse, related terms, preliminary results and display results.

Users’ satisfaction with browsing functions is highly related to the problems they encountered in using these functions. This will be discussed in detail in section 4.5.

4.4 Reasons leading to the use of browsing mechanisms

Question 4. Under what circumstances do searchers use these browsing mechanisms?

Subjects were instructed to write down the reasons leading to the use of each browsing mechanism. Table 5 presents in detail under what circumstances that searchers use each type of the browsing mechanism. In general, users use browsing features for subject browse under the following circumstances:

- 1) When they intend to do a quick initial search
- 2) When they don’t have specific queries in their minds
- 3) when they are unable to construct a query
- 4) when they like to have an overview to see what is available

Users use browsing features for query formulation under the following circumstances:

- 1) when they don’t know how to formulate a query
- 2) when they intend to specify their searches to achieve higher precision
- 3) when they look for information in specific formats
- 4) when they try to identify some related terms

Users use browsing features for query reformulation under the following circumstances:

- 1) when they need to narrow their searches
- 2) when they need to expand their searches
- 3) when their original queries fail to generate relevant results
- 4) when they need to explore new aspects of the search topics

Users use browsing features for result evaluation under the following circumstances:

- 1) when they try to limit search result
- 2) when they try to filter search results based upon certain criteria
- 3) when they try to look for specific information

Types of Browsing Functions	Types of Reasons
Subject browse	<ul style="list-style-type: none"> • common search topic • unfamiliar search topic • Obtain general information effectively • Preliminary general search/Not look for something specific • Fail to find results by specific search • Find out different aspects of a subject • Find related topic • Quick access specific subject • Overview of what is available • Eliminate other subjects irrelevant to the search topic
Related words browse	<ul style="list-style-type: none"> • Narrow search • Expand the original search • Find related topic/similar sites • Original query terms fail to generate relevant results • Enhance/define the initial search • Discover related aspects of a topic • Need new ideas or avenues to the topic
Search query/question browse	<ul style="list-style-type: none"> • Does not care what others look for • Find out whether somebody has asked the same question and found the answer • Need to know how to formulate a query • Curiosity
Preliminary results browse	<ul style="list-style-type: none"> • Narrow search • Focus search/Eliminate unwanted information • choose categories best represent the search topic • Expand the original search • Discover something new on the topic • Move from one aspect of the search topic to another • Overview of different aspects of the search topic
Ranking based output	<ul style="list-style-type: none"> • Quick search/focus on a particular aspect of the search topic • Get the best/most relevant matches • Limit the search results/Eliminate unwanted results • Save time • Evaluate the query
Highlighting key words	<ul style="list-style-type: none"> • Evaluate the relevancy of the site effectively • Look for specific information • To see how terms are used in context • Search for possible hyperlinks
Document like this	<ul style="list-style-type: none"> • Find similar sites • Find more relevant sites • Define search • Fail to formulate an appropriate query
Field assistance (e.g. all the words, any word, in the title, in URL, etc)	<ul style="list-style-type: none"> • Specify searches • Narrow searches • Look for specific topic • Look for specific format • Assist to formulate query

Results display (e.g. number, length of the records, portion of the records)	<ul style="list-style-type: none"> • Filter search results • Limit search results • Test the original query (pilot search) • Evaluate a site without viewing it • Scan for useful information
Sort results (list by web site, etc.)	<ul style="list-style-type: none"> • Filter search results • Evaluate credibility of the search results • Save time for evaluation • Identify results for specific search

Table 5. Reasons leading to the use of browsing mechanisms

4.5 Problems encountered in using browsing features

Question 5. What are the problems users encounter when they use browsing functions?
Subjects were instructed to list their problems in using each of the browsing functions.

Table 6 summarizes the problems users encounter when they use these browsing mechanisms in their search process. Although each type of browsing function has its own problems, some of them represent problems across different browsing features. The major problems users experienced in the existing browsing capabilities were: 1) unclear logical structure, 2) too many options to sift through and 3) inappropriate and unclear names. These problems reduce the effectiveness and efficiency of users' information seeking process.

Browsing functions provide users opportunities to effectively interact with search engines and find relevant information. However, users were not clear about the logical structure behind some of the browsing mechanisms, and that weakened the effectiveness of these mechanisms. Some of the users were confused by the hierarchical structure of the subject tree, and that affected their abilities to identify the right categories or sub-categories for their search topics. When users tried to browse related terms, or use more like this function, they often found that those terms are not related or those sites are not like the one in which they are interested. Users were also annoyed when irrelevant categories or unusual interpretations presented as part of the preliminary results, and they wondered what was the basis for the generation of these categories. Many users did not know that the rank output was generated based upon the frequency of the terms appeared in the web site, therefore they were always surprised to find the site rated 99% relevant was less relevant as the one rated 70%. Users would like to have the logical structure of the browsing functions available on the web search engines for their references.

The second problem related to browsing is that it was too much for users to sift through a long list or to be presented with too many options. Too many options appear to be a burden for users in their information seeking process, and it takes too much time to browse and users easily get lost. The long lists of subjects, preliminary results and search queries forced people either giving up browsing or quickly selecting a choice which might not be the best choice. The reason that users were quite satisfied with result browse was because results could be controlled in a more manageable way for browsing by using different functions of results display. It seems unrealistic for users to remember all the search commands. However, field assistance also has its own problems. Users felt too many options actually made search engines too complicated to use, and furthermore, these fields made them difficult to sift through it.

Another common problem for browsing mechanisms is that the names of categories are either inappropriate or not descriptive enough, and that greatly affects the effectiveness of browsing. Users complained about the inappropriate labels of the subject category and subcategories in the subject tree or preliminary results that sometimes led them to a wrong direction. They were also concerned that some of the labels were not descriptive enough so that they have to click them to see whether those are the categories they would like to browse.

Types of Browsing Functions	Problems
Subject browse	<ul style="list-style-type: none"> • Unknown logical of the hierarchical structure • Too few subjects • Too broad • Not helpful for specific data • Inappropriate labels of the subjects • Labels are not descriptive enough • Not always focus on the topic being searched/many irrelevant sites • Too many hits
Related words browse	<ul style="list-style-type: none"> • Not always related • No good hits • Terms are too broad
Search query/question browse	<ul style="list-style-type: none"> • Long list
Preliminary results browse	<ul style="list-style-type: none"> • Long list • Irrelevant categories/unusual interpretations • too broad categories
Ranking based output	<ul style="list-style-type: none"> • Rank logic unclear • Frequency of terms do not always represent the content of the site • Not very accurate or reliable • Duplication of web sites
Highlighting key words	<ul style="list-style-type: none"> • Highlighting terms not obvious • Too long to scan • Sometimes distracting
Document like this	<ul style="list-style-type: none"> • Generate sites not like this • Logical structure unclear
Field assistance (e.g. all the words, any word, in the title, in URL, etc)	<ul style="list-style-type: none"> • Some of the fields don't really work • Too many options to sift through • Too complicated
Results display (e.g. number, length of the records, portion of the records)	<ul style="list-style-type: none"> • Not able to remove duplication
Sort results (list by web site, etc.)	<ul style="list-style-type: none"> • Not able to remove duplication • Not always bringing up relevant sites

Table 6. Problems encountered in using browsing features

4.6 The Impact of Browsing Functions

Question 6. To what extent, do these browsing mechanisms help users use search engines and retrieve relevant information?

Subjects were instructed to evaluate the impact of browsing functions on their easy use of search engines and their effective retrieval of relevant information (1=not at all, 2= a little, 3= some, 4=some more, 5 =extremely).

	<i>not at all</i>	<i>a little</i>	<i>some</i>	<i>some more</i>	<i>extremely</i>
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
do you think that browsing functions help you use search engines easier?	2%	6%	40%	32%	16%
	1	3	20	16	8
do you think that browsing functions help you more effectively retrieve relevant information?	2%	8%	50%	24%	12%
	1	4	25	12	6

Table 7. The impact of browsing functions

Table 7 presents subjects' overall evaluation on the impact of browsing functions on search engine use and information retrieval. The results demonstrate that browsing functions have high impact on the easy use of search engines and effective retrieval of relevant information. Only a few subjects rated the impact of browsing functions on easy use of search engines (8%) and effective retrieval of relevant information (10%) as "not at all" and "a little." The results also show that users considered browsing functions more as tools to help them effectively use search engines than retrieve relevant information since more subjects rated the impact of browsing functions as "extreme" and "some more" on the former (48%) than the latter (36%).

4.7 Desired Browsing Functions.

Question 7. What needs to be improved?

Subjects were instructed to write down their desired browsing functions for search engines. Subjects' recommendations for improvement of browsing functions on search engines can be summarized in the following aspects: 1)transparent structure, 2) organized list 3) visual representation, 4) more user control, and 5) standardized browsing features.

In order to solve the problem of unclear logical structures of browsing functions, users suggested that making the structure of browsing functions transparent on the web search engines, and that it would help them to determine whether to use certain browsing function and to interpret the results more easily.

Instead of browsing a long list, users would be more interested in browsing an organized list. For example, people are not interested in spying on what the other people are searching now, but they love to browse FAQs (Frequently Asked Questions) created for users to quickly find answers for common topics.

One objective of browsing functions is to assist users to effectively find what they need. As users normally have to spend quite a large amount of time to go through text information, they

hope visual representation, can be introduced to supplement text representation to promote effective browsing.

Users would like to have more control for the search process. The desired browsing functions should allow users to have other alternatives when certain browsing features do not provide the expected results. For example, in addition to related terms generated by the system, users also like to have a thesaurus/dictionary ready for them to find related terms themselves.

Users were confused by different browsing features on different search engines. Therefore, they would like to have standardized browsing mechanisms across different search engines, which means standard labels as well as standard functions.

5. CONCLUSION

This study demonstrates that browsing functions have a high impact on the easy use of search engines and effective retrieval of relevant information. Furthermore, browsing features play important roles in users' selection of search engines. This study indicates that users did not randomly select browsing functions, instead, they chose different browsing features based upon different situations. The results show although users' frequencies of use browsing functions were high, not all of the features were equally used. In addition, users' levels of satisfaction were not as high as their frequencies of use. The existing browsing mechanisms need to be improved based upon users' feedback to promote the use of browsing functions and effective information retrieval.

Further studies should focus on the in-depth study of how users use different browsing functions of search engines under different circumstances, and moreover what are the problems that emerge in their browsing process. Further study will help researchers understand the nature of browsing behavior as well as provide researchers more empirical data to design desired browsing mechanisms.

6. ACKNOWLEDGEMENTS

The author thanks Nancy Ross for her contributions to the data analysis part of this paper.

7. REFERENCE

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