

# ACCESS TO ONLINE DATABASES: AN EXPLORATION OF USERS' EXPERIENCES WITH WEB INTERFACES

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**Abstract:** This paper reports on an investigation that was conducted to compare searcher experiences with web and non-web interfaces to online databases. The following criteria were used to evaluate these interfaces: 1) database access, 2) database selection, 3) search strategy formulation and reformulation, 4) usefulness of help mechanisms, 5) document organization and display, and 6) printing, downloading and exporting of results. This study was conducted based on thirteen students' evaluation of web interfaces of online systems in an Advanced Database Searching class. These students had used both web and non-web interfaces of online databases, such as, Dialog, Dialog Web, DataStar Web, WilsonWeb, Lexis-Nexis, FirstSearch Web, Ovid Web, ProQuest Web, Dow Jones and DataTimes. They were asked questions about their experiences with database interfaces in terms of the six criteria above. Most importantly, searchers were instructed to elaborate upon the reasons and examples for their answers. Results of this study demonstrate that web interfaces outperform non-web interfaces on most of the six aspects. According to respondents, it is more intuitive and flexible to use. However, some negative aspects of web interfaces were identified, associated with searcher's ability to interact with databases effectively and intensively. This problem was stronger for people who were more experienced with traditional interfaces. In addition, some inherent limitations of the web technology itself were also recognized. Results of the study are further discussed in relation to implications for system design and library and information science education.

## 1. INTRODUCTION

According to Martha E. Williams, in 1996, there were 1,805 vendors, 2,938 producers and 10,033 databases. The growth in online database use on the major U.S. systems offering word-oriented databases increased from 750,000 searches per year in 1974 to the high in 1995 of 72.40 million searches per year (1). Along with this growth of commercial databases, World Wide Web access to them is becoming more pervasive, and this development is one of the most important factors influencing the database producers, vendors and users. Even some window-based online system providers are planning to transfer their service to the web. For example, Dow Jones plans to build a web interface with all the functionality of the latest windows software. The Dow Jones News/Retrieval software, version 5.0 marks the transition for the entire service to a full web interface (2). A fundamental characteristic of web based searching is that it is inherently

*interactive*, and that it facilitates a variety of ways for users to interact with both information and systems. Some of the significant characteristics of these new web-based access mechanisms are:

- guiding user access to a variety of databases
- facilitating multiple interactive search strategies, such as browsing, searching, etc.
- assisting mapping to thesaurus terms
- offering interactive help mechanisms
- affording multiple manipulations of output
- providing iterative movement by links

In general, web interfaces are more intuitive and flexible to use. Koehler and Mincey (3) compared the dial up access method and web access methods, and concluded that FirstSearch Web was a major improvement. However, not everyone agrees that web interfaces are better than non-web interfaces of online databases. In one recent study of web searching behavior, Bates (4) compared web-based packages--Dialog Web and DataStar Web with the Classic, ASCII, dial-up version of Dialog that most experienced online searchers learned to search with. She acknowledged the benefits of the web-based product, but also considered the Web-based product to be less efficient and responsive for the experienced searcher than the ASCII product.

## **2. RESEARCH QUESTIONS**

The emergence of web-based access to online databases provides end users with an alternative way to interact with databases that previously could only be accessed via traditional interfaces. At this point, one might ask what the advantages and problems of these new web interfaces are compared with non-web interfaces of online databases. More importantly, how can these interfaces be improved? These are central questions that need to be answered in order to design interfaces or systems to support end-users effectively interacting with online systems.

## **3. METHODOLOGY**

This study was conducted based on thirteen master's level students' evaluation of web interfaces of online systems in an Advanced Database Searching class. Before they attended this class, they all had experience with Dialog search. These students had used both web and non-web interfaces of online databases, such as, Dialog, Dialog Web, DataStar Web, WilsonWeb, Lexis-Nexis, FirstSearch Web, Ovid Web, ProQuest Web, Dow Jones and DataTimes in this class. The following criteria were used to evaluate these interfaces at the end of the class: 1) database access, 2) database selection, 3) search strategy formulation and reformulation, 4) usefulness of help mechanisms, 5) document organization and display, and 6) printing, downloading and exporting of results. Open-ended questions were administered to participants, who were asked questions about their experiences with database interfaces in terms of the above six criteria. Most importantly, searchers were instructed to elaborate upon the reasons and examples for their answers. Content analysis (5) was used to analyze the data.

## **4. RESULTS**

Based upon thirteen students' evaluation of web and non-web interfaces of online systems, the results are presented in the following sections: 1) database access, 2) database selection, 3) search strategy formulation and reformulation, 4) usefulness of help mechanisms, 5) document organization and display, and 6) printing, downloading and exporting of results.

### **4.1 Database Access**

Three categories of database access emerged from the data: 1) easy access and platform independence, 2) browser compatibility, and 3) connection time. The first category mainly discussed the advantages of accessing web-based online systems while the second and third represented the problems searchers encountered in connecting to web-based online systems.

#### **Easy access and platform independence**

Almost every searcher agreed easy access was one of the most distinctive features for web interfaces. Any computer that could access web could also access these web-based online systems. They could search at school, office, even at home at any time. Platform independence was another advantage of web interfaces. Searchers did not have to spend hours to download the software and install it. Also they could connect to online services regardless of whether that software was used on a PC, MAC or UNIX, and they could access these systems in a similar way from different systems. No proprietary software or specific operating system or platform was needed, other than a web browser.

#### **Browser compatibility**

Although web-based online systems take advantage of easy access, they have compatibility problems. Not all the online systems could be accessed with different types of browsers. Two searchers mentioned their problems with WilsonWeb when using Internet Explorer. In one case, one searcher tried to access WilsonWeb via Internet Explorer, and the screen locked up several times. Originally he thought that it was just a service problem, but after several attempts, he switched to Netscape, and everything worked. The same thing happened to another searcher as well.

Another problem that affected searchers' access to these online systems was "accepting cookies." For most of the online systems, the process of "accepting cookies" is required to logon. If a browser is set to "disable cookies," it is difficult for the searcher to figure out why he/she can not logon. Several searchers experienced hours of trying without realizing the reason for their difficulty, because no feedback from the system informed them of this problem.

#### **Connection time**

Slow connections were identified as one of the problems of web access, especially at certain times of the day. Almost every searcher agreed that the response time was better on direct link systems.

Just as one user said: "No matter what kind of wonderful interface you have, it doesn't help if your users cannot access it because of heavy traffic on the server." Several searchers also complained that they were disconnected for no apparent reasons, for example it happened while one user tried to do a search on Dialog Web and use help in ProQuest Web. Problems were also reported on DataStar Web, FirstSearch Web and WilsonWeb.

## **4.2 Database Selection**

On web interfaces, databases can be selected by choosing subject, by using type of information provided, by checking the box next to the database label, by clicking on the name of the database itself, or by selecting databases when ordering the service. Three major categories of database selection identified by searchers were database description access, database identification and multiple databases access.

### **Database description access**

It is essential for searchers to have a rudimentary knowledge about databases before they select the appropriate databases. According to searchers, the visual layout made the database selection an easy task because all databases or database groups were listed in one place. The various point-and-click menus, subject arrangements, and check boxes made it easy to select relevant databases. Web interfaces also provided the immediate access to descriptions of a variety of databases. The only difference is that in some of systems searchers can view the database description before they select that database while in others they have to select that database first. Most of the searchers preferred the former, and Ovid was well complimented for its feature-"I" (Information) icon. FirstSearch and WilsonWeb also provided comprehensive information about the databases, but information was only displayed after the selection of databases. Some searchers also liked the display of database descriptions in First Search in which they did not have to click help.

### **Databases identification**

With an increasing number of online databases, users like to be able to select relevant databases within in one system. It is a powerful tool for searchers to search across all the databases to find the appropriate databases when they are not sure which database or databases to select. Even though traditional interfaces also provided this feature, users still preferred web interfaces because that feature normally was on the same screen of a list of available databases, such as DataStar Web's "Find Database" and WilsonWeb's "Find Terms in Database." They hoped that other web-based products also provided that option.

ProQuest does not require users to select databases. Searchers had different opinions of this feature. Some thought that ProQuest files were pre-selected in the ordering process, and it allowed them to concentrate on how to formulate their search strategies; Others argued they felt they lost control for which databases to select and what corresponding search strategies to take.

### **Multiple databases access**

Some non-web, graphical interfaces such as Dow Jones, Lexis/Nexis and DataTimes, offer users the opportunity to select groups of databases as well as individual ones, and further they also allow users to keep their source lists. For most of the searchers, the biggest problem of web interfaces was that most of them only allow one database to be selected. One searcher pointed out: "it became a source of frustration when one had to change from one database to the other to find the results."

### **4.3 Search Strategy Formulation and Reformulation**

Field assistance, term selection, search history, and search limit assistance were identified as the major issues related to search strategy formulation and reformulation. According to these searchers, web interfaces, to a great extent, assisted them in selecting fields and terms, connecting search history, and limiting their searches. However, these help mechanisms also brought some problems that need to be improved. They also called for the need to expand advanced search for experienced users.

#### **Field assistance**

In using web interfaces, searchers took advantage of clicking check-boxes and pull-down menus for selecting different fields. In general, they liked the way that they did not have to remember complex commands as they had to do in traditional interfaces. However, searchers also pointed out problems brought by the assistance features: 1) Some interfaces, such as WilsonWeb, did not reset the search choices for a new search, and that made several users redo their searches. 2) Assistant features in Ovid and ProQuest provided helpful guidance for searchers in terms of field selection. Simultaneously, they also required several steps for users to formulate their queries. One searcher described her dilemma: "I thought the Search Assistant was sort of awkward because you had to switch from page to page, but if you didn't have to remember how to designate a field or a connector, it was useful." 3) Not all web interfaces showed all fields that existed in a database, so sometimes searchers had to consult the manual to figure out which ones were available. 4) Some of the query boxes were not big enough for the complete search statement.

#### **Term selection**

The index features provided by the web interfaces impressed most of the users. They felt the index features of web databases seemed easier to use than that of non-web interfaces. DataStar's classification text, WilsonWeb's index, ProQuest's related terminology and Ovid's vocabulary mapping were the examples of these index features. These systems allowed searchers not only to verify these terms and show the number of hits, but also to automatically formulate a query for them.

### **Search history link**

In web interfaces, searchers were satisfied with the ability to view their search histories. Almost all the web interfaces created sets for recombination by selecting Boolean “and” or “or” sets. Most web interfaces allowed searchers to go back to their search history and modify their query. However, to some searchers, the extensive history lists of each search that showed all the time were a disadvantage in web interfaces, such as the search history in WilsonWeb and DataStar Web. FirstSearch had a nice history button that searchers could press when they wanted to review the history. Ovid had a “combine searches” icon at the top throughout its databases and proved to be very useful to these searchers.

### **Search limit assistance**

Several searchers liked the “focus” function of Lexis/Nexis, which could narrow their previous search results, and hoped to see similar features available on web interfaces. FirstSearch also allowed searchers to limit their searches, but only in certain categories, moreover, those categories varied from database to database. It was difficult for searchers to know beforehand what to limit. Searchers liked the “repeat” function which made it possible to rerun previous searches provided by DataStar and Ovid.

### **Advanced search**

According to users, Dialog and Lexis/Nexis window interfaces supported more sophisticated search formulation than web interfaces, and the structure of the web interfaces encouraged users to do simple searches and combine them later. The traditional command-line searching, while time consuming to learn, allowed for very powerful and flexible searches to be performed. Web-based interfaces generally used form-based searches, sometimes they limited searchers’ ability to perform. Several searchers called for the need to expand the advanced search capabilities of web interfaces.

## **4.4 Usefulness of Help Mechanisms**

The help mechanism is a key component of an online system. A well-designed help mechanism facilitates use of the system. In contrast, a poorly-designed help mechanism will confuse the user and reduce the usage potential. Users preferred the help mechanism to be: 1) sensitive to their problems, 2) well organized for easy access, and 3) easy to scan and understand.

### **Context sensitivity**

Most searchers stressed the need for the system to offer help specific to their problems in the search process. Most of the web interfaces did not provide such context-sensitive-help that Lexis/Nexis and Dow Jones provided. It was very difficult for users to figure out not only how to solve their problems but also how to characterize or label their problems.

### **Organization of help topics**

According to searchers, the advantage of the "Help" function of web interfaces was the hyperlink access, so they could easily get to a specific topic. Just as one searcher said: " the biggest advantage to the web based products Help was the ability for hypertext links to the topic that one might be interested in." They identified three types of help that they liked: 1) ProQuest presented a book style format based on a hierarchical table of contents with hyperlinks to pages with help on the specific topics. 2) Ovid allowed easy access to help by offering buttons next to their databases and search fields. 3) FirstSearch Help took searchers directly to help associated with that page.

### **Examples and tips**

Instead of reading through the Help to learn the search syntax, searchers liked to view examples, especially those examples where their displays could be easily controlled. Several searchers found it was incredibly easy both to scan and to understand examples and tips in Dow Jones. However, they did not like those examples that took most of the screen and were displayed on every screen on some of the web interfaces.

### **4.5 Document Organization and Display**

On web interfaces, documents were typically displayed in citation, with other options such as abstract, full record, full text, PDF, or text and image, etc. As to document organization and display, users cared about two issues: 1) how many formats they could view a document; and 2) whether different types of display could help them to evaluate the relevance of an item.

#### **Display choices**

In terms of document organization and display, users preferred to have multiple display choices. ProQuest was regarded as the best service to allow extensive display choices, e.g. citation, abstract, text only, page image (PDF), and text+graphics. Its text plus graphics was the one considered most useful. Both WilsonWeb and ProQuest presented Adobe Acrobat portable document format (PDF) which allowed searchers to view documents as they appeared in print format. FirstSearch was praised for its method of containing Internet accessible resources that directly link to variety of web pages

#### **Evaluation facilitation**

In addition to multiple display choices, searchers also expected that different formats of display could help them to effectively evaluate documents. For the time being, those highlighted search terms were widely used to facilitate their evaluation of information on web interfaces. Key word in context (KWIC) format in Lexis/Nexis was one of their favorite formats that assisted them to look for factual data without requiring the searcher to sift through the full text.

#### **4.6 Printing, Downloading and Exporting**

Printing, downloading and exporting are the final steps that searchers have to take to finish their information seeking process. There are three major concerns of these users: 1) how to print search results easily; 2) how to keep the styles of the documents intact; and 3) how to send the search results in a quick and convenient way.

##### **Print function**

Most searchers took advantage of the web browser to print by hitting the print button. Users could easily print in the search process on web interfaces. However, searchers were annoyed that the graphics of the screen were also printed out, and that was why they liked FirstSearch and WilsonWeb that contained a nice feature to redisplay documents in a clean copy.

##### **Style retainability**

As to downloading search results, users preferred to keep the original style so that they could edit it and present it to patrons in a nice format. DataStar was praised for its rich text format, so searchers could retain the styles of search results. Searchers were also happy that ProQuest and WilsonWeb allowed them to download PDF files.

##### **Search result transferability**

As to exporting search results, searchers were impressed that they could e-mail results directly to their clients. They hoped that all web interfaces could offer this quick, easy and convenient service.

#### **4.7 Summary of Results**

Figure1 and Figure2 summarize the advantages and problems of web interfaces discussed above identified by thirteen searchers. In these two figures, percentage refers to, for each category of the advantage or the problem, the proportion of the number of subjects identifying that category to the total number of subjects.

### **5 DISCUSSION**

The results of this study are further discussed in relation to implications for web-based online system design and library and information science education.

#### **5.1 Implications for Web-based Online System Design**

The nature of information retrieval is interactive, and interface/system design should support users to effectively interact with information and system (6,7,8). To some extent, the interactive characteristics of web interfaces facilitate users' interaction with information and system. However, from this study we can conclude there are still some issues that need to be further



explored: 1) how web interface can be designed to support multiple forms of interactions, 2) how web interface can be designed to facilitate both advanced and novice users, and 3) how web interfaces can be designed to support natural language queries.

### **Support multiple forms of interactions**

In general, web interfaces outperformed non-web interfaces in these six criteria. Recent studies of interactive IR demonstrate that people engage in multiple forms of interaction within an information seeking episode (9,10,11,12). The evaluation of web and non-web interfaces showed that searchers cared about not only how systems effectively support them to formulate queries but also how systems support them to perform other forms of interaction. Searchers need online systems that enable them to learn system features, database content and domain knowledge; to evaluate information/item in terms of its relevancy, correctness, duplication and fitness; to explore to find useful information; to look for a known item with incomplete information, to find specific information; to find items with common characteristics; to keep them informed about their search status and problems, etc. Here are some questions that need to be further investigated for web-based online system design:

- a) How can systems support searchers to *learn* system features, database content or domain knowledge by providing context sensitive help not just general help?
- b) How can systems support searchers to effectively support different types of *evaluation* by offering different forms of display?
- c) How can systems support searchers to *explore* the most up-to-date information by making Current News available as DataTimes and Dow Jones have already provided?
- d) How can systems support searchers to *look for a known item* with incomplete information, such as “keywords in title” in FirstSearch?
- e) How can systems support searchers to *find specific information* efficiently, as Lexis/Nexis freestyle tries to offer?
- f) How can systems assist users to *find information with common characteristics* by using features, such as “document similar like this,” different types of index, hyperlinks of descriptors, etc. that some of online systems provide?
- g) How can systems *keep* searchers *informed* about their *status* and their *errors*?

### **Ease of use vs. control**

It seems that web databases fall short in the area of features for advanced searchers, but facilitate use for novice searchers. Web interface designers should consider the needs of both advanced and novice searchers. In this study, experienced searchers had their own unique ways to evaluate online systems and interfaces. On one hand, they preferred the ease of use of web interfaces, on the other hand, they were also concerned that they might lose the control they had before. For example, in database selection, searchers always complained how difficult it is to select the appropriate databases, but they felt they lost the control when they did not have to choose a database in ProQuest. Searchers also expressed their concerns in using field assistance, as one searcher said: “Sometimes I’d rather just memorize commands, at least then you know all the options available to you.” Another searcher commented: “I am not very impressed by relevance ranking and I prefer to manipulate sets of results by specifying a sort field myself.” The question

for system/interface design here is:

How to provide searchers with ease use of systems and at the same time allow searchers to have a certain degree of control?

One solution could be that systems provide both command and guided search as Dialog Web does. However, it is still a question as to whether to design command search that keeps all the traditional formats or the one that takes advantage of the web interface. One searcher criticized the command search in Dialog Web: "Dialog Web does not seem to have taken advantage of the web at all. They just put a simple web wrapper on the traditional interface."

#### **Support natural language query**

Natural language (free style) was found to be a particularly useful tool in Lexis/Nexis. One searcher suggested: "I would like to have seen this as an option in some of the web interfaces." Users liked the opportunity to use natural language in Lexis/Nexis (free style), but they did not use formulated natural language in DataTimes in which they had to divide their information problems into who, what, where and when. The central question in supporting natural language use is:

How to support searchers to use natural language without confusing them by requiring unnatural categorization of their information problems?

#### **5.2 Implications for Library and Information Science Education**

New web-based online systems challenge the traditional way people search information on online systems. This study showed that in using web-based online systems, users tried to adapt to the new interactive access mechanisms. However, users were also constrained by the traditional conceptual perceptions or models of search process and retrieval system. Users often applied old search strategies to the new system, which might not support such behaviors. New systems also confronted users with not only new features but also new forms of interaction, and effective performance depended upon searchers developing competence as interactants in these environments.

All these problems are centrally related to interaction in information seeking. Just improving interfaces or systems can not solve some of these problems. They are the result of a lack of understanding the nature of interaction in information retrieval, resulting in the inability to effectively interact with new information systems. Xie and Cool (13) suggested these problems could be addressed by placing greater emphasis on teaching interaction in LIS programs. It is the responsibility of library and information science educators to introduce "interaction" into online searching training, furthermore, to teach students and online searchers new conceptual models, to teach ways to adapt existing search strategies to new interactive IR systems and to develop search competence with new forms of interaction.

## 6. CONCLUSION & FURTHER RESEARCH

Web-based online systems are becoming more and more popular. It is the trend to convert non-web online services to web-based services. Web-based online systems provide users new access mechanisms to support users interacting with information and systems. However, these systems also pose new problems to users, especially experienced users, in terms of how to effectively employ these access mechanisms. Also it is important to improve the web-based online systems based upon users' feedback on system use.

Further studies need to investigate how users interact with different online systems, and how these interfaces/systems facilitate users' interaction with information and systems. Moreover, these studies should also examine how novice users evaluate online interfaces/systems, especially the similarities and differences between experienced and novice users, to see how online systems can best accommodate different levels of users.

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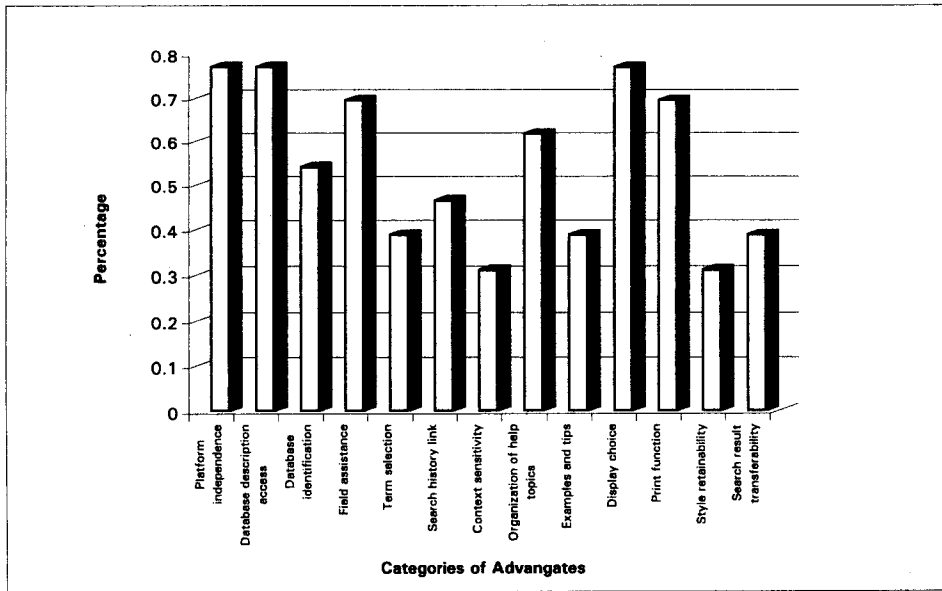


Figure 1. Advantages of Web Interfaces

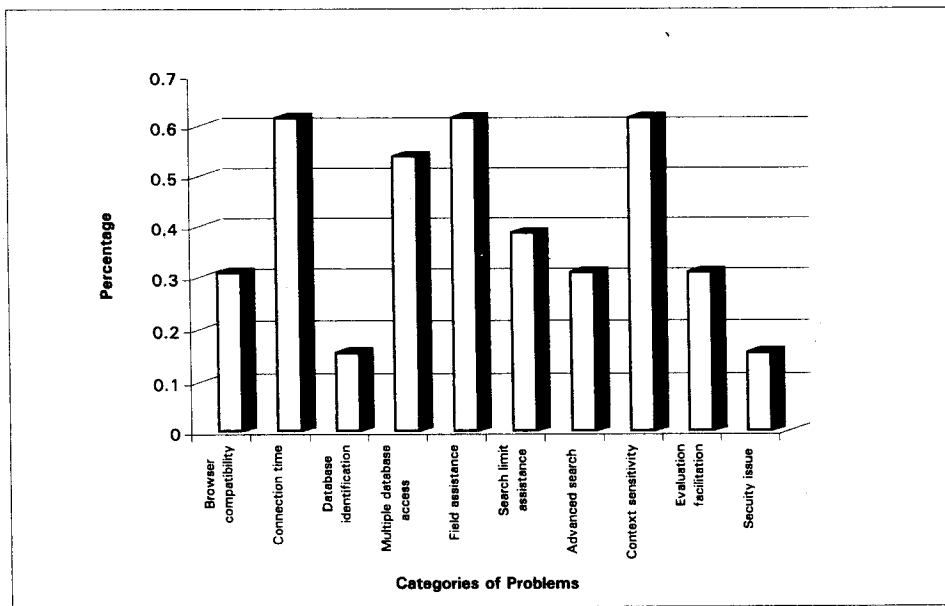


Figure 2. Problems of Web Interfaces

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