

ONLINE INTERFACE COMPARISON: FEATURES AND FUNCTIONALITIES

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Abstract:

Online database services are increasingly migrating to the web. In such an atmosphere, we need to take stock of how well these new web products perform compared to traditional online systems. This paper reports on a study of user assessments of web and non-web interfaces to online databases. In particular, the focus was on identifying aspects of system features and interface functionalities that are preferable among online database users. Twenty-eight graduate students participated in the study. Each student performed similar searching tasks using multiple online systems, with different interface conditions. Participants were asked to evaluate each of the web and non-web interfaces for usability, effectiveness and overall preference. Results of the study indicate that some of the functions of web interfaces outperform non-web interfaces; but at the same time they are not universally preferred. This study identifies specific system features and interface conditions that are highly preferable and usable, along with a discussion of particular weaknesses in poorly designed features and functionalities.

1. INTRODUCTION

It is hardly an understatement to say that the world of online searching has changed dramatically with the development of the World Wide Web. The seemingly easy access to a limitless supply of information resources has suddenly turned many ordinary citizens into "online searchers." At the same time, existing online database vendors are increasingly developing web-based versions of their products, in an effort to enhance usability and increase subscribership. Traditional online searchers are now faced with decisions regarding the use of web or non-web based interfaces to database systems they have used for years, and this decision is not a trivial one. Both web and non-web interfaces have their comparative advantages and disadvantages; however, at this time the differences between these two access systems are only vaguely understood. In this paper we attempt to contribute to our knowledge of the specific features and functionalities that make web and non-web interfaces to online information systems effective and desirable.

1.1 Online Systems and the Web

Within the past year alone, a number of online database services have migrated to, or enhanced their presence on the web. Chemical Abstracts Service recently introduced its new, full

functionality web-based interface to STN (Ref. 1). According to the service, STN on the web is marketed for experienced online search professionals. In another recent development, Ovid Technologies has introduced Ovid On Call, (Ref. 2) a new web based interface designed for use by doctors, nurses and other health care professionals. In contrast to Chemical Abstracts, Ovid On Call is designed for use by experienced health care professionals who are novice online searchers.

In another extension of the web, a number of newspapers and journals that already provide web-based access are now linking with existing database services such as Lexis-Nexis and Medline (Ref. 3). The idea here is to enhance the value of information by introducing web users to the world of online database searching. In other recent developments, existing web-based services have announced significant enhancements to their products. CARLweb 3.0 offers multilingual support, along with full integration with multimedia collections (Ref. 4). The Gale Group now offers a consolidation of three of its online services - InfoTrac, Search Bank, and GaleNet, into the single product, InfoTrac Web (Ref. 5).

1.2 Use and Usability of Web and Non-Web Interfaces

In spite of the recent explosion in the development of web-based interfaces to online information systems, we know relatively little about the effectiveness and desirability of these systems with respect to specific features and functionalities. In an earlier article, Xie and Cool (Ref. 6) describe some of the central characteristics of web interfaces worth noting in studies of online searching behavior. 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 that they:

- guide user access to a variety of databases
- facilitate multiple interactive search strategies
- assist mapping to thesaurus terms
- offer interactive help mechanisms
- afford multiple manipulations of output
- provide iterative movement by links

In a recent discussion of searching behavior with interactive systems, Miller and Thomas (Ref. 7) describe some of the issues related to novice searchers' behaviors. They suggest that researchers distinguish between "system characteristics" such as performance, facilities and online information, and "interface characteristics" such as dialogue style, displays and graphics, in their assessments of the usability of information systems for this general population. Looking in another direction, Conger (Ref. 8) investigates some of the problems that accompany experienced searchers' shifts from traditional online database systems to access via the web. In general, experienced searchers need to form a new mental model of the web searching experience, and they need to accept a certain measure of loss of control over the searching experience when they migrate to the web. Taking another approach to the study of online searching behavior, Bell (Ref. 9) argues that researchers have largely ignored the "emotive" side to searching, while focusing on cognitive, and affective dimensions. This study compares two interface conditions: telnet and web access to information systems, and finds that although web

interfaces are more “supportive,” especially for less experienced searchers, they do not necessarily contribute to better search outcomes. In another comparison of search interfaces, Meadown, Wang and Yuan (Ref. 10) investigate novice user behavior with two systems - Dialog classic, and OAK, a menu-based interface to Dialog. This study predates the development of Dialog’s own web-based product. The authors found that users varied in their adaptation to the different interfaces, and that this adaptation and subsequent search performance was related to the searchers’ level of experience and domain knowledge. Some of the differences between online, CD-ROM, and web retrieval sources are discussed by Clausen (Ref. 11) in a study of the use of a business information service. One of the strong conclusions of this study is that future users of information systems need to be trained in specific searching skills appropriate for the web. The concept of “web information literacy” is introduced in this paper. This same theme is echoed in a paper by Hastings (Ref. 12) who reviewed Lexis-Nexis Universe, and concluded that although the system was easy to navigate and generally well designed, the overall search results were often unsatisfactory.

These studies of online searching behaviors with various interface conditions suggest that there are advantages and disadvantages of both web and non-web based systems. It is hard to know from the previous research if these differences are attributable to differences amongst searchers, their task assignments, or the systems themselves. We can conclude from this literature, however, that more research needs to be done in order to determine the specific features and functionalities of web and non-web based interfaces that are associated with search success and failure.

2. METHODOLOGY

The study reported here is a continuation of research in a previous study (Ref. 13). It was designed to address some of the questions raised above about the use, usability and desirability of web and non-web based interfaces to information systems, and in particular, about users’ preferences on specific features and functionalities contributing to the success or failure of these systems. This study is based on an analysis of the searching experiences of twenty-eight Master’s level students enrolled in an Advanced Database Searching class. At the time of this study, most of the subjects (96.5%) had at least “some” experience searching computerized library catalogs and web search engines, and about half of the subjects (53.5%) reported having at least “some” experience searching CD-ROMs. Half of them (50%) had this same level of experience searching full text databases. The majority had little or no experience searching in both ranked-output information retrieval systems (60.7%) and information retrieval systems that provide relevance feedback (75%).

As part of this study, students were asked to evaluate web (Dialog Web, WilsonWeb, FirstSearch Web, Ovid Web, and ProQuest Web, and Windows (Dialog, Lexis-Nexis and Dow Jones Interactive) interfaces of online databases. Table 1 presents the online systems that subjects used.

After using these systems for a period of several months, participants were asked to evaluate the features and functionalities of each based on the six criteria: system access, database selection, search strategy formulation and reformulation, help mechanisms, document display and exporting results. For each of these criteria, participants were asked to rate the online systems using a five-point scale (1 = none, 2 = a little, 3 = some, 4 = some more and 5 = extremely). In addition, open-ended questions were asked to determine more detailed information about user

preferences for features and functionalities of web and non-web interfaces. The results are discussed in terms of both these quantitative and qualitative data.

Online Systems	Subjects' Experience (mean score)
Dialog	3.39
Dialog Web	1.07
Dow Jones Interactive	1.28
FirstSearch Web	1.10
Lexis-Nexis	1.53
Ovid Web	2.46
ProQuest Web	1.21
WilsonWeb	1.57

Table 1. Online Systems Evaluated by Participants

3. RESULTS

Table 2 presents the mean scores for each system rated by the participants, for each of the six criteria listed above. The table indicates that the following systems were rated the highest in system access, database selection, search strategy formulation and reformulation, help mechanisms, document display and exporting results respectively: WilsonWeb (4.14), WilsonWeb (3.96), Ovid Web (4.18), Ovid Web (3.96), ProQuest (4.32), and Ovid Web (4.32). In the sections below, we draw upon the interview data to summarize users' preferences on features and functionalities of different online systems according to the six criteria.

Rate the following	System Access	Database Selection	Search Strategy	Help Mechanisms	Documents Display	Exporting Results
Dialog	3.18	3.75	3.57	2.79	3.36	3.79
Dow Jones	3.57	3.82	3.57	3.25	3.96	3.89
Lexis-Nexis	3.32	2.43	3.21	2.68	3.43	3.25
Dialog Web	3.75	3.57	3.54	3.36	3.82	3.75
FirstSearch Web	3.46	3.32	3.36	3.36	3.29	3.68
Ovid Web	3.86	3.68	4.18	3.96	4.07	4.32
ProQuest Web	3.79	3.57	3.54	3.57	4.32	4.29
WilsonWeb	4.14	3.96	3.68	3.46	3.75	3.96

Table 2. Subjects' Evaluation of Online Systems

3.1 Assessment of Features and Functionalities for System Access

Web browsers contribute to the major advantage of web-based online systems: ease of access. All the online systems with web interfaces were rated higher than traditional interfaces, for example, Dialog Web (3.75) versus Dialog (3.18). Within the Web-based online systems, those having their unique web addresses are more welcomed than others, such as WilsonWeb (4.14), so users do not have to look for a specific link from a list of options and go through a couple of screens to the final destination.

3.2 Assessment of Features and Functionalities for Database Selection

In database selection, web-based systems have their advantages in assisting users' selection of appropriate databases. The top four rated systems were WilsonWeb (4.14), Ovid Web (3.86), and ProQuest Web (3.79) and Dialog Web (3.75) while the two traditional systems were rated the lowest: Dialog (3.18) and Lexis-Nexis (3.12).

Database name and database description are essential for searchers to know the content coverage of these databases. WilsonWeb was highly regarded for its descriptive names of databases, thus users can quickly determine the relevance of each database for their specific search problems. In addition to descriptive name, quick access to the description of a database is appreciated. Ovid Web was well complimented for its feature-"I" (Information) icon. One subject commented: "the 'I' icon placed at the left of the databases' name is the easiest and quickest way of getting information on the content of databases throughout the various systems." Some searchers also liked the automatic display of database descriptions in FirstSearch Web in which they did not have to click help.

The mechanism that enables searchers to search across all the databases to find some appropriate databases when they are not sure which database or databases to select is a powerful tool. Users preferred web interfaces over tradition interfaces because they can easily link to relevant databases from a list of available databases, such as Dialog Web's "DIALINDEX" and WilsonWeb's "Find Terms in Database."

Searchers are quite puzzled by ProQuest Web. On one hand, they don't need to select databases, on the other hand, they don't want to search all the databases every time. Lexis-Nexis was not favored because of its complicated database groups.

3.3 Assessment of Features and Functionalities for Search Strategy Reformulation

Among all the systems, Ovid Web was rated the highest (4.18) among all the online systems in assisting users to formulate and reformulate search strategies. There is not much difference between web-based and non-web based online systems.

For searchers who have problems identifying good terms, a term index can be browsed in FirstSearch Web, "Expand" on Dialog or Dialog Web, "index" on WilsonWeb, ProQuest Web's related terminology, Dialog's descriptor, and Ovid Web's vocabulary mapping are the best that

online systems can offer. ProQuest's "table of content" which helps searchers to visualize the actual magazine is another browsing feature that was highly appraised.

For searchers who have problems constructing queries, check-boxes and pull-down menus are essential for them to easily submit a query. Assistant features in Ovid Web and ProQuest Web provided helpful guidance for searchers to select proper fields. However, these assistant features also require users to take several steps to formulate their queries, and make the process quite cumbersome. In addition, these check-boxes and pull-down menus can not satisfy the requirements of searchers who conduct searches involving special fields.

For searchers who have problems in reformulating their queries, search history in web-based online systems is a great help. Ovid Web has a "combine searches" icon at the top throughout its databases that proves to be very useful to searchers. Flexibility plays an important role in determining users' preferences for different search features and functionalities. For example, searchers disliked those web-based systems that did not allow them to get rid of the search history when they did not need it.

3.4 Assessment of Features and Functionalities for Help Mechanisms

In general, searchers are not quite satisfied with the help mechanisms of online systems. The mean score of the top system is only 3.96. The help mechanism is the last resort searchers try to look for help. Web-based online systems outperform the traditional interfaces in offering mechanisms because of the hypertext. Again they have higher ratings than the traditional ones: Ovid Web (3.96), ProQuest Web (3.57), WilsonWeb (3.46), Dialog Web (3.36), FirstSearch Web (3.36), Dow Jones (3.25), Dialog (2.79) and Lexis-Nexis (2.68).

One subject described a typical problem frequently encountered across all systems: "When queries are not well formulated according to the system's requirements, most systems will prompt the searcher saying that a suffix, or field or operator is not supported or is an unrecognized command, but rarely has any system been very specific to the particular reason or where the fault is precisely happening." WilsonWeb, FirstSearch Web, ProQuest Web, Lexis-Nexis and Dow Jones Interactive provide some context-sensitive help, but they still can not offer enough guidance for searchers to solve their problems encountered in the search process.

It is normally more difficult for users to characterize their problems than to find the solutions to their problems. Ovid Web allows easy access to the help screen by offering buttons next to their databases and search fields. ProQuest Web presents a book style format based on a hierarchical table of contents with hyperlinks to pages with specific topics. Searchers prefer the help features that are easy to access as well as easy to understand. The reason that Dow Jones was ranked the top among the traditional interfaces is that it has a very unique feature labeled "examples and tips."

3.5 Assessment of Features and Functionalities for Document Display

Generally speaking, searchers are pretty satisfied with features that facilitate document display. The mean score for document display ranges from 4.32 (ProQuest Web) to 3.29 (FirstSearch Web).

Searchers like to view different formats of documents. ProQuest Web was regarded as the best service to allow extensive display choices, e.g. citation, abstract, text only, page image (PDF), and text+graphics. ProQuest was also considered to be the system that helped searchers effectively organize and display results. Its text plus graphics was the one judged most useful.

Most importantly, searchers desire online systems that are able to assist them in evaluating the relevance of the search results. For now, the key words in context (KWIC) format in Lexis-Nexis, Dialog, Dow Jones Interactive and Ovid Web is the only feature that assists them to quickly identify factual data. More features need to be introduced to enable searchers to effectively evaluate the relevance and usefulness of search results.

3.6 Assessment of Features and Functionalities for Exporting Results

As to exporting results, searchers rated almost all the systems quite high except Lexis-Nexis (3.25) because of its offline printing functionality.

Searchers have three basic requirements: ease of printing and downloading functionalities, ease of distributing the search results and retaining original style. They were pretty happy that they could e-mail results directly to their clients from most of the web-based online systems. "One of the obvious advantages of the web systems is the ability to email the search results," commented one searcher. They hoped that all online systems could offer this quick, easy and convenient service. Accordingly, they also suggested that online systems be able to retain the original style of the search results when searchers try to print, download or send to other people, just like ProQuest Web's PDF file downloading feature.

In addition to the above requirements, searchers also liked the idea that they were able to log the whole search session during traditional online systems, such as Dialog. The search log records the whole search process for them to learn from their experiences and to identify any information they might need later. However, they could not find this feature in any web-based online systems.

4. DISCUSSION AND CONCLUSIONS

We now return to the original question raised in this study: What are the features and functionalities of web and non-web interfaces that users prefer and find helpful in terms of retrieving relevant information? Table 3 below summarizes the preferred and problematic features and functionalities, as identified by the participants.

This table illustrates that not all functions of web interfaces are easy to use, or preferred by users. In a recent paper, cited above, we suggest that a preference for web or non-web interfaces may

reflect a tension between the desire for greater user control versus ease of use. One of the most important characteristics of the web-based interfaces is that they are interactive, and as such they provide a wider range of possibilities for searchers, giving them greater control over their search process. Greater user control comes at a price - often that of greater complexity, and increased effort. One significant finding of this study is that in an ideal online world, searchers want both greater user control, greater ease of use. They don't want one without the other.

As we can see in Table 3, the number of system features and functionalities that are preferred in web-based systems outnumbers those that are problematic. However, we shouldn't dismiss those features that our subjects disliked about the web interfaces. Some of these could clearly be addressed through modifications in system design. One example where this could be done is the problem of having log records, which many web-based systems currently lack. Although searching with the web interfaces is intuitive and less difficult to use than command language systems, many of our subjects felt that the web-based systems needed better help mechanisms. This is another area that could be addressed through system design. The biggest improvement that designers of web based could make is in the area of evaluation. The inability to adequately evaluate the relevance of retrieved documents was the biggest frustration experienced by our subjects. Designing systems with ranked output and better visualization techniques with which to view retrieved document sets would help users to evaluate their search results in the web environment. Another system improvement that we suggest, based upon the results of this study, is the inclusion of relevance feedback. Relevance feedback would help searchers to reformulate their queries and improve their searches, and it would also help users feel a sense of control over the interaction. As we have discussed above, greater control is something searchers desire more of in the web-based systems.

To conclude, this study has examined user evaluations of web and non-web systems. Future research will investigate actual searching behaviors with web and non-web interfaces to online systems in order to further understand the effectiveness of each.

Preferred features and functionalities	Problematic features and functionalities
WilsonWeb's unique web address for easy access	Traditional online systems's requirement of special software installation
WilsonWeb's descriptive database names	ProQuest Web lack of control of database selection
Ovid Web's "I" providing ease of access database description	Dialog's "DIALINDEX" providing no direct access to a set of relevant databases
FirstSearch Web's automatic display of database description	Lexis-Nexis's database groups too complicated to identify
Dialog Web's "DIALINDEX" and WilsonWeb's "Find Terms in Database" for relevant database identification and direct access	Assistance features in Ovid Web and ProQuest Web too cumbersome to use
Term index in FirstSearch Web, "Expand" on Dialog or Dialog Web, "index" on WilsonWeb, ProQuest Web's related terminology, DIALOG's descriptor, and Ovid Web's vocabulary mapping for identification of good terms	WilsonWeb's search history lack of flexibility
Check-boxes and pull-down menus in Ovid Web and ProQuest Web for easy query construction	Almost all the online systems providing too general/non-specific error message
ProQuest's table of content for easy browsing	More features for evaluation needed in all the online systems
ProQuest Web's "examples and tips" offering easy to understand help	Lexis-Nexis' offline printing lack of control
Ovid Web's help buttons next to their databases and search fields and ProQuest Web's book style help with hyperlinks offering easy to access help mechanisms	Web-based online systems lack of log records
ProQuest Web's multiple formats providing multiple display options	
Key words in context (KWIC) format in Lexis-Nexis, Dialog, Dow Jones and Ovid Web facilitating evaluation	
Most of Web-based online systems' ability to transfer search results.	
ProQuest allowing downloading original format for style retainability	

Table 3. Preferred and Problematic features and functionalities

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