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EVALUATION AND COMPARISON OF FREE AND COMMERCIAL USER INTERFACES OF DIGITAL LIBRARIES

R. Alijani, M.A.

Department of Library and Information Science
Payame Noor University
Firozabad, I. R. of Iran

Corresponding author: alijanir@pnu.ac.ir

M. Nikkar, M.A.

Department of Library and Information Science
Payame Noor University
Shiraz, I. R. of Iran

email: m_nikkar@yahoo.com

Abstract - In this study, at first, different free and four fee book-based Digital Libraries (DLs), available via www were reviewed. Four DLs Gutenberg, 24×7, Netlibrary and Ebrary were chosen. A comprehensive inventory consisted of general information, search features, display options and unique features was composed for comparing the interfaces of these DLs. Then chosen interfaces were compared and evaluated. Results showed that Netlibrary scored higher according to the specified criteria. However, in designing interface for such DLs, designers should take into considerations all the criteria proposed in this study.

Keywords: Electronic Book, Database, Digital Library, User Interface, Ebrary, Netlibrary, 24×7, Gutenberg.

INTRODUCTION

This article presents the findings of a study of the user interfaces of four Digital Libraries (DLs) offering access to e-books. E-books refer to digital texts issued as individual works and designed to be accessible using special software for text navigation and ease of reading. In this paper, web-based e-books are PC and laptop-based book that can be read on the computer monitor via connection to the Internet and are produced to search, study and do a research with academic intent. Their target audiences are usually researchers, professors, and students.

The DLs studied were Gutenberg project, 24×7, Netlibrary, and Ebrary. This study was intended to examine the user interfaces in order to discover the characteristics of the systems and the differences between them. Since three of these systems - 24×7, Netlibrary, and Ebrary- are commercial, they might be expected to follow, for the most part, design guidelines and standards both in respect of functionality and usability and user friendliness. However, a degree of variation might also be expected to occur. The differences between the systems' functions can result in different perceptions that users

have of the user friendliness of these systems. A second aim of this study was to discover potential difficulties for users of these systems and to investigate these as a preparation for the follow-up user study.

DLs are given different names by the various groups working with them. Librarians refer to DLs as “databases” and people in arts and humanities name them “electronic archives” [1]. In the UK and Western Europe, DLs are referred to as “digital surrogates” and regarded as substitutes for traditional libraries in the role of “collections of validated and structured information” [2]. One definition for DL is that: a DL is a collection of services and “information objects” that are available digitally. Information objects can be defined as anything in a digital format such as books, journal articles and sounds. DLs organize and present information objects to users and support them in dealing with these objects [14].

The above definitions all convey the same meaning which reveals that a DL is a source of information in different formats e.g. text, video or audio and that such information is stored digitally. Moreover, given the proliferation of communication technologies such as Internet, it comes as no surprise that in a modern context, DLs also represent a networked resource. In this study the definition used is that “a DL is a networked repository of digital content” [11].

Every IR¹ system such as digital libraries has an interface that consists of software and hardware which are needed for users interacting with the system. User interfaces allow people to input commands to the computer, read the computer’s output, structure information and complete certain tasks related to retrieving information. Different types of interfaces allow users to perform a multitude of tasks on a computer such as creating documents, searching Internet or sending and receiving e-mail messages. A user interface may enable a user to enter, locate, manipulate, analyze, monitor or retrieve information. Effective user interfaces are extremely important and the success of an IR system depends on the interface [3]. Some users find computer interfaces difficult to use and a user’s ability to perform tasks on a computer is directly related to the effectiveness of the computer interface. Human-computer interactions should be structured and presented to ease learning, minimize errors, and facilitate use. A poorly designed interface display may lead to user mistakes, non-use of the computer system and low user satisfaction. In general, interface design needs to answer questions about when, what, and how a user completes a task. User interface designers consider issues such as human memory, color perception and task complexity to define the display requirements for a computer interface.

Designers are aware that DL utility is measured by getting more satisfaction from users. To make DL services more helpful, designers have to learn more about users’ needs and try to fulfill them. In other words, users must be the focus of attention. Thus

in designing users interfaces, designers need to find out whether DL interfaces are designed in a user-friendly manner. Findings show that users react positively to interfaces which are pleasant and/or interesting [3]. These are basic considerations that need to be taken into account while designing and/or evaluating a user interface. They apply both to system functionality and to features of usability and user friendliness [23].

Due to end user access, research into user interfaces of IR systems has gained popularity in recent years. Since IR systems designers are always reviewing, revising and changing interfaces for better interaction, they need more attention from the viewpoint of designers, experts and users. As the interfaces change according to new findings, research on the interfaces of IR systems is a task that should be done regularly.

LITERATURE REVIEW

A comprehensive search in related databases such as LISTA² (former ISTA), LISA³, Library Literature, ACM⁴ Digital Library and Computer Source (CS) was conducted to discover if others had completed similar comparative studies. Many articles offered comparisons of different databases; a few compared different versions of the same database. However, we did not find any study regarding comparison of e-book DLs.

Quite a few of these studies provided comparisons of diverse versions of the ERIC, Medline or other databases. In a 1993 study, Bev Kennedy [12] used ERIC database to compare numerous search features offered through the end-user systems of First Search, After Dark and Knowledge Index [12]. A 1995 study by Fiscella and Proctor [7] provided a comparison of selected features of the BRS MENTOR and SPIRES/Prism interfaces of ERIC. Features compared included those related to searching, displaying, manipulating results and method of access. In a more recent study, Jatkevicius and Sebold [10] compared several free versions of ERIC with one commercial version (SilverPlatter). Kotai [13], Shonbaert [21], Notess [17], Jakobs et al. [9], Groote [8] and Schneider [20] evaluated and compared different versions of Medline database and in some cases introduced criteria for designing better user interfaces. Xie [24] compared interfaces of DIALOG Web, Lexis-Nexis Web, FirstSearch Web, Dow Jones Interactive and Ovid Web from the viewpoint of users. The qualitative and quantitative analyses of the data in her study showed users consider that both ease-of-use and user control are indispensable for effective retrieval. Vilar and Zumer [23] compared and evaluated four user interfaces of web-based e-journals (Science Direct, ProQuest Direct, EBSCO Host and Emerald). They found many similarities. However, some differences among systems were discovered and analyzed in detail. The greatest differences were found in the area of query formulation and between the interface languages and types. In a recent study, Marill, Miller and Kitendaugh [16] reviewed the challenges involved in

designing, modifying and improving MedlinePlus.

As the above literature review shows, almost all of the works cited were works done on e-journal DLs. In all databases we searched, just a few works were found regarding different aspects of e-book DLs. However, we did not find any study regarding comparison of e-book DLs.

METHODOLOGY

Research into user interfaces of IR systems usually demands specific approaches to evaluation, i.e. various ways of acquiring data which form the basis for their evaluation. This can be done through user or expert studies. However, frequently there is a combination of both. Sweeney et al. [23] define a user study as a study of one user performing at least one task in a chosen setting of an IR system. Conversely, an expert study is performed by an expert researcher using the IR system in a structured way to establish how the system's characteristics correspond to previously formed criteria. Expert studies, according to Sweeney et al. [22], are qualitative, enabling the diagnosis of errors and providing guidelines. Their advantages are that, compared to user studies, they are cheaper, quicker and easier to perform. A well qualified expert with a good knowledge of the user population can predict the usability of the software and envisage potential user errors and difficulties. Similarly, Manglano-Bosch and Hancock-Beaulieu [15] state that the expert, knowing the subject area and the user population, can foresee different aspects of system usage even before it is implemented. They recommend that expert studies should use a well-structured framework, resulting in a systematic review of all interface aspects. Expert studies are diagnostic and can foresee potential difficulties users might face while working with the system. They can also serve as the predecessor to user studies since they can be used as a platform for defining the areas which need further research.

There are some IR systems that provide access to e-books, among them, we can name Ebrary⁵, Nelibrary⁶, 24x7⁷, Gutenberg project⁸, NAP⁹, Electric library¹⁰ and others. Some of these systems such as Gutenberg project or NAP are free but most of them are commercial fee-based services. In this paper, one free and three commercial fee-based e-book IR systems were chosen. The first reason for choosing e-book used in this study was that the user interfaces of these systems should be different enough for a meaningful comparison. A second reason was that the focus of these systems is mainly providing electronic books. In addition, these are among established free and for-fee e-book IR systems [4, 6, 18, 19] and all are accessible via Internet and finally provide electronic access to the full-text of books.

The first step in this study was to determine criteria or features on which a

comparison is based. We looked at each DL in detail and developed a list of 51 features and options that were either common to all or unique to one. To make the comparison less cumbersome, we divided the features into four categories such as general information, search features, display options and unique features. Then, we created a template showing the features to be compared and went through each database again to fill out the template. The information needed to complete the template was found either within the databases themselves or on the vendors' web sites. Technical support personnel at these sites were very helpful in answering questions for which answers were not readily found either within the database or on the vendors' web sites.

Comparison tables prepared in the studies of Jatkevicius and Sebold [10], Brown [5] and Vilar & Zumer [23] were used in this study. However, as these comparison tables had mainly been prepared for e-journal databases, some criteria were omitted and some new criteria were added to meet the needs of e-book interfaces. The criteria were added by observing, comparing and interacting with these systems. Then we gave a score to each of features or options in tables, having a feature or option would take 1 and absence of it would take 0. Finally, we counted the scores to rank the selected e-book DL interfaces.

Research Questions

This study tries to answer the following questions:

1. According to proposed criteria in Tables 1-4, what features and options are available in these DLs?
2. According to proposed criteria in Tables 1-4, which of these DLs have better interface with more features and options to support a user?
3. What features and options are suitable to be in interface of a book based DL?

FINDINGS

Regarding the first question, user interface was initially investigated independently of system functions, to focus on user-friendliness features. Findings presented in Table 1 shows mainly those features where the systems differed.

Although all the systems studied mainly provide access to e-books, two of them provide access to other resources such as journals. Among these systems, Ebrary provides more diverse resources such as books, journals, magazines and maps. Netlibrary not only provides e-books and e-journals but also supplies audio books.

In general information, Gutenberg scored 6 out of 9 (Table 1); in search features scored 8 out of 17 (Table 2); in display options scored 6 out of 10 (Table 3) and in unique features scored 5 out of 15 (Table 4). Totally, Gutenberg received 25 scores out

of 51 (Table 5).

In general information, 24x7 scored 5 out of 9 (Table 1); in search features scored 9 out of 17 (Table 2); in display options scored 8 out of 10 (Table 3) and in unique features scored 4 out of 15 (Table 4). Totally 24x7 received 26 scores out of 51 (Table 5).

In general information, Netlibrary scored 7 out of 9 (Table 1); in search features scored 15 out of 17 (Table 2); in display options scored 9 out of 10 (Table 3) and in unique features scored 10 out of 15 (Table 4). Totally, Netlibrary received 41 scores out of 51 (Table 5).

In general information, Ebrary scored 7 out of 9 (Table 1); in search features 12 out of 17 (table 2); in display options 6 out of 10 (Table 3) and in unique features scored 7 out of 15 (Table 4). Totally, Ebrary received 32 scores out of 51 (Table 5).

With regard to the second research question in general information, Netlibrary and Ebrary scored 7 and were positioned at the highest rank, while 24x7 scored 5 at the lowest rank. In search features, Netlibrary scored 15 and got the highest rank, while Gutenberg with 8 scores got the lowest rank. In display options, Netlibrary scored 9 and received the highest rank. Gutenberg and Ebrary got 6 scores and gained the lowest ranks. In unique features, Netlibrary with 10 scores was positioned higher than Gutenberg (5), 24x7 (4) and Ebrary (7).

In all features and options, Netlibrary with 41 scores was the winner in this study. Table 5 and Figure 1 summarize and show the findings in this regard. As Table 5 and Figure 1 show, the followers of Netlibrary from highest to lowest were Ebrary(32), 24x7(26) and Gutenberg (25). Figure 1 summarizes the final points of the IR systems.

With regard to the third question, it should be noted that a part of this study gives some suggestions to designers of DLs interfaces. We reviewed, compared and evaluated the systems. The main features and options that are regarded as necessary have been presented in Tables 1-4. What will follow is what we have found comparing the systems and what are suitable to be presented in e-book DLs.

As interfaces are the only means that users take to interact with systems, paying attention to designing a suitable interface is important. It should be added that a good interface attracts more users and therefore can have a critical rule in the success of systems. Above tables show that some features and options of e-journal and e-book DLs are the same but some of them especially those in Table 4 are useful to e-book DLs.

General information

Along with e-books it would be better:

1. To add other resources such as e-journals, as the users may want, to search these resources at the same time.

2. To design interfaces in a way that users do not need special hardware or software to view, save and print resources. Working with the systems, we did not have any problems with Netlibrary, Gutenberg and 24x7. These systems provide html and/or PDF formats. The problem was with Ebrary. Ebrary needs specific software called Ebrary reader. In some cases, this software is not installed, so viewing and saving options are impossible.

3. If possible, the resources be available in PDF and HTML formats as these are the most used formats.

4. That users be able to order the titles they may request via the DL interface.

5. That an icon introduces the titles which have been added recently to the DL.

6. That help mechanism be presented in all parts of the DL to enable users to use the resources better.

8. That language of interface be selectable.

9. To personalize area. In this way users will be able to have favorite list and gather the titles they want for future use.

Search features

In search features it would be better that

1. Search features such as Boolean operators, field searching, phrasal searching, truncation and other limiters that were explained in Table 2 be added.

2. Along the search features, browsing features be added. Like physical libraries, users may want to see related topics. So browsing is important.

Display options

It is better that

1. Full metadata be added for each e-book. In many cases, users want to cite the resources.

2. Searched keywords be highlighted. As users may want to scan the text.

3. Sorting by relevance, time and alphabet be available.

4. Considering copyright issues, saving and printing be partially available.

5. For better usage, options such as changing the shape, color and number of items be added to interfaces, so users can customize the interface.

6. Front cover of e-books be added. Users may want to see it. In addition, users become able to move page-to-page, part-to-part and chapter to chapter inside a book.

7. Searching inside an e-book be available.

8. A reference collection be added. Users may need reference resources such as dictionaries while reading.

CONCLUSION

In findings section, we provided answers to the questions of the study but a total answer to conclude is needed. It is clear that the only free, open-access e-Book DL of this study i.e. Gutenberg scored lower than commercial e-Book DLs. Readers can see the clear differences of the interfaces of the studied DLs via five tables and one chart in the text. The highest scores go for Netlibrary (Figure 1), this e-Book DL is a part of OCLC. It seems that fine funding in different aspects for commercial e-Book DLs could be an important reason for higher score of the three commercial DLs in this study.

However, the results show that a structure can not be considered as just a desired interface structure. The list of 51 features and options of the interfaces in this study which have been scattered in five tables could be a starting point for other evaluations and comparisons as well as for designers. One way to overcome the challenge is to empower systems as well as users, that is to design an IR system to facilitate interactions between users and systems. Therefore, users and IR systems become partners. To facilitate interactions, an IR system design needs to go beyond query formulation.

Findings of this study should be useful for information scientists studying and/or working with DLs and of course for the future designers and developers of the existing e-Book DLs. By uncovering potential difficulties and disadvantages of a certain interface, we can improve its usability and user friendliness, thus contributing to increase use and better results.

This study provides a review and comparison of e-book DLs. It is our intention to use findings to prepare a user study with the goal of comparing the findings of the expert study with users' perceptions of usability and user friendliness and to discover how, if at all, they differ. These findings can help in a better understanding of the use of full-text IR systems and the characteristics of the users of these systems. At the same time, they can be used in improving of the user interface design to enable users to better and more successfully perform the tasks and procedures pertaining to information retrieval.

Table 1: General information.

	General interface features	Gutenberg	24×7	Netlibrary	Ebrary
1	Type of sources books Other sources (Journals, Audio books...)	1 1	1 0	1 1	1 1
2	Online help	0	1	1	1
3	Interface language selection	1	0	1	1
4	Personal options	0	0	1	1
5	Number of simultaneous users	1	1	0	1
6	Ease of navigation	1	1	1	1
7	Ordering new titles by users	0	1	0	0
8	Books in different languages	1	0	1	0
Points 9		6	5	7	7

Table 2: Search features.

	Features	Gutenberg	24×7	Netlibrary	Ebrary
1	Search mode options Basic Advanced Power	1 1 0	1 1 0	1 1 0	1 1 0
2	Boolean operators available	1	1	1	1
3	Proximity searching	1	0	1	1
4	Truncation	0	0	1	1
5	Wild card	0	1	1	1
6	Field Searching	1	1	1	1
7	Phrase searching	1	1	1	1
8	Limiting	1	1	1	1
9	Expanding	0	0	1	1
10	Refine searching	0	1	1	1
11	Spelling suggestion	0	0	1	0
12	Save search strategy	0	0	1	0
13	Combine previous search	0	0	0	0
14	Browsing	1	1	1	1
15	Links to similar titles	0	0	1	0
Points 17		8	9	15	12

Table 3: Display options.

	Features Database	Gutenberg	24×7	Netlibrary	Ebrary
1	Metadata	1	1	1	1
2	Highlighting keywords in retrieved items	0	0	1	1
3	Sorting	0	1	0	1
4	Marking	0	0	1	0
5	Saving	1	1	1	1
6	Printing	1	1	1	1
7	Search strategy displayed automatically	1	1	1	1
8	No need for special software to view content	1	1	1	0
9	Formats available				
	PDF	0	1	1	0
	HTML	1	1	1	0
	Points	10	6	8	9
					6

Table 4: Unique features.

	Features database	Gutenberg	24×7	Netlibrary	Ebrary
1	Viewing the items cover to cover	0	1	1	1
2	Book accessibility:				
	Page	0	0	1	1
	Section	1	1	0	0
	Chapter	1	1	0	0
3	Browsing the content of books	1	1	1	1
4	Searching the content of books	0	0	1	1
5	Using reference resources while viewing a book	0	0	1	0
6	Reference resources availability	0	0	1	0
7	Borrowing a book	0	0	1	0
8	Bookmark the retrived books in personal files	1	0	1	1
9	Bookmark pages	0	0	1	1
10	Highlighting books pages	0	0	0	0
11	Printing parts of books	1	0	1	0
12	Citing saved items in personal file	0	0	0	0
13	Note adding	0	0	0	1
	Points	15	5	4	10
					7

Table 5: Total points.

	Database	Gutenberg	24x7	Netlibrary	Ebrary
1	General information	6	5	7	7
2	Search features	8	9	15	12
3	Display options	6	8	9	6
4	Unique features	5	4	10	7
	Points	25	26	41	32

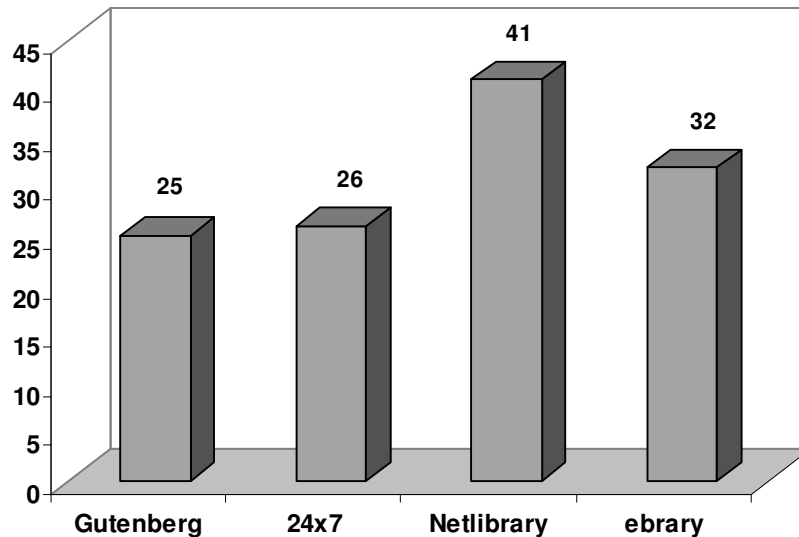


Figure 1: Total points.

ENDNOTES

1. Information Retrieval (IR)
2. Library, Information Science & Technology Abstracts (LISTA)
3. Library and Information Science Abstracts (LISA)
4. Association for Computing Machinery (ACM)
5. www.ebrary.com
6. www.netlibrary.com
7. www.24x7.com
8. www.gutenberg.org
9. www.nap.edu
10. www.elibrary.com

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