

User experience in the library: a case study

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Abstract

Purpose of this paper—To describe the need for and realization of a new kind of interface for searching and obtaining library materials, an interface designed around user needs and decoupled from, though interoperating with, current library systems.

Design/methodology/approach—The paper describes a product that was released in May 2007—the Primo[®] system from Ex Libris—as an example of a new solution for the discovery and delivery of library collections. The paper deals with the issues involved in the design of the product, the way in which the product was built to address the needs of both information seekers and libraries, and the use of usability studies to affirm the overall design and help shape fine points of the interface.

Findings—The paper demonstrates how users' expectations, which emanate from the everyday experience on the Internet, can be addressed by library software in a way that corresponds to librarians' requirements and suits and libraries' technological infrastructure.

Originality/value—Using a concrete example, this paper demonstrates how the design of a discovery and delivery interface for library materials can satisfy the expectations of users who are accustomed to services on the Web and can help libraries attract such users back to the library environment, where they can obtain credible, trustworthy scholarly content.

Introduction

This paper is the second in a series of two that together describe the need for—and realization of—a new kind of interface for searching and obtaining library materials, an interface designed around user needs and decoupled from, though interoperating with, current library systems. The first paper, “Time for a change: new approaches for a new generation of library users” (Sadeh, 2007), explores current trends in information seeking, defines and describes factors that contribute to an up-to-date, user-centric library experience, and examines the movement of vendors and libraries toward realizing such a library experience. This paper, the second and final in the series, describes a new approach to creating an environment that encourages users to explore their library collections. The approach is demonstrated through a case study based on the Primo[®] discovery and delivery system from Ex Libris, a library interface designed with this new approach in mind.

What do users expect from a library interface?

An examination of user surveys (OCLC Online Computer Center, 2005, 2006; Akselbo *et al.*, 2006; Law, 2007; Mele, 2007), new interfaces in the scholarly environment (such as Google Scholar [1] and Scirus [2]), and the success of popular Internet services (such as Google [3], Amazon.com [4], YouTube [5], Flickr [6], MySpace [7], Facebook [8], and del.icio.us [9]) suggests several patterns of user expectations and preferences.

First, users clearly prefer familiar and easy-to-learn discovery interfaces. The typical searcher relies on the Internet to find many types of content—not just scholarly information—and to accomplish many everyday tasks; hence, such users expect scholarly interfaces to provide an experience similar to the interfaces with which they are most familiar.

Indeed, more and more information services in the scholarly environment, such as Scirus [2], PubMed [10], and JSTOR [11], are now providing a query interface that is similar to that of Google: one search box, where users can enter one or more terms, on which the search engine performs a keyword search; and an advanced search interface, which is more comprehensive and allows better control over the search. Many library OPACs are now offering a similar approach—for example, the OPAC of Royal Holloway, University of London [12]; Universiteit van Amsterdam (University of Amsterdam) [13]; Technische Universität Berlin (Technical University Berlin) [14]; and University College London [15].

In addition to an intuitive interface, users expect to find results rapidly and in a way that does not require precision searching. For example, informal observation suggests that users expect the system to overcome incorrect or alternative spellings and to handle multiple forms of a word, such as the singular and plural.

Other issues that affect users' preferences are the kind of materials that a specific resource offers and the breadth and quality of the resource. People are attracted to Web search engines because these provide materials of multiple types—online books, online articles, Web sites, images, videos, conference presentations, and more—all in one place. The alternative approach, offered by many academic institutions, forces

the user to repeat the search in more than one information resource to obtain multiple types of materials. In a report prepared in February 2006 for Denmark's Electronic Research Library (DEFF), *The hybrid library: from the users' perspective*, librarians observed that "the problem with the databases is that you can't content yourself with just searching one place, like you can with Google. It is hard for the students to differentiate between the different databases" (Akselbo *et al.*, 2006).

On the other hand, many users prefer searching in the scholarly information resources, because the quality of the materials has been verified by the publisher of the materials and confirmed by the institution's selection of these resources. The initial results of a recent survey conducted at the European organization CERN regarding their users' perception of information systems related to high-energy physics show that 93% of the scientists consider the depth of the resource coverage very important, and 91% of them indicated that the quality of the content is very important (Mele, 2007). The OCLC Online Computer Library Center survey shows that college students have similar preferences (OCLC, 2006). When asked how they decide which electronic information source to use, 82% of the students marked "Provides worthwhile information" as the leading criterion, and 73% marked "Provides free information" and "Provides credible/trustworthy information." When asked to judge the trustworthiness of information, 31% of the students felt that the information that they obtain from library sources is more trustworthy than the information from search engines, and 53% consider the two sources equally as trustworthy; nevertheless, 16% of the students indicated that search engines in general provide information that is more trustworthy than that of libraries, and 6% felt that Google, specifically, provides more trustworthy information than libraries. In another survey, conducted by ProQuest and encompassing responses from 5,000

ProQuest users, the results were unequivocal: almost 80% of the respondents thought that ProQuest “has better quality and credibility of content” when compared to Google; more than 30% thought that ProQuest “has more current content”; almost 60% said that it “has more useful search results”; and about 80% preferred it “for academic research and course assignments” (Law, 2007).

Because users see the discovery process as a means to obtain the material, they value a system’s ability to electronically deliver any type of material. In the CERN survey, for example, 95% of the scientists indicated that access to full text is very important when they are selecting an information resource (Mele, 2007).

Recommendations from fellow users, provided in different ways, play a significant role in the choice of information resources and materials. According to the OCLC survey, more than 65% of the students polled reported that they learn about new information resources from a friend; 50% learn from a teacher, 36% from the library’s Web site, and 33% from a librarian (OCLC, 2006). The DEFF field study “identified three key strategies that users utilize for selecting literature: by getting recommendations from colleagues, advisors, or fellow students; by exploratory work in bibliographies and references from previously known works; and by using various net-based services (e.g., Google)” (Akselbo *et al.*, 2006). The success of Web services that are based on user collaboration (such as YouTube, del.icio.us, and flickr), community-initiated projects such as Wikipedia [16], and social community-based features added to some sites (such as the reviews available on Amazon.com) leaves no doubt that users are willing to contribute their expertise and to trust the community—people like themselves—when it comes to recommendations.

Today's users also seem to prefer services that are always available and require little effort to access. Users who are accustomed to the omnipresence of the Google toolbar and Google desktop gadgets, regardless of the Web site or application in use, have difficulty switching to the other side of the spectrum, to the interfaces of library systems and scholarly information resources. The process of scholarly discovery and delivery is not yet sufficiently integrated with other user spaces to enable users to access such services when they need them—for example, when they are working through a course management system, looking at their Web-based workspace such as their Facebook or Connotea accounts, and browsing through the collection of an Internet bookstore.

Finally, users expect an engaging and gratifying process. The various services offered on the Web provide an interaction that is user-centric, friendly, and reassuring, and users rarely encounter a situation in which no item is presented to them. Most library systems do not yet offer their users a similar experience.

Many of the changes that were introduced by Internet services in the last few years are described as adhering to the Web 2.0 concepts of building on the Internet as a platform for user collaboration and sharing. Libraries, for their part, often express the way in which Web 2.0 applies to their services as "Library 2.0": "The heart of Library 2.0 is user-centered change. It is a model for library service that encourages constant and purposeful change, inviting user participation in the creation of both the physical and the virtual services they want, supported by consistently evaluating services. It also attempts to reach new users and better serve current ones through improved customer-driven offerings. Each component by itself is a step toward better serving our users; however, it is through the combined implementation of all

of these that we can reach Library 2.0" (Casey and Savastinuk, 2006). Meanwhile, however, Library 2.0 remains just a goal for libraries to strive toward.

Decoupled architecture

Current systems in libraries fall short when the user experience that they provide is compared with that of popular services on the Web. However, libraries are better equipped to satisfy user needs when it comes to other criteria, such as the quality and relevance of their collections, the rich metadata they offer for accurate searching, the services they can tailor for their users, and the control over the overall workflow, terminology, and look and feel of their application. By leveraging their unique qualities and providing a better user experience, libraries are likely to offer discovery and delivery services that will best suit the users' expectations and needs (see Sadeh, 2007).

Implementing new end-user interfaces for systems in the library is not a simple task and cannot be successfully achieved by only making improvements to current interfaces. The first problem is that today's library systems are inherently librarian-centric; their design in terms of data structures and workflows is focused on library administration and hence severely limits the possibilities for the end-user interface. Second, existing library collections are fragmented, offered by multiple library systems, each of which focuses on specific types of materials—physical items, locally digitized materials, remote e-journal collections, or others. Hence, libraries cannot present a unified entry point to their many types of offerings, unless an interface that overarches the multiple library collections is implemented.

Several stakeholders—libraries and vendors—have embarked on a path toward creating a better user experience (see Sadeh, 2007). The library solutions deriving from this new path are based on “decoupled” architectures: whereas existing systems in the library, such as the integrated library system and digital asset management system, will continue to serve librarians as management tools, the user-experience layer is developed as a separate platform. In a recent posting on his blog, Lorcan Dempsey explains that “the discovery experience does not have to be tied to the inventory management system... Discovery of the catalogued collection will be increasingly disembedded, or lifted out, from the ILS system, and re-embedded in a variety of other contexts” [17].

This decoupling not only provides the capability to create a better user experience for a given collection but also unifies the discovery processes across heterogeneous collections. The new solutions can harvest data from multiple repositories and create a single index. As Dempsey puts it, “...there will be a growing desire to hide boundaries between databases (A&I, catalog, repositories, etc) in some cases—especially where those boundaries are seen more to reflect the historical contingencies of library organization or the business decisions of suppliers than the actual discovery needs of users” [17]. However, although these new solutions can harvest and preprocess some of the collections, thus optimizing the search in such collections, libraries will still need to provide seamless access, through remote searching, to resources that are not necessarily harvestable—either because of licensing restrictions or because of the library’s policies or technological capabilities. Dempsey indeed envisions that “we will see greater integration of the catalog with these other resources, whether this happens at the applications level (where the catalog sits behind the resolver, or is a metasearch target), or at the data level

(where catalog data, article level data, repository data, and so on, are consolidated in merged resources).”

The North Carolina State University (NCSU) Endeca-based catalog was the first system to go live with what the NCSU library refers to as a new catalog built on decoupled architecture [18]. Other solutions, such as the Primo system from Ex Libris and AquaBrowser® Library from Medialab Solutions [19] (recently acquired by Bowker [20]), adhere to the same kind of architecture. The rest of this paper describes Primo in more detail as an example of a solution based on a decoupled architecture.

The main components of the user experience

When describing the new-generation end-user interface, vendors and librarians use expressions that vary from “visual faceted search that connects to any number of data sources” (AquaBrowser, from Medialab Solutions) [19] to “a new product...that brings together content, community, and discovery in a single search” [Encore, from Innovative Interfaces) [21]; a “new online catalog...[that] provides the speed and flexibility of popular online search engines while capitalizing on existing catalog records” (NCSU Endeca-based catalog) [22]; and “one-stop solution for the discovery and delivery of local and remote resources” (Primo, from Ex Libris) [23]. Although these products differ in many aspects, the basic functionality that they offer to users is similar.

The process of searching for and locating scholarly materials is the pivot around which the user experience is built. This discovery process is accompanied by a

delivery mechanism to complete the user's quest for information. In addition, the system provides related services to enable users to save queries, set alerts, store records in various formats in the system or elsewhere, set their preferences, and perform other such tasks that facilitate their research.

Besides the straightforward discovery process that is described later, Primo—like similar products—includes new features to help users find materials and label the materials in a way that the users deem logical. Such features include search suggestions at various points: “Did you mean” alternatives related to the query, links from a given result to other, relevant results, search suggestions derived from the system's analysis of the search results, and features that are based on contributions from the community. Unlike traditional systems in a library, where the stream of information has usually been unidirectional, Primo and similar products are interactive; users can add information for their own benefit—for example, by tagging records to make them easily accessible at a later time—or for the benefit of the community, by reviewing and tagging materials to enhance the searching experience for other users. Once tags are available in the system, they can help users search the library collection according to the popularity or timeliness of specific topics.

Aiming for a successful search process

The main challenge in designing an effective search process is to create an interface that is as familiar and intuitive as the ones employed by Web search engines and other Internet tools but that serves the user better. Such an interface would yield results that are more appropriate to the user's needs and would offer immediate gratification by making items readily available in a variety of ways; these could include, for example, providing links to electronic materials, showing the locations

where the user can pick up physical items, and enabling the user to submit requests related to items of interest.

The success of a search process depends on several factors: the research data available to the user, the search engine, the search interface, the user who initiates the process, and the order in which the results are returned. This section discusses these factors and, using the Ex Libris Primo discovery and delivery solution, illustrates ways of addressing them.

The research data

Clearly, the research data available to the user needs to be as complete and relevant as possible. The Primo system addresses this requirement according to the library's specifications, by harvesting data from multiple resources regardless of the type of resource, its cataloging format, or its location (figure 1). Furthermore, although data elements may originate from heterogeneous repositories, the Primo system normalizes the harvested data (makes the data conform to one set of rules) and converts it into a unified format that is designed to fully support the task at hand—a quick, efficient, and friendly search process. Putting such an infrastructure into place is technologically possible today, and the Primo system follows others, such as Google, that have led the way.











5	 Book	<p>Wallops Station and the creation of an American space program (View details)</p> <p>Harold D. Wallace 1960- United States. National Aeronautics and Space Administration. Office of Policy and Plans. Washington, D.C. : National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans 1997.</p>	
		<input type="checkbox"/> Add to e-Shelf _____ Checked out (Get it)	
6	 Book	<p>Shared voyage : learning and unlearning from remarkable projects (View details)</p> <p>Alexander Laufer Todd Post 1961-; Edward J Hoffman (Edward Jay), 1959- Washington, D.C. : National Aeronautics and Space Administration, NASA History Div., Office of External Relations 2005</p>	
		<input type="checkbox"/> Add to e-Shelf _____ Available in ENSW Libraries (Get it)	
7	 Book	<p>Failure is not an option : mission control from Mercury to Apollo 13 and beyond (View details)</p> <p>Gene Krantz New York : Simon and Schuster 2000</p>	
		<input type="checkbox"/> Add to e-Shelf _____ Available in ENSW Libraries (Get it)	
8	 Video	<p>Space Station History (View details)</p>	
		<input type="checkbox"/> Add to e-Shelf _____ Online access (Get it)	
9	 Image	<p>Globe east. (View details)</p>	
		<input type="checkbox"/> Add to e-Shelf _____ Online access (Get it)	

Figure 1. Results originating from multiple collections—two library catalogs and a digital repository

The research data includes metadata and, when relevant, core information, such as the full text of an article. In addition, to support a more complete user experience, the Primo software enriches the basic information with data retrieved from other sources, such as tables of contents and textual translations of numerical codes (for example, Library of Congress classification numbers [LCCN]), all indexed and available for users. Along with the core bibliographic data, Primo can also maintain information such as the number of times that a book has been borrowed or an article has been downloaded; although this information is independent of queries, it can

help the search engine place the items that are most likely to meet the user's needs at the top of the result list.

When processing the normalized data, the system—designed from the end user's point of view—groups together items that are similar, such as multiple editions or multiple translations of a book. Such preprocessing of the metadata enables the system to later provide a concise result list that offers users a choice between a grouped display and an itemized display of all the similar items. As of mid-2007, most library systems' OPACs offered only an itemized display of similar items, frustrating those users who wanted to see all the different items relevant to their topic. For example, a user who is looking for Shakespeare's tragedies expects to see *Hamlet* as one item on the result list. The Primo groupings are based on the IFLA Functional Requirements for Bibliographic Records report (IFLA Study Group on the Functional Requirements for Bibliographic Records, 1998), with enhancements resulting from librarians' feedback and input from development partners. According to Barbara Tillett (2004), "FRBR [Functional Requirements for Bibliographic Records] offers us a fresh perspective on the structure and relationships of bibliographic and authority records, and also a more precise vocabulary to help future cataloging rule makers and system designers in meeting user needs." Although most information resources do not support "FRBRized" groupings as part of the bibliographic information, the Primo system can build groups while constructing its indexes and, without requiring any modification of the original resources, provide the functionality that users expect (figure 2).

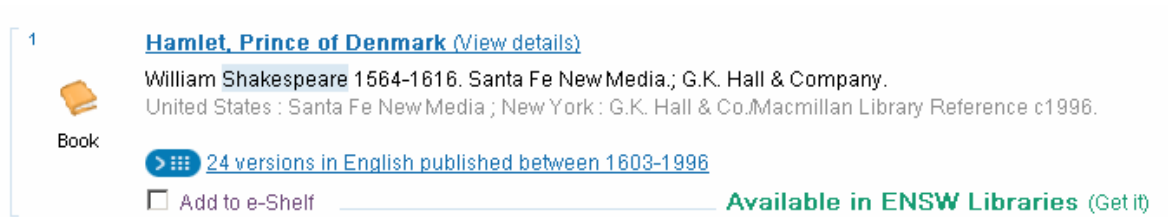


Figure 2. "FRBRized" display, which can be expanded to show all 24 versions

Another challenge in designing a search process is to address the gap between the technological capabilities available for handling controlled, harvestable collections and those available for providing just-in-time access to remote resources through a metasearch (Sadeh, 2006). The Primo system includes metasearching as an integral part of the user experience, sending the user's query to remote resources through a metasearch engine and integrating the results returned from these resources with the results obtained through a search of the local Primo indexes. Primo deploys the Ex Libris MetaLib[®] metasearch system, using that system's application programming interface to provide seamless integration.

The search engine

The requirements for a search engine include a well-built infrastructure that will enable it to operate efficiently and rapidly. Addressing user expectations means not only that the system provides results instantaneously but also that these results are accurate. Furthermore, a search engine needs to support queries of various types and to allow users to employ the search interface as a query authoring tool for defining their needs as precisely as possible.

The search interface

The search process starts with the query interface, which enables users to express their search requirements and obtain and process the search results. The simpler the query interface, the more sophisticated the system needs to be, for it must enrich the query with additional information. For example, the Google search engine does not force the user to select Boolean operators when entering a multiword query, because the user is most likely seeking information that relates to all of the words, not to the query terms as one phrase. Similarly, Primo adds an implicit Boolean AND between the query words before performing the search. The search interface also displays the results along with various options that help the user process the results. For a detailed discussion of the query and result-list interface, see the section “The Design of the search interface.”

The researcher

Regardless of the complexity of the interface, the success of the search depends on the way in which researchers use the search interface to articulate their research needs. An interface needs to accommodate all users, no matter how they differ in their research needs, their expectations, and their search expertise. Furthermore, users tend to apply the searching methods with which they are already familiar and are not likely to invest time in mastering a new kind of search behavior.

The order of the results

The success of a search is measured not only by the documents that the search engine locates but also by the order in which it presents them. Because of the large

amount of data available in almost any field of research, an exploratory search for information about a topic is likely to yield a large number of results, which users will probably find difficult to manage. Relevance ranking of the result set can be crucial in such cases, because it helps users focus on those results that are likely to be the most valuable for their research.

Web search engines and some recently developed search engines in the scholarly environment, such as Scirus [2] and Scopus® [24], both from Elsevier, rank the results by relevance. Accustomed to the default sorting of results by relevance and expecting all resources to provide the same sorting order, users typically look only at the first few results in the list.

However, a system's relevance ranking may not always be adequate; determining whether certain materials are more relevant than others is a complex issue, and the developers of relevance-ranking algorithms must make some assumptions about the context of the search, such as who the user is and what the user's goals and areas of interest are. Because the default sorting of results by relevance is not helpful in every context, an option to re-sort the results by other criteria, particularly by date, is provided—in some research areas, the most recently published materials are often of greatest interest.

Another issue is whether the display of a linear list of results is satisfactory. As Wang and Zhai explain, "The utility of a search engine is affected by multiple factors. While the primary factor is the soundness of the underlying retrieval model and ranking function, how to organize and present search results is also a very important factor that can affect the utility of a search engine significantly" (Wang and Zhai, 2007). A

search interface can present results in such a way that will help users understand the content of the result list and focus on the aspects that are relevant.

The design of the search interface

In a typical search process, users go through the following stages:

1. Defining and submitting a query
2. Examining the result list, which includes a brief description of each result
3. Refining the query, if necessary. In some cases, the user refines the query by adding search terms or by selecting an option from a set of refinements offered by the system.
4. Identifying the relevant materials by either skimming the result list or examining the results in greater detail
5. Obtaining the material if it's available physically or electronically, or obtaining other services that are relevant to the specific material, such as the option to save the bibliographic record as a reference

To address the needs and expectations of today's users, the design of the Primo interface adheres to the following principles:

- The information displayed on the screen is minimal, with the goal of satisfying a user's needs in the specific context.
- The default workflow and search options are appropriate for most of the users most of the time.
- Queries can be as simple or as complex as needed; complex options do not clutter the simplicity of the interface, and complexity is achieved in stages.

- The system offers post-search tools that help users focus on relevant items within the result list.
- The system suggests alternative routes for finding relevant information.
- No training is needed for searchers.

Defining a query

The Primo query interface is designed to offer three levels of complexity: for most users, most of the time, the query interface looks very simple; the users might notice a slight increase in complexity when they want to make a more specific query; and the query interface becomes more complex for those who want all search options to be available.

The design uses two forms—one for simple searches, featuring a text box similar to the one offered by Google (figure 3), and the other, for advanced searches. Included in the simple search form are several options that enable less experienced users to frame their query more accurately without being intimidated by an advanced search form. These options allow the researcher to direct the search to specific metadata fields, specific types of material, and data that users have added to the information originating from the library, such as tags. Researchers can also choose to limit their search to a specific domain, such as a library collection or a group of databases.

The screenshot shows a search interface with a light blue background. At the top left, the word "Search" is written in a bold, purple font. Below it is a white search input box. To the right of the input box is a blue button with the word "GO" in white and a white right-pointing arrow. Below the input box, there are three dropdown menus. The first is labeled "Look for" and has "all items" selected. The second is labeled "that contain my query words" and has "that contain my query words" selected. The third is labeled "anywhere in the record" and has "anywhere in the record" selected. Below these dropdowns is another dropdown menu labeled "In" with "Needle Library: Books and more" selected. At the bottom left, there is a blue link labeled "My preferences". At the bottom right, there is a blue link labeled "Advanced Search".

Figure 3. Simple search box in Primo

Because most of today's users are accustomed to the query syntax of Web search engines, the Primo search syntax was designed to resemble that of the Web engines: the user can type one or more words, and the system interprets them as having an implicit AND between them. However, the user can employ Boolean operators and certain punctuation marks, such as quotation marks and parentheses, to create a complex query. Hence, the user's expertise, rather than the search interface, determines the complexity of the query.













Working with the result list

A user can search for "known" items, that is, specific items that the user has in mind and can identify when they are displayed, or "unknown" items, any items that satisfy the user's research needs. When a user searches for a known item—for example, a book recommended by an instructor—the first page of results is likely to display the item. In most cases, the result list is short, because the user has probably entered enough information for the system to identify the results accurately. However, a result list yielded by a search for unknown items might be very long, because users of scholarly information are not necessarily experienced searchers and might enter broad terms. Relevance ranking provides only a partial solution, because the relevance of items is not always well defined, and many of the results are likely to be equally as relevant to a broad query term. For example, a search for *Renaissance art* in a large library collection will probably bring up hundreds of results that have the same degree of relevance to the query.

Long result lists are not the only challenge that users face; sometimes their queries are ambiguous, so the result list may contain items that are very different from each other. For example, a user who types “mercury” as the search term has a certain context in mind, but the result list displays items from many areas, including astronomy, chemistry, mythology, the environment, and the seafood industry.

To address both the search for a known item and the search for unknown items, the Primo system presents the list of results, sorted by relevance, as the focal point of the screen and also provides the user with tools to refine the query (figure 4). The purpose of the information presented at this stage is to allow users to scan down the list quickly and identify items of initial interest. Because the user’s goal is to obtain the actual material, the system displays the information that is most likely to answer this need, in the form of a “Get it” link. For example, the system can indicate that a physical item is in the library and thus offer a link to the detailed holdings page; if the item is out on loan, the system can offer a link to a reserve form. On the same screen, the user can easily modify the query, drill down to subsets of the result list, re-sort the results, and launch a new search based on the system’s suggestions. The query remains at the top of the page, serving as a title for the result list, and the user can add search terms or modify the query in some other way.

Show only: [Online items \(335\)](#) [Items currently in library \(24110\)](#)

1	 President John F. Kennedy's Moon Speech (View details)	<input type="checkbox"/> Add to e-Shelf	Online access (Get it)	
2	 The History of the International Space Station (View details)	<input type="checkbox"/> Add to e-Shelf	Online access (Get it)	
3	 NASA STI Program Coordinating Council Twelfth Meeting April 13, 1994 : standards. (View details) NASA STI Program Coordinating Council. Meeting 1994 : Crystal City, Arlington, Va.) United States. National Aeronautics and Space Administration. Scientific and Technical Information Program Washington, DC : National Aeronautics and Space Administration, Scientific and Technical Information Program ; Linthicum Heights, MD : NASA Center for AeroSpace Information distributor ; Springfield, Va. : National Technical Information Service, distributor 1994.	<input type="checkbox"/> Add to e-Shelf	Available in ENSW Libraries (Get it)	
4	 Exploring the unknown : selected documents in the history of the U.S. civil space program (View details) John M Logsdon 1937-; Linda J Lear 1940-; United States. National Aeronautics and Space Administration. History Office. Washington, D.C. : National Aeronautics and Space Administration, NASA History Office : For sale by the Supt. of Docs., U.S. G.P.O. 1995-<2004>	<input type="checkbox"/> Add to e-Shelf	Online access (Get it)	
5	 Report of the Task Force on Issues of a Mixed Fleet (View details) NASA Advisory Council. Task Force on Issues of a Mixed Fleet Washington, D.C. : National Aeronautics and Space Administration ; Springfield, Va. : National Technical Information Service, distributor 1987	<input type="checkbox"/> Add to e-Shelf	Available in ENSW Libraries (Get it)	
6	 Science information systems newsletter (View details) United States. National Aeronautics and Space Administration. Pasadena, CA : NASA 1993-	<input type="checkbox"/> Add to e-Shelf	Online access (Get it)	

Refine My Results

Narrow my results by limiting the search to:

Topic:

- > [Forums \(Discussion and debate\) \(222\)](#)
- > [Astronautics \(197\)](#)
- > [Wind tunnel tests \(196\)](#)
- > [United States. National Aeronautics and Space Administration \(173\)](#)
- > [Space sciences \(142\)](#)

[Show 15 more](#)

Author/Creator:

- > [United States. National Aeronautics and Space Administration \(14,140\)](#)
- > [Langley Research Center. \(2,962\)](#)
- > [Ames Research Center. \(1,115\)](#)
- > [Lewis Research Center. \(795\)](#)
- > [United States. National Aeronautics and Space Administration. Scientific and Technical Information Program \(707\)](#)

[Show 15 more](#)

Collection:

- > [North Campus Eng Library \(23,807\)](#)
- > [Lake Campus Library \(1,221\)](#)
- > [North Campus Main Library \(327\)](#)
- > [West Campus Government Documents \(86\)](#)
- > [West Campus Stacks_floors 2-4 \(66\)](#)

[Show 5 more](#)

Creation Date:

- > [After 1992 \(10,949\)](#)
- > [1983 to 1992 \(15,214\)](#)
- > [1974 to 1983 \(662\)](#)
- > [1965 to 1974 \(78\)](#)
- > [Before 1965 \(41\)](#)

Item Type:

- > [Books \(24,015\)](#)
- > [Journals \(189\)](#)
- > [Images \(33\)](#)
- > [Other \(19\)](#)
- > [Audio Visual \(11\)](#)

[Show 1 more](#)

Language:

- > [English \(24,248\)](#)
- > [Portuguese \(19\)](#)
- > [Russian \(9\)](#)

Figure 4. Part of the result list page, including the results and the facets

Like services such as the OCLC WorldCat® global library catalog and Amazon.com, the Primo system provides a “faceted” browsing feature: the system analyzes the search results and groups them according to predefined categories, called facets, such as topic, author, type of material, language, and date. For each facet, the system lists the most frequently occurring data (see figure 4, under “Refine My Results”). The user can narrow down the result list by clicking these refining options. To categorize the results into their respective facets, the system uses two kinds of information that it obtains from each record in the result list: metadata that the result records share, such as topic or author; and administrative information, such as

whether the items are new, available online, or currently on the shelf. Although users may not be able to articulate their initial queries in a precise manner, once they are presented with a list of available options—for instance, a list of topics—they can readily identify relevant elements. For example, users whose search query was *civil war* can easily home in on the American civil war, as opposed to another civil war, by selecting the relevant option in the Topic facet. Because the facets are recalculated with every such selection, the users can continue narrowing down the list, choosing the facet type and option that is relevant each time, until they consider the list manageable yet still comprehensive.

When scanning the initial result list, a user who realizes that the query was not effective enough might not know how to phrase it better. The interface can help by offering suggestions for further searching (figure 5). These suggestions might be of a general nature, such as directing the user to tools already present on the screen or offering other resources and services. Alternatively, the suggestions might relate to the specific query and result list. For example, the system can offer new searches based on synonyms or on subjects characterizing the results.

Haven't Found What You're Looking For?

May we suggest:

- Use the [Refine My results](#) box to limit the search and narrow my results.
- Change my query words or your selections in the Look for boxes (in the [Search](#) area at the top of the page).
- Try one of our [suggested new searches](#).
- Select [an item above](#), and explore its details to expand or narrow your search (to see the details, click the item's title).
- Search for "brain mind" at [affiliated off-campus libraries](#).
- Search for [articles](#) on "brain mind".
- Use Google™ to search for "[brain mind](#)" on the web.
- Search for "[brain mind](#)" in WorldCat®

Suggested New Searches

Ignore my query and look for everything on the **subject**:

- > [Cognitive neuroscience](#)
- > [Brain -- Evolution](#)
- > [Evolutionary psychology](#)
- > [Child psychology](#)
- > [Infant psychology](#)

Ignore my query and look for everything by the **author**:

- > [Sargant W](#)
- > [Bergson H](#)
- > [Calderwood H](#)
- > [Gardner H](#)
- > [Bastian H](#)

Figure 5. Suggestions for further searching

In many cases, the details given about an item, along with a statement of the item's availability, are sufficient for the user to decide whether the item is of interest or not. If these minimal details are not sufficient, the user can navigate to a full-record display, which contains additional bibliographic information; various forms of community input, such as tags, ratings, and reviews; and information from resources outside the library that the library has decided to add to the bibliographic record, such as a table of contents or an abstract (figure 6). Furthermore, the user can start a new search for related items based on some of the information displayed, such as the subject.

Details Back to result list

Failure is not an option : mission control from Mercury to Apollo 13 and beyond

Author: [Gene Kranz](#) ;
Subjects: [Kranz, Gene – Career in aerospace engineering](#) ; [United States National Aeronautics and Space Administration](#) ; [Manned space flight – Systems engineering – United States – History](#) ; [Ground support systems \(Astronautics\) – History](#) ;
Related Titles: Series: [New series in NASA history](#)
Publisher: New York : Simon and Schuster
Creation Date: 2000
Format: 415 p. : ill. ; 25 cm.
Language: English

[→ This item in ALEPH](#)
[→ Table of Contents](#)
[→ Abstract](#)
[→ This item in Amazon.com](#)
[→ This item in WorldCat®](#)

Add to e-Shelf Available in ENSW Libraries (Get it)

Availability and location:
Available: • [North Campus Main Library](#) East Asian (ON ORDER)

Reviews:

- **Edward Lawson** rated this item **9/10** (06/21/07): "This book illustrates the important roll mission control staff at NASA take in the space program. The stories of the scientists, usually behind the seen, of space exploration. Highly recommended to a" [More](#)
- **Neil Armstrong** rated this item **8/10** (06/21/07): "This book truly captures the great roll the good man and woman at mission control fill in the space exploration program."
- [Write a review](#)

Keeping this item

[E-mail](#)
[Print](#)
 [Go](#)

Tagging What is tagging ?

Ignore my query and look for everything tagged:

My tags for this item:
[Mercury \(1\)](#)
 [Assign/remove tags](#)

Everybody's tags for this item:
[tech_and_society \(7\)](#)
[Lawson78367 \(4\)](#)
[Apollo_13 \(2\)](#)
[NASA \(2\)](#)
[Space \(1\)](#)
[Mercury \(1\)](#)
 [Tags page](#)

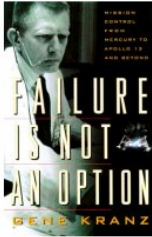


Figure 6. Full-record display in Primo. Note the reviews, including ratings, and the tags.

The search process typically ends when the user has identified the items of interest and clicks the “Get it” link to obtain the actual material if it is available online, view information about the location of a physical item, or place a request for the item. Other options enable the user to save results in various formats, send them by e-mail, push them to other user spaces such as the researcher’s Connotea or del.icio.us account, or invoke related services that the library has selected and configured.

Evaluations of the user experience

The University of Minnesota (U of M), a Primo development partner, conducted two usability studies “to examine the usability of the PRIMO tool and to identify potential

usability issues for its varied users" (Rosen, 2006). The usability studies took place at the Usability Services lab on the U of M Twin Cities campus in August 2006 and January 2007. A cross-functional evaluation team consisting of personnel from the Usability Services lab and the U of M libraries set the goals for the studies, recruited the participants, defined the tasks, and conducted the studies. Ex Libris staff members, including a user experience consultant, joined the process and observed the tests.

Goals

The usability studies attempted to answer the following questions:

- Are the users able to easily find a variety of library materials about a given topic?
- Are the users aware of the tools that the system provides for narrowing down or broadening a search and able to use them properly?
- At the end of the search, do the users feel confident that they have found the materials they need?
- Do the users apply the knowledge that they might have gained from using Amazon.com?
- How do the users rate the Primo system in comparison with the University of Minnesota catalog?

Participant sample

Eight users from various disciplines participated in each of the two studies. The participants in the first study consisted of one faculty member, five graduate students, and two undergraduate students. The second study's participants consisted of two faculty members, four graduate students, and two undergraduate students.

Tasks

The participants were presented with seven scenarios in the first study and nine scenarios in the second. The testing was conducted with the version of the Primo system that was available at the time. In the first study, the participants used a prototype of the system for some scenarios and an alpha version, which did not yet provide the full functionality, for others; in the second study, the participants used the beta version of the system. The following excerpts from the work sheets given to the participants portray a few of the scenarios with the steps that the participants were asked to perform:

Scenario #1: You want to borrow Shakespeare's play, *The Tempest*, from the library.

Tasks:

1. Find *The Tempest*.
2. Find multiple editions of this item.
3. Find a recent version.
4. See if at least one of the editions is available in the library.
What is the call number of the book?
5. You'd like to print the details of this edition of the book, so you can refer to it later.

Scenario #2: You're writing a paper for a class on leadership and need to find some information on the topic.

Tasks:

1. Find some items on this topic.
2. You want to see leadership in the past. Request to see only items which were published before 1980.
3. From those, request to see only books.
4. Ask to see only the ones which were written by Bender.
5. You have received too few items--don't limit your search to Bender's books.

Scenario #5: You're a medical student who needs to find the medical journal *EMBO Journal*.

Tasks:

1. Search for *EMBO Journal*.
2. Can you get this journal online (in full-text)?
3. Let's say you needed to get a copy of a 1995 article in the journal. Is this possible?
4. Is there a print copy in the library of a 1995 article that you could read?

Scenario #6: You're in an art class and want to see the painting by Picasso called "Dove with Flowers" in order to replicate it. You've heard that the painting is not located on the North Campus.

Tasks:

1. Find the painting "Dove with Flowers."
2. Enlarge the image to near screen-size.
3. Assign your own keyword to the "Dove with Flowers" image so you can easily find it later.
4. Describe how you could find items by Picasso without typing in a new search.

Methodology

At the beginning of the session, the evaluation team gave the participant a brief explanation of the procedure and requested that the participant "think aloud" while performing the tasks; this verbalization of the participant's thought processes would help the team understand the participant's actions.

The participant performed the tasks in one room while, in another room, the evaluation team observed the session through a one-way mirror. The evaluation room was equipped with cameras and microphones that enabled the team to see the participant's facial expressions and to hear what the person was saying. The team also had computer monitors that displayed the participant's computer screen and mouse and keyboard movements. In the second study, the addition of eye-tracking

equipment, which was calibrated before each session, permitted the team to observe what the participant was focusing on. [25]

When the participant finished the computer tasks, the usability consultant conducted an interview to obtain feedback on the user experience and to find out what features the participant liked about the system. Next, the participant reviewed a desirability matrix that contained 44 adjectives, about 60% of which were negative and 40% positive. From the matrix, the participant selected five adjectives that best expressed his or her view of the system, and gave the rationale for the choices.

Each session lasted up to 90 minutes.

Results and Conclusions

The participants reported that they found the interface friendly, easy to use, and easy to learn; in less than an hour, all the participants managed to complete the assigned tasks with minimal help and without any prior knowledge of the system.

Figure 7 shows a portion of the eye-tracking data for one of the participants, data that can help the interface designers understand what aspects of the screen design might need improvement. The participant in this example started scanning the page at the top. After looking at the query, the participant looked at the specific item displayed on the screen—the painting *Dove with Flowers* by Picasso—and spent a considerable amount of time examining the thumbnail. The participant's eyes then moved through most of the item's metadata (middle left) and briefly scanned most

of the links and buttons surrounding the item, presumably to figure out the next action for achieving the research goal.

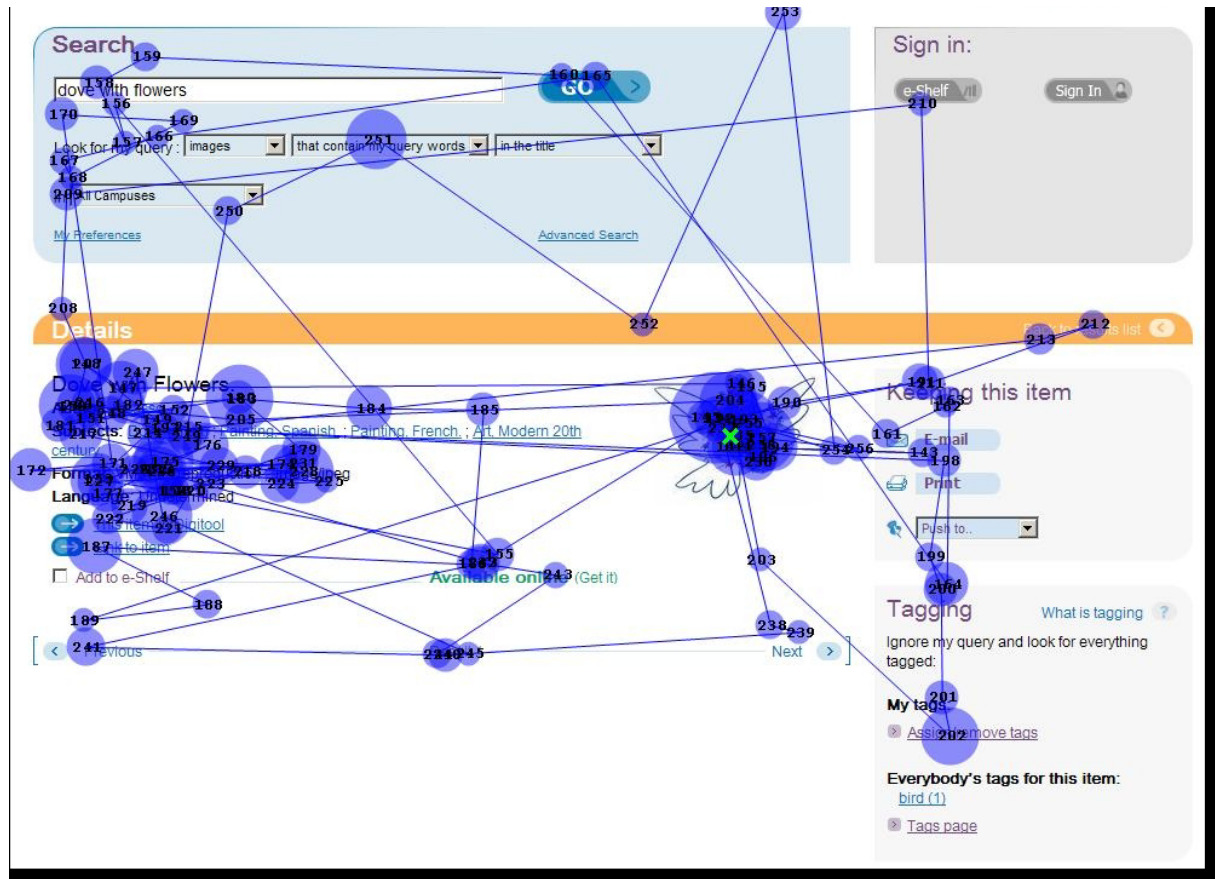


Figure 7. Eye movements of a participant scanning a Primo screen (Arth, 2007)

Keeping in mind the controversy surrounding the use of eye tracking in usability studies, we can cautiously infer from the scan pattern that the screen has no design problems; the amount of attention that the participant paid to each element of the screen was appropriate to the function of that screen element and suggests that the location of the elements on the screen reflects their relative importance.

All the participants reported that faceted browsing is useful as a means of narrowing down the result lists and considered this tool one of the differentiating features

between Primo and their library OPAC or other interfaces. Participants were also positive about the “Get it” service, the tagging capabilities, and the option to view only items that are available online or only items that are currently in the library (see the top left of figure 4). When asked to describe the Primo system, the participants selected terms such as “clear,” “no distractions,” “straightforward,” “informative,” and “efficient.” Most participants said that Primo seemed easier to use than other systems with which they are acquainted (Rosen 2006, Rosen 2007).

During the sessions, the usability team and the Ex Libris observers identified a few minor usability issues, related mainly to terminology, icon design, the need for additional links and system feedback, and the manner in which the services were displayed. Because the studies were conducted early enough in the development process, the problems were rectified in the version that was released for general use in May 2007.

Conclusions

Until recently, the changes in the search experience on the Web were not reflected in library interfaces. While Internet services were providing users with friendly interfaces and a rapid response time, were being integrated with user spaces, and were enabling users to interact with each other, describe information as desired, and participate in creating information, libraries were still focusing on developing and maintaining content.

To catch up with user expectations and regain their clientele, libraries are starting to adopt new interfaces that bring together library collections and methodologies, on

the one hand, and contemporary user experience elements, on the other. These new solutions are based on a decoupled architecture, drawing the line between the creation and maintenance of the data and the provision of that data to end users.

Several solutions are now available to bridge the gap between libraries and their users. Designed around the user's needs, such systems can serve as a feasible, robust model for the new approach.

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[25] Eye-tracking equipment follows the gaze of a usability study participant while he or she is carrying out tasks; the data indicate which parts of the screen the participant looked at, for how long, and in which order. Eye tracking is a controversial method in usability studies (Schnipke and Todd, 2000) because it is technologically complex and cannot be used with all usability-study participants (such as those who wear glasses); furthermore, the interpretation of eye-tracking results is not always straightforward. For instance, a participant's prolonged gaze at one area of the screen can suggest that the area is appealing—or confusing. However, eye tracking can help point out specific elements of the design that the participants do not notice (Schiessl et al., 2003).