Lessons Learned: Usability Testing a Federated Search Product

Carole A. George, Carnegie Mellon University
Abstract

Purpose. Usability testing using think aloud protocols was conducted on the MetaLib interface, a new federated search product soon to be offered by the university libraries. The object of the testing was to find problems users might experience with the MetaLib interface in order to improve site usability.

Methodology/Approach. Based on responses to a demographic questionnaire, we selected a representative sample of eight volunteers, diverse with respect to affiliation, discipline, gender, language, and computer expertise. Using the MetaLib interface and guided by a moderator, participants completed real-world tasks while verbalizing their thoughts. Participants also completed a questionnaire and answered three open-ended items. Transcripts provided the data for the study which were used to determine problems and difficulties with the interface.

Findings. The usability testing revealed one critical issue, that is, problems with the login. Other issues included problems with primary and secondary navigation, confusing terminology, and inconsistency with the site design and user expectations.

Research limitations. This was a qualitative study and results should not be used to generalize to a larger population, but rather to identify issues with usability.

Implications. The issues identified will provide feedback that will be used to address the usability of the software and the design of training, tutorials, and quick guides.

Value. Results of this study will add to the body of information about the usability of a federated search product and can help others to select and/or design a usable product. This study can also be used for the future improvement of the MetaLib product.

Keywords. Usability testing, federated search, multi-resource

Category. Case study


The current issue and full text archives of this journal is available at www/emeraldinsight.com/0264-0473.htm
Introduction

University libraries are increasingly adding to the number of scholarly information resources, and many of the found sources are available online as a full-text document. Unlike information available over the Internet, the university library offers valued scholarly resources from licensed databases. Why then do so many users choose the Internet as a start to their information search? One reason is that many popular Internet search engines such as Google, have an easy one-step query box, while library resources require separate queries for each of the databases, catalogs, indexes, and other information sources.

To address this problem, recently introduced federated search products enable users to access the universities’ multiple information resources or databases by completing one search query. The user enters a search query using the product’s query box, and the query is sent out to the individual databases and information resources that are provided by the university library thus simplifying the process and decreasing the need for individual searches of information resources. Recently the Carnegie Mellon University Libraries has acquired such a product, MetaLib® from Ex Libris™. This study describes the process of usability testing of MetaLib to determine the usability of the interface for the purpose of designing a more usable product.

Usability testing using think aloud protocols was conducted on a new federated search product, MetaLib. This product provides the functionality for users to create one query that will simultaneously search heterogeneous resources, for example licensed databases, catalogs, and indexes, that are offered by the institution. For example, users can enter keywords and search library catalogs, licensed databases, indexes, and other resources. The product provides functionality for the institution or the user to create sets of resources specific to a subject area and then search these sets. Each user has their own account where they can personalize their searching, for example, they can save citations for found journal articles, books, or other references and resources and retrieve them during a future visit.

Though the functionality provides a method of simplifying search procedures, the interface, the screen display that enables the user to design a search, find results, and use advanced options, can be difficult to understand thus establishing barriers to successfully using the product. Usability testing is designed to find these barriers or problems.

The object of the testing was to find problems users might experience with the MetaLib interface in order to improve site usability. By studying the behaviour of participants as they use the interface and complete real-world tasks, we can increase the usability of the interface thus improving users’ ability to locate and use scholarly resources. The objectives of the testing were to:

- Assess the overall navigability and usability of the MetaLib interface
- Investigate whether terminology and language are appropriate
- Obtain subjective feedback from participants
- Provide specific recommendations for addressing found issues

This paper describes the findings of the usability testing, a description of the methods used in the study, the results of each of six tasks with a description of participants’ actions and their verbal comments, discussion of the results, and the implications for further iterations of the interface.

Methodology

We used two methods to collect data. The chief method was think aloud protocols, used to gather feedback from users, to observe their movement through the site, and to record their comments. This is a one-on-one activity during which representative users attempt real-world tasks. Users are asked to think out loud during task completion and verbalize what they are doing and thinking in
order to provide a mental model of their activities. Observing participants as they complete tasks, limits errors caused by participant reports that rely on long term memory. “The primary concern is to support the development of usable systems by identifying system deficiencies.” (Boran and Ramey, 2000, p. 263).

Jacob Nielsen (1993, p. 195), whose extensive research and experience in usability studies have been recorded in books, articles, and on his website, www.useit.com, describes the importance of think aloud protocols by saying, “Thinking aloud may be the single most valuable usability engineering method”. Think aloud protocols stem from the early work on human cognition and information processing of K. Anders Ericsson and Herbert A. Simon (1984, 1993 cited in Boren and Ramey, 2000). Ericsson (2002) asserts that “the closest connection between thinking and verbal reports is found when subjects verbalize thoughts generated during task completion”.

The second method of data collection was a short questionnaire (see Appendix B) with three open-ended items to determine users’ perceptions, suggestions, preferences, and comments. Both methods were piloted before the sessions began. Generally, pilot testing is used to refine tasks and completion criteria of the protocol tasks and to evaluate the questionnaire, for example, to reveal problems with instructions, evaluate the difficulty level of the tasks, and to clarify definitions (Nielsen, 1993).

Selecting participants who are representative of the targeted users improves the validity of the study (Nielsen, 1993). We used a demographic survey to select a representative sample (see Appendix A). Volunteers were recruited by placing an email request with a description of the study on the university’s online bulletin boards. The email included a link to an online survey that requested demographic information. Participants were offered the incentive of aiding in the development of a library multi-resource search product as well as a monetary incentive of $20. Volunteers responded by completing the survey.

To enable multiple studies thus supporting iterative design and the usability of the site (Nielsen, 2001), we selected a small sample of eight participants (six students and two staff members). To select a representative sample we selected the participants based on their feedback to the survey. They were diverse with respect to discipline, year, first language, gender, and search expertise. All but one participant (poor) were good to expert in their searching expertise.

The libraries’ human factors researcher conducted each test session often accompanied by an observer from the MetaLib Implementation Group. From April 27 to May 11, 2006, eight sessions were conducted using a live prototype of the MetaLib interface. Sessions were held in an office of the university library which was quiet and private. Each session lasted thirty-five minutes to one hour. To create a more relaxed atmosphere, participants were welcomed with introductions, a little chatting, and an offer of a beverage. We began the think aloud protocols with information about the session that included an explanation of the purpose of the test, assurance that results will be used to improve the interface and that all feedback is confidential, that users may ask questions which will be answered after the session, and most importantly that the interface, not the participant, is being evaluated.

Participants were asked to complete six tasks, each with multiple parts. Tasks, developed with input from the libraries’ MetaLib Implementation Group, were designed to replicate the way a user might complete a search. Each task was printed on a display board near the computer for participants to read and also read aloud by the moderator. The moderator read each part of the task and waited until participants completed one part before reading the next part.

Transcripts of participants’ actions and verbalizations were used to determine the degree of difficulty of using the interface, discover problem areas, and point out needs that might feed the design of tutorials and future training sessions. The protocol was designed to observe, to the degree possible, how participants would use the software off-site (in their offices, dorms, or homes), so the moderator offered no help until the frustration level was high and failure was evident. When that occurred, the moderator offered a hint in order to observe as the participants
completed other parts of the task.

Users can productively use the federated search software if they could use Basic Search and other basic options (Find Databases, Find Online Journals), so tasks were concentrated on these features. We used one task that required the advanced functionality of the Cross Search option to determine the level of difficulty of the task and the needs for additional training and tutorials. At the end of the session, in order to gather feedback about their experience with the site, each participant completed a questionnaire. Participants are identified by enclosing in brackets the letter P and the participant’s number, e.g., [P1].

Results

Task results

<table>
<thead>
<tr>
<th>number of successful attempts</th>
<th>X 100 = task completion rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>total number attempts</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. Task completion rate

Participants were asked to complete six tasks; however, Task 6 was an open-ended search and was not rated regarding task completion. Task 4 had only seven attempts due to problems with the system’s operation for one participant. Each task listed below begins with the text of the task and then a chart that shows the task completion rate. The task completion rate is the number of participants who completed the task divided by the number who attempted the task and then multiplied by 100 (see Figure 1).

The protocols began with participants sitting at a computer which displayed the opening screen of the multi-resource search software (MetaLib) as shown in Figure 2. Resources available in the Basic Search were grouped by subject with a subject label. To complete a search users would enter a query and then select a subject set (Quick Set) and then click on Go. Nearly all Quick Sets were locked with the exception of Library Catalogs. To unlock all Quick Sets, the user must log in. Any search completed without logging in would search only the Library Catalogs set of resources (Quick Set).

After explaining that the displayed screen is what they would see if they initiated a MetaLib session, the moderator instructed the participant to complete Task 1. The desired action was for participants to log in, choose a relevant Quick Set, enter the query, and complete the search by finding a full text article, show how to email the article, and find a second resource.

Login

The first objective was to determine if participants were aware they had to log in to use all resources, and whether they were able to log in. No one recognized that they had to log in, and all began the first task using the default Quick Set category, the library catalogs, to find a full text article. Instructions on the Basic Search page, including login information, were written in normal text size and clearly state that users must log in, however, only one participant noticed them.

I didn’t read that at all. Now that we’ve finished two tasks, I just now see the “login logout click the padlock”, but only after I’ve been using this for 15 minutes. [P8]
Though some commented that they noticed the padlock icon (in this software, used to indicate a locked resource and also used as a link to the login page), they did not recognize it as an indication to login. For example, participants said,

I’m not really sure what the little locks here mean. … Lock icon not clear why a lock to login? [I] would have expected something different like a door icon. [P2].

Give hints that I need to login as a CMU user to unlock. [P1]

It just looked like some sort of symbol. I’ve seen a lock before but it’s down in the right hand corner, and it tells you that the place is secure to type in your credit card number. … I would rather have a main login before you even attempt to look at your topics or try to do your tasks. [P7]

When I explained that they had to log in to access all resources, all found the login icon (the locked padlock), logged in successfully, and began Task 1 with all Quick Set categories available. The following is the summary of participants’ actions during task completion after they logged in.

Task 1

Imagine that you’re taking a psychology class and you need additional information about Sigmund Freud for a presentation. Show me a full text article about Sigmund Freud. Show me how you would email the reference to yourself. Examine the list of found resources and select a second resource about Freud.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Completion Rate (n = 8, 7, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a find a full text article on Sigmund Freud (8 attempts)</td>
<td>4 1a: 50%</td>
</tr>
<tr>
<td>1b email the reference (7 attempts)</td>
<td>6 1b: 86%</td>
</tr>
<tr>
<td>1c select a second resource (7 attempts)</td>
<td>5 1c: 71%</td>
</tr>
</tbody>
</table>

**Table I. Completion Rate for Task 1**

After logging in, participants attempted the first task. Only two had problems selecting a relevant Quick Set category for the search, though half of the eight participants had problems finding a full text article. Problems finding the full text article were mainly due to confusion about the use of the
SFX icon ( ) shown on the website page in red. SFX® from Ex Libris™ is a linking service to information sources, for example to the journal that provides the article or the citation. Clicking on this icon opens a window to a list of available services that enable the user to obtain a resource. Participants’ comments indicated their uncertainty about the icon.

*When I first saw SFX, I didn’t know what it stands for. Usually if I don’t know what it stands for, I don’t bother going.* [P1]

*It tells you where you can find it, or it gives you the citation abstract, but I’m still not sure exactly how to find the article.* [P6]

Emailing the link posed a problem for only one, and finding a second resource was a problem for two participants (43%) who had problems with the Next link and moving between views in the results (Table View, Brief View, and Full View).

These problems stemmed from participants’ use of the Back button for navigation (rather than page navigation). The browser back button appeared to be intentionally disabled by the developers leading to unexpected results.

*The Back here [pointing to the browser Back button], when you try to go back to the search, requires a little fighting before you get to go there….I can’t figure out how to go to the list. Like the next button doesn’t operate the way I wanted it to.* [P2]

Participants who used the browser Back button to move from the Full View (view of single reference) to the Table View (view of a list of results) had unexpected results when using the Next link. For example, a participant’s actions might be:

- table view → click on title → full view of item → browser back to table view → click on the Next link → next record in full view [last action using MetaLib navigation was full view]

Because they were viewing the references in the Table View, participants expected to go to the next page in the Table View, however they went to the next page in the Full View.

*It seems like the Next button doesn’t work as I want it to. After looking at this, making one selection, I expected it to give me the next list of results.* [P3]

*I keep clicking on Next thinking it will bring me to the next screen, but it just brings me to the next article.* [P6]

*Oh, Next just goes to the next record, it’s not going to the next page of results. Hmm, what would be the next page of results button? Now it’s difficult to get to the next page of results.* [P8]

**Task 2**

Task 2: Imagine you are writing a paper for an Art History class that focuses on the life and achievements of Andy Warhol. Locate a biography of Andy Warhol and view the citation. Add this reference to your list of resources. Check to see if this resource has been added.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Completion Rate (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a find a biography of Andy Warhol</td>
<td>8 2a: 100%</td>
</tr>
<tr>
<td>2b add to your list of resources</td>
<td>8 2b: 100%</td>
</tr>
<tr>
<td>2c check to see if it has been added</td>
<td>8 2c: 100%</td>
</tr>
</tbody>
</table>

**Table II. Completion Rate for Task 2**

All participants successfully completed all parts of Task 2 by finding the biography of Andy Warhol, using the basket icon ( ) to add the reference citation to My Space, and checking My Space to find the added reference citation. One commented that, though he was able to locate and use the basket icon correctly (it has a link title that offered more information), the icon was
confusing.

Though the task was completed successfully, a few participants had other problems in *My Space*. While checking *My Space* for their saved reference, they noticed that they unintentionally added the reference more than once. To delete the duplicate(s), they used the check box to select the duplicate(s) and then used the trash (Trash Bin) to delete (see Figure 3). Though participants expected that only the checked items would be deleted, they inadvertently deleted all references that were listed, not just the checked references.

> I thought because I checked one, that that was going to go. [P5]

> The blue x doesn't fit for me, for delete; I would think it would be red. But if I click on the blue X, why do I have a checkbox here. What I would have thought is that “delete selected”, so I marked them initially then realized I needed to do them one-by-one. [P2]

Though frustrated by the previous action, participants quickly learned that they had to use the blue delete icon (Trash Bin) for each item. In a real-life situation, however, this problem could lead to a user losing a day’s work or more.

**Task 3**

*Task 3: You are writing a paper on business ethics and need resources. You would like to select resources that are not included in the Basic Search. Find a method of searching that lets you select your choice of databases and other resources. Select 3 resources on business ethics. Complete a search and find resources on business ethics. Show me a citation. Show me another.*

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Completion Rate (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a. find a method to choose three databases or resources so that you can search all simultaneously</td>
<td>1 3a: 13% best method</td>
</tr>
<tr>
<td>3b. search using all three resources</td>
<td>4 50% using any method</td>
</tr>
<tr>
<td>3c. show a citation</td>
<td>8 3c: 100%</td>
</tr>
<tr>
<td>3d. show another citation</td>
<td>7 3d: 88%</td>
</tr>
</tbody>
</table>

Table III. Completion Rate for Task 3

Only one participant completed the Task 3, *Cross Search* option, using the desired. The *Cross Search* option (see Figure 4), an alternative to the Basic Search where users select subject-related *Quick Sets*, provides a method for users to customize their searching by selecting individual databases or information sources from a subject-related list. The desired action was to select the *Cross Search* option, use the drop down menus to select a relevant category (business) and sub category (business ethics), and then check three databases or resources for the search. Participants then would complete a search on business ethics using the selected databases.

Three other participants, some who discovered *Cross Search* by exploring the site, used the databases available on the opening screen of *Cross Search*. The screen default showed the resources from the *Quick Sets*, the predefined sets as in the Basic Search. Though they successfully completed a search, they selected the same databases that were available in the Basic Search (the task was to select alternative databases).

Two issues are significant. First, half of the participants (50%) did not recognize *Cross Search* as an advanced method of searching consequently selecting other methods to find databases, all single database searching, leading to task failure.

> I wonder what Cross Search is. I don't know if I will use this or not. [P1]

> What does Cross Search do? [P6]
Task 4

Task 4: Imagine that you’re writing a paper for your engineering class. A friend gave you a citation for a relevant article and you would like to find the article. Find the article “The March of the Robot Dogs” by Robert Sparrow in the journal Ethics and Information Technology. Show me the full text of the article.

Using either Find Online Journals or Basic Search, nearly all (86%) were successful in finding the article. Only one participant had a problem and this may be due to a bug in the system. This needs further examination.

Two had problems finding the full text of the article; one who never found the article and another who found the article but could not find a method to access the full text of the article. Another problem surfaced when two participants using the Basic Search enclosed the article title with quotation marks. The default assumes quotation marks, so adding a second set led to failure. One participant also had problems when entering the author’s name. The acceptable syntax was “last name, first name”. When the user entered “first name last name”, a logical approach, he failed to find the article.
Task 5

Task 5: Imagine that you’re on a team that has designed a new product. You would like information about getting a patent for your product. Find a relevant database with patent information. Add this database to your list.

Only one participant had problems finding a database (he did not use the Find Databases option). By the end of the task he commented that if he did it again, he would use Find Databases. All participants successfully added the database to their sets, and all participants went to My Space to find it. Four participants, however, did not see the My Databases option in the secondary navigation leading to failure for Task 5c (see Figure 5).

![Figure 5. My Space – the navigation links at the top of the page](image)

Table V. Completion Rate for Task 5

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Completion Rate (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a. find a database</td>
<td>7 5a: 88 %</td>
</tr>
<tr>
<td>5b. add the database</td>
<td>8 5b: 100%</td>
</tr>
<tr>
<td>5c. check to see if the database was added</td>
<td>4 5c: 50%</td>
</tr>
</tbody>
</table>

Task 6

Task 6 provided the option for participants to use MetaLib on their own, either to complete a search or to view and use other options. During this task participants were also encouraged to talk about their experience.

Participant questionnaire

At the end of each session, participants were asked to complete a questionnaire of ten items rating their experience with MetaLib (see Appendix B). The items were rated on a scale of 1 to 5 where 1 is “strongly disagree” and 5 is “strongly agree”. The results of the questionnaire were consistent with the findings of the tasks (see Table VI).

An average rating of 1.71 for item 10 (prefer fewer resources and shorter wait time) indicates that, despite the longer wait time, participants still prefer to search many resources simultaneously. Other participant ratings indicate that they liked the appearance (item 8, rating 4.0); were mostly satisfied with MetaLib (item 1, rating 3.63); considered it easy to learn (item 2, rating 3.33); and thought the instructions were easy to understand (item 5, rating 3.33).

Other ratings hovered closer to the midpoint indicating a need for review. These items included item 3, error messages were clear and adequate (rating 2.17), most link names were clear (rating 3.0), and possibly items 4 and 7 (rating 3.25) it’s easy to find information and icons are easy to understand. Participants had mixed feelings about attending a training session (3.0).
Discussion

The comments and experiences of the participants suggest problems that can be addressed in the next iteration of the MetaLib interface. The remainder of this report contains the discussion and recommendations regarding users’ expectations, design of navigation, use of terminology, and the implications of the findings.

The design of popular websites drives users’ expectations

Users approach a new website with some expectations about how it will operate. These expectations are influenced by previous, often-used commercial websites and their libraries’ own website. Nielsen (2004) asserts that “Several design elements are common enough that users expect them to work in a certain way”. He continues by saying 80% or more use the same design approach for standard elements (e.g., design of home page layout) and 50% or more use similar conventions (e.g., link names and color, shopping cart icon and placement). Because “users spend most of their time on other websites”, they become accustomed to the design standards and conventions of frequently visited sites. Thus they assume that a new website will work the same way others have. Inconsistencies with users’ expectations can lead to problems.

In this study when participants’ experiences with the tested website were inconsistent with their expectations, they got stuck, did not find the information they wanted, or even abandoned the tasks often resulting in frustration or failure. The most critical issue that all participants experienced was problems with login. All participants were completely unaware they had to log in leading to failure for all. When asked to complete a search, they began with the opening screen, the Basic Search in the locked position, using the default Quick Set, Library Catalogs. After being told that they had to log in, one confused participant, whose expectations were based on experience with the libraries’ catalog (Cameo) said, “You don’t have to log in to Cameo, do you?”.

Even when participants failed to successfully complete the first task, designed to be an easy article search, they assumed that the problem was their search technique. None considered that they had to log in, though a locked padlock was next to the Quick Sets and text near the page title explained the need to log in. One reason could be that on previously used sites, when logging in was required, the login page was the opening page. Users may have expected a similar approach.

In other examples, participants expected that MetaLib would operate similarly to other familiar search engines. Those who used the trash to delete items in the eShelf in My Space expected that

![Table VI. Participant questionnaire: average of participants’ ratings (n = 8)]
after checking an item, only that item would be deleted when hitting the trash. Instead, all items in the eShelf (checked or unchecked) were deleted.

The syntax required for entering search terms was inconsistent with other major search engines. Participants who used quotation marks to enclose the title of a journal article, as they have on other search sites, experienced problems. The MetaLib default assumes quotes so additional quotes resulted in failure of the search query. Also, as found in an earlier usability study in the United Kingdom, (Lockyer, Creaser, and Davies, 2006) which found that unusual syntax of search terms can lead to problems, searching by the author’s name was a problem when using an unacceptable form (e.g., “first name last name”). The product required a specific form (“last name, first name”) for successful results.

Participants expected the Next link, which indicates the next page, to be at the bottom of the page as well as the top. One participant, who saw no Next link at the bottom of a list of databases, assumed that there was no next page. Another suggested, “I would have put the Next also at the bottom, that’s where most students look for it” [P2].

Sometimes lack of consistency within the site can lead to false expectations. The Find Online Journals default that defines the search query is “starts with” in contrast to the Find Databases default which is “contains”. A few participants, who may have expected the default to be similar to the previously used online journal search, experienced failure when trying to find a database. Inconsistencies within a site and with other often-used sites can lead to longer learning time, frustration, and even failure.

Well-designed navigation leads users through the website

Navigation must look like navigation. Often, as in this study, navigation links do not look any different than surrounding text leading to problems for users who fail to notice the links. “A rich set of graphic navigation and interactivity links within your Web pages will pull users' attention down the page, weaning them from the general-purpose browser links and drawing them further into your content” (Lynch and Horton, 2004).

![Diagram of navigation links](https://via.placeholder.com/150)

**Figure 6. Basic Search – main (top row) and secondary (bottom row) navigation links**

In this study the design of the primary navigation bar and the secondary navigation (page links) are examples of navigation that fails to draw the attention of the user. On the opening page of the product (see Figure 6) the navigation bar is at the top of the screen. Though participants noticed and used the primary navigation links (the top row), many often failed to notice the second row of links (e.g., Search | Results). This row looks more like the surrounding text than a set of navigation links.

Not only did most participants fail to use the second level, page navigation links, they relied on the browser Back button for navigation. Because the browser Back apparently was intentionally disabled in this software, participants had considerable difficulty navigating the search results occasionally leading to failure.

Use of the browser Back as a method to navigate the site is not unique to this study. According to
Nielsen (1999), “The Back button is the lifeline of the Web user and the second-most used navigation feature (after hypertext links)”. This is especially evident when navigation links are poorly designed. Using the browser Back is often not a problem, however when the browser Back button is intentionally disabled, as in this software, users have a great deal of problems.

**Terminology and icons need to be familiar and easily recognized**

The names and the icons (images) used to represent a link can lead to clear navigation or confusion depending on whether users recognize the links and understand where the links take them. Using icons and terminology that are easily understood by users can contribute to smooth navigation. “To understand an icon, we must first of all recognize it. Recognition comes from matching the visual symbol with a memory, or experience, stored in our brain” (Web page design for designers, n.d.). The same can be said of the link names.

Though participants understood most terminology and icons, two links presented problems for more than one participant, specifically, Cross Search in the primary navigation bar and the SFX icon. When looking for an alternative search, some participants completely disregarded the Cross Search link choosing another method often unsuccessfully. The name did not successfully communicate to users where the link would go or what they would find in the section.

The same was true of the icon for SFX. When looking for full text articles, some participants ignored this link or looked for further definition. For example, when one participant rested the cursor on the SFX icon, he commented. “It just says SFX”. Based on previous use with other sites, he expected to see more information pop up (link title) that would explain where the link will go. As found in a recent study on how presentation of digital resource pages affect human behaviour (Finder, Dent, and Lym, (2006), confusing terminology and icons can lead to errors or even failure.

Adding a link title can help users understand where the links will go. A link title is a short (rarely more that 60 characters) explanation of where the link goes, and it pops up when users rest the cursor on the link name (Nielsen, 1998). Using familiar terminology and icons and adding a link title to further explain to users where they are going can reduce errors and frustration.

**Implications**

This study was prepared for the MetaLib Implementation Group, which is working on customizing MetaLib for university use. As a group they will review the problems detected during usability testing and review recommendations in this study. In further iterations of MetaLib, they can address the problems found in this study. The following are recommendations for further iterations.

- Improve the login by making the need to log in clearer to users. Methods to influence user behaviour might include inserting a login page as the opening screen or adding a pop-up message box with information about login when the opening page is accessed.

- To improve navigation, make the primary and secondary navigation look more like navigation. Good navigation is clearly distinguished from the content of the page, leads to obvious content, and is consistent and predictable (Nolan, 2001).

Make site and page navigation more visible and clear. Techniques include using a different font size or color for navigation links; using different line spacing, making a visual cue to separate the navigation from the content, like a line or box; or leaving white space around the menu (Beaumont, Gibbons, Kerr and Stephens, 2004).

- Improve names and icons used to label or represent links. Whether links are displayed as text or icons, names and images that are simple, clear, and indicate where the link will go can reduce errors. Use link titles to offer more information about where the link will go.
• Use consistency when determining design issues. “Meet user expectations by following conventions established by other major sites” (Bevan, n.d.). Sites such as Google, Amazon, Yahoo and even the libraries’ search engines and databases drive users’ expectations.

• Use tutorials, training, and quick guides (online and in print) to educate users and library personnel on the most efficient use of MetaLib and how to use the advanced features.

The length of the learning curve is an important aspect when designing interfaces. With this product users learned quickly how to recover from most problems and on repeated use, performed successfully. This was true of the Basic Search, use of Quick Sets, and the functionality of My Space. For more advanced functionality, for example use of Cross Search, creating personalized Quick Sets, and advanced functionality in My Space, users might need additional help in the form of training and tutorials.

Occasionally with frequent use, some users will continue to improve and eventually learn to use the more advanced functionality. Some will learn on their own, from friends, libraries’ personnel, training, or tutorials. And others will be satisfied with the basic functionality and have no desire to learn more. To determine if the issues detected by this usability study have been addressed adequately and the extent to which users have learned advanced functionality, further usability testing is recommended. This testing can occur several months after MetaLib has been available, and after training and tutorials have been introduced. Iterative usability testing and redesign lead to a more usable site.

**Summary**

Usability testing was conducted on the MetaLib interface. Using think aloud protocols participants, guided by a moderator, completed real-world tasks using the MetaLib interface while verbalizing what they were thinking as the moved through the site. Transcripts of the sessions provided the data for the study. Results revealed the only critical issue was the login, which all participants failed. Other issues were lack of clarity with navigation links, confusing terminology, and inconsistencies with user expectations. Recommendations include improving login, making navigation clear and visible, improving terminology and icons by renaming problem links and using link titles, using consistency when determining how issues are addressed, and using well-known and frequently used websites as guides to interface design. Training, tutorials, and quick guides can be used to educate users. Further usability testing in several months will reveal if the issues have been addressed adequately and will determine how well users have learned to use the basic functionality of MetaLib.

**Acknowledgements**

I would like to thank the MetaLib Implementation Group for their thoughtful input, and the reviewers of this article for their feedback that helped to improve and shape this article.
References


Appendix A. Participants

Participants were selected based on their responses to a demographic survey.

- [P1] M - 2nd year undergraduate, engineering; first language – not English
- [P2] M - graduate student, computer science, first language – not English
- [P3] F – graduate student, policy, first language – English
- [P4] F – 1st year undergraduate, humanities, first language – English
- [P7] F – staff (research for professor), humanities, first language – English
- [P8] M – 2+ years undergraduate, fine arts, first language – English
Appendix B. Participant Questionnaire

Please indicate which of the following you have used. (Check all that apply).

- Cameo (library catalog)
- CiteSeer
- Amazon.com
- Library databases
- multi-database search
- Google
- Yahoo or other
- Other searches

Indicate your level of agreement. (Check N/A if not applicable.)

<table>
<thead>
<tr>
<th>The multi-database and research search:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall I am satisfied with the MetaLib search.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>It was easy to learn this system.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The system gives me error messages that clearly tell me how to fix the problem.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>It is easy to find the information I need.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The screen instructions are easy to understand.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The names of links and labels are easy to understand.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The purpose of the icons is easy to understand.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The appearance of this system makes it appealing to use.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>If the library had training sessions, I would attend.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>I prefer to search a set with fewer databases and resources and have a shorter wait time.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

What was most frustrating in this multi-database and resource search?

If you could change anything about this system what would you change?

Please add you comments or questions.