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Usability testing in a library web site redesign project

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Introduction:

As libraries move forward into the digital age, our web presence becomes increasingly important for meeting the needs of our users. The library web interface represents a critical meeting ground between the information professional and the individual who is seeking information. With distance learning and the proliferation of remote library use, we often do not ever see or meet the users that we are serving. Without human intervention, our electronic interface represents our only opportunity to provide library services and resources to online users. An intuitive library information gateway is needed to help users find, select, and access appropriate information resources. The web interface should be clear and uncluttered, easy to maneuver, and provide built-in redundancy to accommodate different learning styles. In order to help us construct such an intuitive gateway, it is important for librarians to observe how users interact with our current library web sites, explore other library information gateways, and employ usability testing methods as we design new web prototypes.

Background:

The current Roger Williams University web site, located at http://library.rwu.edu, has undergone various transformations since it first went online five years ago. Earlier versions of the library web site tended to evolve around the need to add new resources and services as they became available. When the library's home page became too unwieldy to navigate, librarians attempted to impose a more logical order by separating links into three main categories – resources, library services, and research guides. Although librarians thought this approach would simplify the interface, it soon became

apparent that the library's user population was overwhelmed by the array of link choices available from the home page and were unable to determine which information resources they needed to complete assignments. The interface failed because web site designers had not adequately thought about the needs and capabilities of its most frequent users, undergraduate students unfamiliar with both print and electronic research tools. Furthermore, most of these students lacked any formal training in proper research methodology. After struggling with several library web site designs that never really seemed to meet the needs of this user population, it was decided that a more formal procedure, incorporating a user centered approach, was needed for a library web site redesign project at Roger Williams University.

Library Web Site Requirements and Analysis:

An initial component of the redesign process is to determine the requirements for the library web site. The requirements of the library web site are based on both presenting the resources and services that the library has available and in providing users with the guidelines they need to locate desired information. At the start of the project, we outlined the following seven requirements, which provided the foundation upon which to build the web site.

1. Provide access to the shared library catalog, HELIN.
2. Provide access to online periodical indexes and databases.
3. Provide access to online reference materials.
4. Provide access to web resources and web search engines.
5. Offer information about the library and its services and policies.

6. Provide support through tutorials, context-sensitive help, and e-mail.
7. Create a usable interface that will help users identify what they need.

Most of the requirements for providing access to information resources were being met by the then current library site, however because of poor interface design users did not recognize the proper resources to use for specific information needs. In observing students using the library home page, it was noted that students do not often possess the necessary information literacy or critical thinking skills for locating the proper resources for their research needs. Therefore, a more intuitive initial interface that can more closely imitate the user's thought processes and help them identify what resources they need would be beneficial.

To help us design this initial interface, we considered the types of users that would be using the library web site. Primary users of the library web site encompass the entire RWU community. Included in this community are experienced researchers, such as faculty, as well as inexperienced users, such as freshman or clerical staff who may not yet be familiar with the research process. Those unfamiliar to research and the various resources available to them will need instruction and explanation along the way in a manner that is clearly understandable from the initial screen. Experienced users may desire an escape route that will give them efficient access to the resources that they use most frequently for research.

Users may be accessing the site from within the library where human support is readily available, or they may be remote users accessing the site from any location. Online and e-mail support will be critical to distant users.

Another challenge will be to meet the needs of individual learning styles. Built-in redundancy may allow individual users to find their best path to available resources. The ability to search across the site will be useful to those who prefer keyword searching to hierarchical menu systems. A site index could also be useful to people who like to see an outline of what the entire site has to offer.

In addition to analyzing the users of the web site, it is also important to do an analysis of the tasks that these users perform in order to locate the information they seek. What different types of information or materials do users seek from the library gateway? For example, if a user wants books on a topic, he/she would need to access the HELIN library catalog, or if factual information is needed he/she may want to consult online reference materials, or if the need is for periodical articles, an online database might be consulted. Depending on their information needs, users may choose to search one or all of the resource options. Judging from queries received at the reference desk, it seemed that most users had previous experience with using the library catalog and possessed the procedural knowledge for finding a book in a library. However, most are not familiar with the use of online databases for locating journal articles. In order to help us understand the process users needed to complete in order to locate a journal article, we outlined the various cognitive tasks for achieving that goal.

1. Recognize where to go on the library home page to locate periodical articles.
2. Choose the proper online database or index.
3. Access that database.
4. Search that database, which may require using advance searching techniques.
5. Understand search results. Are they citations? Abstracts? Full-text?

6. Evaluate which articles are useful for the topic.
7. Print, e-mail, or download selected citations and articles.
8. If the full-text is not available online – locate the article.
9. Does the library own the journal title that the article is in?
10. Where is it in the library? Hard copy? Microfilm?
11. What if the library does not own the journal title?
12. What is interlibrary loan and how do you request it?

If the user has experience in locating articles in an online environment, they may be more successful in completing this series of tasks. As Jenny Preece points out in her book, Human-Computer Interaction, "an important determinant in the success of any particular design is the procedural knowledge possessed by users" (Preece, 1994). Consequently, users who know how to conduct research may be more easily satisfied with the library web site design while others, unfamiliar to research and libraries may find the current library web site too confusing and frustrating for completing their information seeking task. Comments from our first observational study certainly found this to be true. Users who knew how to conduct research were satisfied with the 1999 library interface and said it was "easy and self-explanatory." However, users unfamiliar with online research stated that the site was "kind of confusing – too many initial choices" and "somewhat confusing to those of us who don't know much about web sites." Our goal should be to design an interface that is understandable and useful to both groups of users.

Observational Study of Library Web Site:

The RWU library first began evaluating its web interface in March 1999. At that time a frame design was used for the library home page with major links remaining constant in the left column while different pages were explored within the site.

Take in Figure 1

Almost all choices for resources, library services, and research guides were available from the opening page. The method chosen to study the usability of the library web site was a combination observation-interview. By observing students interacting with the library home page and interviewing them about their experiences in using the home page we hoped to discover where problems existed in the web interface design. For the purposes of this observational study, fourteen students with varying levels of research and computer experience were observed as they sought information for their research assignments. Information seeking tasks for the 1999 observational study of the library web site were not predetermined. This observational study relied on the participants' individual research needs. The complexity of their research determined the number of tasks each participant would require of the system. Complex needs would require additional tasks for database determination, entering search queries, and retrieving results. If the research task was not complex enough, users did not feel the need to explore the full range of options available from the library home page. To address the problems in observing non-uniform tasks, participants in subsequent usability tests on prototypes for new designs and on the 2000 library web site were all asked to perform the same pre-selected information tasks. (Appendices A and B)

In soliciting volunteers for this study, it was made very clear to each participant that the librarians were not trying to judge their research skills, we only wanted to observe their use of the library home page to determine its usefulness to the research process. Participants were asked to "think aloud" as they worked on their research. The think aloud method (Preece, 1994) asks the participant to explain why they are making certain resource choices as they work through their information seeking task. The observer administering the test keeps a log of what the participant says and records the paths that the participant takes in attempting to solve the information seeking task. Because it is often difficult to write quickly enough to record everything that the participant is saying and doing, it is helpful to tape record the session whenever possible. To get a clear picture of where problems of usability are occurring, it is important not to interrupt or make recommendations to the participant as they interact with the page.

Some of the problems to be noted when using the observation – think aloud method are that the observer may not realistically be able to record every single comment or action made on the part of respondent. Also, the respondent may not be consistent in verbalizing every thought or perception that they may have during the observation. Observation, by its very nature, is an obtrusive method because users are continually aware that they are being monitored. This may affect both their performance and their behavior. This phenomenon is commonly referred to as the Hawthorne effect (Preece, 1994).

In addition to gathering qualitative data from interviewing and observing students, we also wanted to gather some quantitative data that could be useful in determining each participant's level of experience with using online resources and their overall satisfaction

with the library home page. The survey was also useful for gathering background information. In this first round of usability testing, a total of fourteen students were interviewed, 4 freshman, 3 sophomores, 1 junior, 4 seniors, and 2 adult students in the evening program. The participants were from six different majors and twelve of them indicated that they used the web frequently to locate information.

Findings from 1999 Observational – Survey Study:

This first observational study was very useful in uncovering several problems with the 1999 Library home page. The following issues were of greatest concern.

1. Users are overwhelmed and confused by the initial interface. Too many resource choices are offered from the first screen with no explanation about their use. More instruction is needed for proper resource selection.
2. The terminology used is not clearly understood. For example, users do not perceive the link, *Online Databases and Indexes*, as the resource choice to make when they are seeking periodical articles.
3. Help is not provided in a useful manner. Users are not interested in reading a research guide prior to doing research. They only want help to be available when they need it and from the screen that they are using. There is a need for more context-sensitive help from this site.
4. No provisions are made for experienced versus non-experienced users. Currently this site is not intuitive for users who have not had any prior research instruction.
5. The site is boring and uninteresting.

From the survey we learned that user expectations for the library system are in many ways similar to the goals previously identified for the library web site. In general, students use the library home page to find materials for research. Participants responded that they expected to find "easily accessible information," "books," and "journals," and "information on the web." They also expected the library web site "to be a doorway to the Internet" and "to be easy for the most basic people." When asked to respond to their initial experience with using the library home page, ten of the fourteen participants thought that "it was intuitive and easy to see what resources and services the library had to offer" and eight responded that "it was useful in helping to locate the materials I needed for my research." Only two participants felt that the home page was "too confusing with too many choices" and that they didn't know what to choose. However, observational notes taken while observing each participant, indicate that several participants did not know which resource to choose for the information they were seeking or were unaware of the resource options available to them. In the observation - interview, many indicated that they were happy using only the resources that they were familiar with, such as the library catalog. One participant insightfully noted that "If you don't know the resources, you don't know where to go" and another stated that "The number of resources on the page is wonderful, but the set-up of the page doesn't get this clearly across to the user." It was also noted that frustration occurred if the task took longer to complete than expected. Interestingly, most users tended to blame themselves rather than the system for their frustration.

After observing and interviewing students using the library web site, it was evident that the interface was designed from a librarian's perspective instead of a user's

perspective. There were only a few participants who possessed the knowledge to be able to use the library site to its fullest extent. In his book, Information Seeking in Electronic Environments, Gary Marchionini, points out that each individual user "possesses unique mental models, experiences, abilities, and preferences" (Marchionini, 1995). The more experienced, or the more instruction the participant had, increased his/her understanding of how information was organized on the home page, thus increasing the likelihood of understanding the different options available and satisfaction with its interface.

The Re-Design Process

Exploration and Networking:

The usability testing conducted on the library web site was valuable for understanding how users interact with the library web site. To help us interpret the data gathered during the observational study and to help find solutions to the problems the study uncovered, librarians began to investigate the wealth of information that is available on human – computer interaction, usability testing, and web design. Some of the leading experts in the field of usability and web site design include Jakob Nielsen, Jared Spool, Keith Instone, and Patrick Lynch. From reading the works of these usability experts it is evident that the most important usability design principle is to make content as easy to understand as possible with clear and consistent navigation. Predictability and consistency in navigational links improves the functionality of the web site (Lynch and Horton, 1999). Other web design principles include: creating a site identity, maintaining design integrity throughout the site, use of small graphic files to shorten download time, consideration of different, perhaps older, browsers, use of ALT

tags for images to aid disabled users who are using specialized software, and the use of concise writing techniques for scannability. Studying the works of usability experts and keeping a list of these design guidelines on hand is very helpful for staying on track throughout the redesign process.

Awareness of what other libraries are doing in terms of usability studies and web redesign projects is also vital. To help visualize library web site design, initial ideas can be gathered by viewing other library information gateways.

Prototyping:

Having a couple different designs in mind, we began prototyping a few initial screens and the next layer of links to see how these designs would work. Prototyping is very useful for determining if abstract ideas can actually be molded into a more concrete design. At first it was useful to begin by sketching out a few designs on paper to see how various components might fit on a page. However, in order to test functionality and to get a good idea about how different designs were going to look and work in different browsers, it was necessary to start experimenting with various ideas in a web page editor. Rapid prototypes of several different designs can be tested in editors such as FrontPage, to get a better feel for how a page will look on the browser screen. This process is very iterative. During this design development phase very little time is spent on perfecting any one design until it has at least gone through a usability inspection test. Usability inspection methods are an inexpensive means of testing a web site design before actually doing a full-scale usability test with actual users. Two inspection methods that we used were the cognitive walkthrough method and heuristic evaluation.

Cognitive walkthrough is a review technique in which evaluators role play the part of the user and "walk through" the interface in an attempt to complete certain information seeking tasks, such as using an online database to find a journal article. Evaluators attempt to simulate the cognitive activities of the user and predict how he or she will react to different interfaces. This method is very useful in the early stages of design development for identifying problems that the user may encounter along the information seeking path. It is recommended that usability engineers perform these inspection evaluations. However, since we did not have any experts available to us, or the budget to hire them, we asked librarians who were not involved in the design process to help us review the prototypes. Librarians were a logical choice for filling the evaluator role because they were familiar with the goals of the library web site and with the library's intended users. They were also readily available to review the site as new iterations of the design were being developed. The cognitive walkthrough method proved to to be very valuable for identifying ways to reduce clutter, reduce the number of links and make links more visible, and reduce the amount of text. It also identified problems with terminology and questioned whether certain color schemes might present difficulties for color-blind people.

Heuristic evaluation is another usability inspection method that evaluates the design of a user interface based on established usability principles. Jakob Nielsen has developed *Ten Usability Heuristics* (http://www.useit.com/papers/heuristic/heuristic_list.html) and Keith Instone (http://webreview.com/97/10/10/usability/sidebar.html) has adapted these heuristics for the web. For a non-biased evaluation, it is best to ask someone outside the library to

evaluate your web design on the basis of these ten heuristics. From this type of evaluation problems with terminology, consistency, visibility of links, user control, errors, and the need for help documentation may be uncovered.

After evaluating the prototypes internally, we tested the new designs on real users -- the students. To continue the usability testing on the RWU Library web site, it was decided to ask users to complete a series of pre-defined information seeking tasks on two different prototypes that we were considering. (see Appendix A) We asked users to tell us what they liked about the new designs, what was confusing, or a problem, and if they had any suggestions for improvement.

Take in Figure 2 and Figure 3

Realizing that there was at least a 30 minute time commitment involved, these students were offered a $5.00 copy card as an incentive for participating. These designs were tested on five students from various academic majors. Based on their responses, the design was refined and mistakes were corrected. We were able to complete the usability - refinement cycle once more before we committed to a new library web site design for the fall semester.

Take in Figure 4

Follow-up:

Though we wanted to make a more usable interface available to our users by the beginning of the fall semester, we realized that there would be a need to make continued refinements as weak spots were discovered and new content and resources were added. In the Spring of 2000, it was decided that another round of usability testing was necessary

to identify and correct suspected problem areas. Because the librarians were aware that users were having trouble locating periodical databases and journal articles, both online and in house, we adapted our pre-defined information seeking task list to include tasks that involved locating particular subject databases and journals. Our past experience with usability testing also taught us that we needed a more formalized instrument guide for conducting the observation-interview, which included a pre and post survey, instructions for the tester, and a set of nine information seeking tasks. (see Appendix B) It should be noted that usability testing does not require one to observe a large quantity of users. In his March 19, 2000 Alertbox Column titled, *Why you only need to test with 5 users*, Jakob Nielsen reports that "Elaborate usability tests are a waste of resources. The best results come from testing no more than 5 users and running as many small tests as you can afford." (Nielsen, 2000) (http://www.useit.com/alertbox/20000319.html)

From this recent round of testing, we found that users really do not read web pages, they only scan for highlighted links. In our first round of testing in 1999, users asked for more guidance in making resource selection. Though our new pages provided such guidance, it was too buried in text. In particular, the web page for periodical information

Take in Figure 5

contained too much information for users to absorb and they quickly clicked on the first resource selection available without looking to find a more appropriate choice.

As predicted, users had the most trouble determining a proper database to use for finding subject specific articles and finding out if the library subscribed to a particular journal title. In fact, when asked to find two databases that would be useful for finding articles

located in science journals, four out of five study participants were unable to complete the task successfully, and none of the participants saw the link on the periodicals page for determining if the library subscribes to a particular journal title. Again terminology used on the web page and in the wording of the information seeking task on the instrument guide caused some confusion. Participants remarked that the term "database" was unclear to them, one remarked that she thought of databases as spreadsheets. From these usability tests, it was also clear that users tend to scroll quickly through a page to find highlighted links, but they do not read descriptions associated with those links. One participant remarked "headings and links need to be more significant so you don't need to waste time reading all the other stuff." The most popular suggestion for improving the site was to reduce the amount of text and make links more significant since users do not want to spend the time reading. For a complete analysis of the data collected from the Spring 2000 usability testing, please see Appendices C and D.

On a positive note, the redundancy that we had built into the page, did accommodate different thought patterns. It was observed that users often selected different paths to get to the same information. For instance, to find a database, users may choose to go to the *Periodicals* page or use the *Where to Find* feature or select the *Site Index*. None of the users observed had any trouble locating the link to the library catalog. And interestingly enough, users were more apt to chose *Research Guides* as an option from this home page design than from our 1999 home page. However, except for the choice, *Research Guides by Subject*, users were not interested in reading the other guides that were designed to provide research help.

Though a whole new redesign project is not needed at this point, we hope to improve the usability of the current library web site by addressing the issues uncovered in this last round of usability testing.

Conclusion:

Usability testing can be an eye-opening experience for librarians. Without user input, librarians may be tempted to design from their own perspective and with the jargon of the field. "To design usable organization systems, we need to escape from our own mental models of content labeling and organization" (Rosenfeld and Morville, 1998). Understanding how users interpret our links and interact with our sites is vital for creating a usable interface. One lesson all librarians could learn from usability testing is that we cannot make broad assumptions about how our users are interacting with our library web sites and accessing our resources. If librarians really aim to serve the needs of their user populations, they should first make sure they know their users' needs, and then make information resources more accessible, understandable, and usable.

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