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International digital library perspectives

Website usability: research and case studies

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ON THE DUBLIN CORE FRONT

Electronic resource usage statistics: the challenge and the promise

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Abstract

Purpose – The purpose of this paper is to describe the challenge and promise of electronic resource usage statistics.

Design/methodology/approach – Discusses the ways in which libraries could take better advantage of usage statistics with the help of systems.

Findings – Provides a brief description of a grassroots effort to develop a decision support system for electronic resources.

Originality/value – Provides insight into the challenges and potential uses of electronic resource usage statistics.

Keywords Electronic media, Resources, Statistics

Paper type Viewpoint

I ain't what I used to be, but who the hell is? (Dizzy Dean).

This past Christmas, my mother-in-law gave me a book of quotes from the great Peter Drucker. Like the tear-away desktop calendars my wonderful mother-in-law is also fond of gifting me, the Drucker book is designed to impart one iota of wisdom per day, a ration that fulfills my mind's capacity for such things. Although there are no usage prescriptions for either the Drucker compilation or the calendar ("Amazing But True Golf Facts"), presumably each are meant to be read at the start of one's day. Because I've positioned the calendar in line with my office window – a window that receives many exasperated stares, usually following receipt of a budget-crushing journal invoice – the calendar never falls far behind the actual date. Occasionally I catch myself lapsing by a day or two, but a quick rip of the pages gets me synchronized. The Drucker text, however, I find much more difficult to keep current. For one, the book isn't as obvious as the calendar; it rests near other books and papers that I generally ignore. Moreover, unlike the calendar, the dates don't stare angrily at me, as if saying, "January 7 was a week ago. Get with the program." Yet when I do open Drucker's book of "insight and motivation," it provides me with thoughts that resonate. I think the March 2 anecdote is especially revealing of some library applications (Drucker, 2004):

> The test of an innovation is whether it creates value. Innovation means the creation of new values and new satisfaction for the customer. A novelty only creates amusement. Yet, again and again, managements decide to innovate for no other reason than that they are bored with doing the same thing or making the same product day in and day out. The test of an innovation, as well as the test of "quality," is not "Do we like it?" It is "Do customers want it and will they pay for it?"

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I've had the good fortune to meet recently with a small group of individuals from Villanova University, Simmons College, and Lehigh University to discuss the need for an application that will help libraries manage e-resource usage statistics. The catalyst for this discussion was the recognition that these statistics could be incredibly valuable to libraries if harnessed in a meaningful and at least partially automated way. The scope of our initial discussion has since grown into a much larger framework, all of which I believe to be an "innovation" rather than merely a "novelty", to classify using Drucker's terms.

A look to the past often lends insight into today's issues. In researching how periodical usage statistics were managed in past decades, I came across an article by Robert Broadus that discusses the value of use studies, but cautions that these studies "measure not what should have been used, but what was used" (Broadus, 1985). Large packages of e-journals that provide access to formerly unavailable e-journals – unavailable because the library recognized that the title was not relevant to the curriculum, pertinent to faculty research, or of academic value – often receive usage because they're just a click away. These uses of convenience, unfortunately, can be neither counted nor prevented. Broadus continues his piece by positing that a well-performed use study should predict future use of periodicals in a library. For instance, if *Journal X* is only marginally used during years one-through-three of a use study, and the faculty and curriculum in the discipline to which *Journal X* is aligned remain constant, it's reasonable to assume year-four use of *Journal X* will remain low. Likewise, high use of *Journal Y* throughout a three-year period should result in continued high use of *Journal Y* in year four of the study, given no changes in the faculty and curriculum of the discipline to which *Journal Y* is aligned. Evidence from the journal study I administer is consistent with this theory. Certainly there are instances where spikes in usage are consequential of a class assignment or other one-time need, but over the course of several years' study, usage trends have remained fairly steady. Broadus raises a question, however, for which little research has been done; that is, how consistent are journal uses between similar libraries? If *Journal X* maintains low usage in my liberal arts college library in Pennsylvania, does this journal have similarly low usage in liberal arts colleges elsewhere in the States? Phil Davis provides some insight with his look at the Northeast Regional Libraries' (NERL) use of the Academic Ideal e-journal package (Davis, 2002). Davis found that the research and medical institutions within NERL during the two years studied tended to use the same group of e-journals most frequently. On the other hand, undergraduate institutions tended to show little similarity in their uses of e-journals within the Ideal stable. Further study substantiating Davis's findings would be of value to collection development officers.

The development work of Caryn Anderson (Simmons), Andrew Nagy (Villanova), and Tim McGeary (Lehigh) mentioned above will fill a void in the e-resources spectrum. Although the Digital Library Federation (DLF) Electronic Resource Management Initiative's (ERMI) functional specifications accommodate both metadata about the availability, frequency, and location of usage statistics, as well as the actual storage of usage statistics, it's unlikely vendors building e-resource systems will soon begin work on this important but glamourless feature. The Anderson/Nagy/McGeary model would incorporate usage statistics into a larger framework that would include elements such as price, impact factor, and faculty interest. The result would be a

decision support mechanism that could communicate with library management and electronic resource systems. It's a powerful idea that I hope will acquire the credentials of the DLF or another funding agency so that this work can be realized.

It's only fitting to end this column the way it began, with a serving of wisdom from Peter Drucker (Drucker, 2004):

> Everything improved or new needs first to be tested on a small scale; that is, it needs to be piloted. The way to do this is to find somebody within the enterprise who really wants the new. Everything new gets into trouble. And then it needs a champion. It needs somebody who says, "I am going to make this succeed," and who then goes to work on it. [. . .] If the pilot test is successful – it finds the problems nobody anticipated but also finds the opportunities that nobody anticipated, whether in terms of design, or market, or service – the risk of change is usually quite small (dated March 11; read July 14).

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Too quick? Log analysis of Quick Links from an academic library website

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Abstract

Purpose – To study the use of "Quick Links", a common navigational element, in the context of an academic library website.

Design/methodology/approach – Transaction log files and web server logs are analyzed over a four-year period to detect patterns in Quick Link usage.

Findings – Provides information about what Quick Links have been used over time, as well as the relationship of Quick Link usage to the rest of the library website. Finds generally that Quick Link usage is prevalent, tilted toward a few of the choices, and is drawn largely from the library homepage as referral source.

Research limitations/implications – Log analysis does not include IP referral data, which limits the ability to determine different patterns of use by specific locations including services desks, off-campus, and in-house library usage.

Practical implications – This paper is useful for website usability in terms of design decisions and log analysis.

Originality/value – This paper targets a specific website usability issue over time.

Keywords Transactional analysis, Worldwide web, Academic libraries

Paper type Research paper

Since the summer of 2001, Virginia Commonwealth University Libraries has offered a "Quick Links" menu in the top right-hand side of many of its pages (see Figure 1). Transaction log files have been run in order to analyze the use of the Quick Links, and several changes have been made based on those logs. This article will discuss those findings and offer contextual ideas for the use of Quick Links in comparison to the rest of the library website.

History

In May of 2001, the Quick Links menu first appeared on the VCU Libraries website as part of a site redesign. Quick Links were viewed by the Libraries Web Redesign Task Force as a space-effective method to present frequently sought after information in a consistent place throughout the site. Further, the Web Redesign Task Force felt that these Quick Links should be incorporated into the standard library headers across the majority of the site. The content of the Quick Links menu was derived from identifying popular pages and resources that were not represented on either the homepage or the standard header. This identification was done through a combination of internal discussions and analysis of web server logs[1]. The resulting list of 13 items included subscription databases, library services, and university services. The Quick Links

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were "chunked" into sections to make it easier to scan for either databases or services (see Table I for a look at the evolution of Quick Links over time).

Things went swimmingly until the following summer, when a request came to the Libraries Information Technology Work Group to add an item to Quick Links. Rather than decide this out of context, the group decided to review the web server logs before determining if anything should be changed. In doing so, several challenges were readily apparent as there was not a single set of statistics from which to draw conclusions. Obviously, the web server logs only included statistics for the pages that resided on the web server! Many of the Quick Links, however, were directed to external databases. Further, for popular pages that were on the Quick Links menu it was not possible to determine if the use of these pages was from Quick Links or some other source. Despite these obstacles, the group wrestled with the available data to define a revision to Quick Links that was put into production by the start of the Fall 2002 semester. This revision increased the number of Quick Links to 15.

Upon implementing the revised Quick Links, the group also decided to undertake a transaction log analysis in order to gain a better understanding of how this resource was being used. The Quick Links use a drop-down select menu that is powered by a server-side script. As such, it was a minor task to adjust that script to log each time a Quick Link was used and which specific Quick Link was chosen. The use of transaction log analysis is well established in the literature, and a recent article by Phillip M. Davis gives a succinct history of the use of such analysis (Davis, 2004).

Figure 1.
Standard VCU Libraries Header with Quick Links

July 13, 2001	September 13, 2002	August 23, 2003	Current
Quick Links	Quick Links	Quick Links	Quick Links
Search our Website	Online Books		
		Online Books	E-Books
CINAHL	Online Journals	Online Journals	E-Journals
Dow Jones		Sitemap	Sitemap
ERIC	CINAHL		
InfoTrac	Dow Jones	CINAHL	CINAHL
Lexis-Nexis	ERIC	ERIC	ERIC
MEDLINE	InfoTrac Onefile	Factiva	Factiva
PsycInfo	Lexis-Nexis	InfoTrac OneFile	InfoTrac OneFile
	MEDLINE	LexisNexis	LexisNexis
Check your E-mail	PsycInfo	MEDLINE/Pubmed	MEDLINE/Pubmed
Explore the Web		PsycInfo	PsycInfo
Online Journals	Check your E-mail	Web of Science	Web of Science
Other Libraries	Course Reserves		
Research Guides	Explore the Web	Blackboard	Blackboard
	Interlibrary Loan – ILLiad	Check your E-mail	Check your E-mail
	Reference Shelf	Course Reserves	Course Reserves
		Explore the Web	Explore the Web
	Search our Website	Research Guides	Research Guides

Table I.
Evolution of Quick Links over time

2002-2003 log analysis

Two separate transaction logs were run during the 2002-2003 school year. The first log ran from September 2002 through November 2002 and recorded 72,446 transactions indicating which Quick Link had been selected. The Information Technology Group decided that a second log should be initiated to gather more data so that decisions would not be based solely on one part of the academic year. The second log (97,332 transactions) ran from December 2002 through April 2003. Interestingly, there was little difference between the two logs.

Both logs revealed that many of the 15 total Quick Links were infrequently used, especially in comparison to the most heavily used selections. In both logs the top two items were external databases (InfoTrac OneFile and MEDLINE), and accounted for roughly 40 percent of the total use. InfoTrac alone drove more than one-quarter of all Quick Links usage. Likewise, the top five items (InfoTrac, MEDLINE, E-mail, Lexis, Ejournals) accounted for approximately 77 percent of the total use. In contrast, the bottom five items accounted for a total of just 4 percent of all Quick Link activity.

Upon digesting these results, several revisions were implemented. The bottom two performers (Illiad and Electronic Reference Shelf) were eliminated from Quick Links. "Search our Website" (0.8 percent) was relocated from the bottom toward the top of the Quick Link list and renamed to "Sitemap" in the hopes of greater visibility. Web server logs were again consulted for any obvious additions, and a web page listing various librarian-created subject guides "Research and Topic Guides" was added. Also, considering the strong use of the "Check your E-mail" choice, "Blackboard", the University course management system, also debuted on the VCU Libraries Quick Links menu. To further highlight each grouping of selections, lines were added in place of the blank space between each group.

Fall 2004 transaction log

The issue of Quick Links had not been revisited for analysis by the Library Information Technology Group since 2003. Since that time, several minor edits as well as contextual changes had occurred. Throughout the site (including Quick Links) "Online Journals" and "Online Books" was changed to "Ejournals" and "Ebooks", "MEDLINE" was renamed to "MEDLINE/Pubmed", and "Dow Jones" had changed its name to "Factiva". Links to Ejournals and Ebooks were also included directly on the homepage in a new "Online Resources" section. Finally, a standard set of personal toolbar bookmarks was added to the public library computers. These bookmarks included links to E-mail access and Blackboard. Given these changes and the length of time since the last analysis, it was decided that another transaction log should run during the Fall 2004 semester.

The new log showed a similar distribution of access where the majority of use was driven by a few of the choices (see Table II). The top two choices (InfoTrac and Pubmed) were used even more heavily at 44 percent compared to 40 percent of all use from the combined logs of 2002-2003. The top five choices (InfoTrac, PubMed, E-mail, Lexis, Ejournals) also remained the same, accounting for 74 percent compared to 77 percent in the previous log. At the bottom end, the least used five items clocked in at the same 4 percent.

There were, however, some significant differences between the Fall 2004 log and the combined Fall 2002/Spring 2003 log that also deserve discussion. While InfoTrac

	First log (percent)[a]	Second log (percent)[b]	Third log (percent)[c]
InfoTrac Onefile	28.1	27.1	27.6
MEDLINE/Pubmed	12.9	12.5	16.8
Check your E-mail	11.5	12.3	10.5
Lexis	9.6	10.3	9.7
Ejournals	15.1	15.7	9.5
Blackboard (added May 2003)	N/A	N/A	6.1
CINAHL	5.7	3.6	5.1
PsycInfo	3.1	3.9	3.1
Factiva	2.3	3.5	2.4
ERIC	1.4	1.5	1.5
Menu	1.6	1.5	1.5
Course Reserves	1.4	0.8	1.8
Ebooks	1.7	1.8	1.2
Web of Science	1	1	1.1
Research Guides (added May 2003)	N/A	N/A	0.7
Search the Internet	1.3	1.2	0.7
Sitemap (changed name in 2002 from Search our Website, moved to top of list May 2003)	0.8	0.8	0.2
Spacer	0.02	0.05	0.03
Illiad (dropped May 2003)	0.4	0.6	N/A
Electronic Ref Shelf (dropped May 2003)	0.5	0.4	N/A
Error – no http referrer (recorded separately in Fall 2004 log)	1.5	1.5	3.5

Notes: [a]September 2002-November 2002 (72,446 transactions); [b]December 2002-April 2003 (97,332 transactions); [c]September 10, 2004-December 1, 2004 (108,559 transactions)

Table II.
Percentage of Quick Link usage from three separate transaction logs

stayed atop the list with 27 percent, the 4 percent growth in use of the top two items was attributable solely to an increase in MEDLINE/Pubmed requests, up from 12.7 percent to 16.8 percent. Another item that had a strong showing at 6 percent was the newly added link to Blackboard. Among other items in the top tier of requests, Ejournals showed a marked decrease from 15.4 percent to 9.5 percent. At the same time, from analysis of web server logs, overall accesses to the Libraries Ejournal page increased. It is most likely that the decrease in Quick Links usage for Ejournals is attributable to the addition of the Ejournal link on the homepage itself.

The E-mail choice only declined slightly from 11.9 percent to 10.5 percent, even though new personal bookmarks on public library computers also offered this choice. The need to access e-mail from the library web page would seem most likely to arise for users inside the library. From casual observation at the Reference desk, many students do use the public library computers to check e-mail. It is tempting to speculate on the overall visibility of browser customizations such as personal bookmarks on public library computers versus the addition of items to the web page itself. In the case of adding a link for "E-journals" directly to the homepage, Quick Link usage decreased much more than for "E-mail" where a direct link was present onsite in the browser toolbar. This could be a fruitful area for further study. In addition to transaction data,

the referring IP address would also be needed in order to make strong inferences on the use of Quick Links by those inside the library versus those outside the library.

Other additions and modifications to Quick Links did not gain measurable attention in the 2004 log. The newly added "Research and Topic Guides" was not a frequent choice at less than 1 percent of all Quick Link activity. The total number of accesses through web server logs to the Research and Topic Guides page remained strong, suggesting that alternate navigation was sufficient and perhaps already established. Despite elevating "Search our Website" to the top of the Quick Links list and changing its name to "Sitemap", this selection still remained at less than 1 percent in relation to the other Quick Links.

Failure points

The logs also pointed toward difficulties with the basic interface. From 1.5 to 1.6 percent of Quick Link activity resulted in the end user clicking the "Go" button without making a selection from the drop down menu. In the same vein, but not as significant (less than 0.1 percent) there were also entries in the log where the user selected the spacer between each group of choices. Another consistent problem was that the server-side script was not always able to determine the http referral (the web page from which Quick Links was accessed). This information was required in the hopes of strengthening security and preventing the script from being used for non-library or potentially hostile purposes. In the earlier logs the absence of an http referral hovered around 1.5 percent. Based on that volume, an alternative was developed that routed these users to a page from which they could access the resources listed on Quick Links. In the Fall 2004 log this had increased to almost 3.5 percent. This increase is most likely attributable to end user security concerns and a proliferation of personal firewalls. Based on this increase, a new approach has been developed whereby http referral data is no longer required. Taken together, for the Fall of 2004, 5 percent of the Quick Link activity was not completely successful, either through selecting the menu option or being routed to a secondary page due to lack of an http referral.

Referral data in the Fall 2004 transaction log

Unlike the earlier logs, where only the absence of http referrals was recorded, the Fall 2004 log also contained specific page referral data. Each entry in the transaction log includes a separate column with the web page from which the choice was made. This was seen as especially important to the Information Technology Work Group, since Quick Links were present on so many of the library web pages. This data was seen as a way to determine how often Quick Links were accessed from pages other than the homepage, as well as looking for patterns of use from different pages.

A total of 389 distinct URLs were recorded as being a source from which Quick Links were accessed. Despite this large number, the majority of requests came from a small set of pages. The library homepage accounted for 76 percent of all referrals, and the top five referral pages alone accounted for just shy of 90 percent of all Quick Link activity. Since such a large percentage of use came from the library homepage, the pattern of Quick Link usage on the library home page was similar to the usage found in the global analysis.

Among the other top referral pages, there were some interesting differences in Quick Link usage. On these top referral pages, users gravitated even more heavily

toward the most frequently used Quick Links. From the Research page, a primary entryway to databases (www.library.vcu.edu/research), InfoTrac was selected from Quick Links 41 percent of the time. Likewise from the Catalog entry page (www.library.vcu.edu/catalog), InfoTrac was used 48 percent of the time. In both cases, this is significantly more than the 27 percent selection recorded in the global analysis. The portrait of Quick Link usage from the homepage of the Tompkins-McCaw Library for the Health Sciences also points toward a distinct research culture. A small percentage (5 percent) selected the popular aggregator InfoTrac, whereas the number one choice was MEDLINE/Pubmed (47 percent) followed by the nursing and allied health database CINAHL (21 percent).

The Quick Links for services were used much less frequently than from the library homepage. Whereas Blackboard was accessed 7.4 percent of the time from the homepage, it was not even selected more than 0.5 percent of the time from the other top pages. Similarly, "E-mail", while at 12.8 percent from the homepage, was only selected 3.2 percent of the time from the Research page and 1 percent of the time from the Catalog page. In general, the referral data challenges the assumption that Quick Links are needed as a persistent choice throughout the site. The referral data can also help in determining what content may need to be added to specific secondary pages if Quick Links were to be removed.

Comparing the Fall 2004 transaction log with web server logs

Data from the transaction log in combination with web server logs can be beneficial both for verification and cross-reference. For example, in the previously discussed example, a decline in Quick Link usage for "Ejournals" was softened by the web server logs showing an increase in accesses to the Ejournal page (most probably through the direct link to Ejournals that was added on the homepage). There were a total of 108,559 entries in the Fall 2004 transaction log, with almost 76 percent (82,415) of those coming from the library home page. In and of itself this seems like a significant number, but by looking at the web server logs one can begin to see how much Quick Links may be used in comparison with the rest of the site. During the same period as the transaction log, there were 777,689 accesses to the library homepage in the web server logs. Thus, the use of Quick Links from the homepage totaled slightly more than 10 percent of the total accesses to the library homepage itself.

Taken further, this cross analysis between the transaction and server logs can look more critically at the top Quick Link choices. From the transaction log referral data, there were 21,636 InfoTrac requests from the Quick Links menu on the home page. Divided by the total number of homepage accesses during the transaction log, this measures 2.78 percent of the library homepage accesses. The top two Quick Link choices (InfoTrac and Pubmed) were accessed 35,713 from the library home page via Quick Links. This is equal to 4.59 percent of homepage accesses.

The web server logs in and of themselves can also provide a check of some of these assumptions. The script that is launched each time a Quick Link is chosen is recorded in the web server logs. For the calendar year 2004, these logs record 2,257,244 homepage accesses and 326,114 Quick Link accesses. Using the 76 percent homepage referral figure from the 2004 log analysis, 247,846 Quick Links accesses or 10.98 percent of all home page accesses are left. This mirrors the figure derived from comparing the transaction log with the server log. Likewise, assuming 44 percent of

Quick Link Activity is focused toward the top two choices (InfoTrac and Pubmed), we derive 109,052 Quick Links to these databases from the home page or 4.83 percent of home page accesses. Again, this number is very comparable to the previously estimated 4.59 percent in comparing Fall 2004 data. In short, it appears that upwards to one in ten accesses to the home page branches off to Quick Links, and that close to half of those Quick Links results in a link out to either InfoTrac or MEDLINE/Pubmed (see Table III).

Quick Links can also be seen in the 2004 server logs right alongside the "top level" pages. The standard library header offers tabs to Home/Research/Catalog/Services/Forms/My Library/Help (see Figure 1). Data for My Library links are not in the web server logs, as this page resides on a different SSL-enabled server. Quick Links usage (326,114) is especially larger than the Services (44,439), Forms (36,599), and Help (16,815) pages. The Quick Link usage is on the same scale as both Research (250,420) and Catalog (292,563) (see Figure 2).

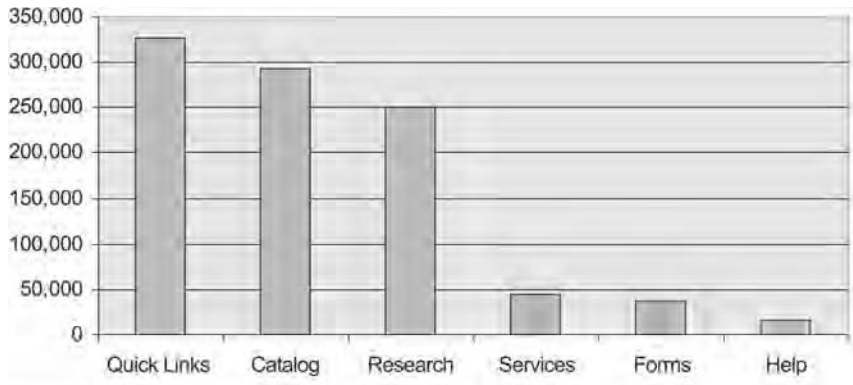
Sticky or transparent: some conclusions

It seems inescapable that there is significant use of the Quick Links feature. This use is tilted heavily from the library homepage, and favors a few of the library databases. In addition, non-library selections such as E-mail and Blackboard have seen more Quick

Homepage accesses	2,257,244
Quick Link accesses	326,114
Estimate 76 percent of Quick Links from homepage	247,846
Quick Links homepage activity as a percentage of homepage accesses	10.98
Estimate 44 percent of Quick Links using Infotrac + Pubmed from home page	109,053
InfoTrac + Pubmed Quick Links home page activity as a percentage of homepage accesses	4.83

Sources: Accesses from web server logs; percentile estimates from Fall 2004 transaction log

Table III.
Estimates of Quick Link activity on the library homepage for the year 2004



Source: Web server logs

Figure 2.
Quick Link activity compared to other top-level pages for the year 2004

Links use than library specific pages such as Sitemap or Research Guides. What type of judgments do we draw from such analysis? What about all of the other subscription databases and library services that are not listed on Quick Links? Does Quick Links limit the view of resources or serve to get people where they would wind up going anyway? If some Quick Links are so popular, why not simply link to them more directly on the homepage instead? Is there an ideal balance that library websites should aspire to in terms of accesses to internal web pages versus linking out to external resources? These questions echo familiar library web design struggles. They also speak to the profession's ongoing aspirations to both save the time of the reader and connect him or her to the appropriate information resource (Ranganathan, 1931). By leveraging transaction and server logs, libraries can in part gauge how well their websites are meeting these goals.

As of this writing, the VCU Libraries Information Technology Work Group is considering these issues alongside the data from the transaction and server logs. Based on this data and professional consensus, a new Quick Link menu should soon be fielded.

Note

1. VCU Libraries uses the Wusage analytic software to measure web server logs. All references in this article to web server log data are drawn from the Wusage compilations of accesses. Accesses are recorded each time a document on the web server is requested (more on Wusage is available at www.boutell.com/wusage/). The transaction log data on the other hand was compiled separately from Wusage.

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Website redesign and testing with a usability consultant: lessons learned

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Abstract

Purpose – The aim of this case study is to present one library's experiences consulting with a usability expert during the design and implementation phases of a new academic library website and the lessons learned during the process.

Design/methodology/approach – The library staff worked with the consultant so that he understood the work of the librarians and goals for the website. Together the consultant and library staff developed a series of tests to measure the usability of the site. The librarians implemented the tests, gradually taking the leadership role in the process.

Findings – The study confirms the value of usability testing as a tool to bring to light some of the ambiguities and complexities of a library website for users. The study demonstrates that librarians have developed an expertise and knowledge base that transfers well to the evaluation of websites and online resources. The experience of the University of Michigan AAE Library reveals that usability testing should be an ongoing exercise so that the website remains relevant to the users.

Practical implications – This study advises librarians of the value of testing and that, on the one hand, test results confirm what one imagines about the users' experiences, but on the other hand they reveal the unexpected strategies and understandings of the users.

Originality/value – This case study provides a useful example of the value of working with a usability expert, a discussion of what to expect during the process, and advice about the role of the librarian in such an endeavor.

Keywords Academic libraries, Worldwide web, Consultants, Content management

Paper type Case study

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The redesign of the Art, Architecture & Engineering Library website involved participation and advice from many. The authors would like to acknowledge the expert contributions of Mike Elledge, Liene Karels, James Reed, and Ryan Steinberg.Phillip M. Edwards and Jeanie E. Fisher were formerly University Library Associates, Art, Architecture & Engineering Library, University of Michigan, Ann Arbor, Michigan, USA.

The experience of completely redesigning a complex website demonstrates the important role of usability testing. Usability testing raises the awareness of how a site is used and provides a model for periodic evaluation. The University of Michigan Art, Architecture & Engineering Library website (see www.lib.umich.edu/aael/) serves a diverse group of faculty, students, and scholars in Engineering, Architecture and Urban Planning, and Art and Design. The website brings together thousands of distinct, but often related, resources and services and aims to deliver them in a logical and easy-to-use manner. The driving goal of the website redesign was to move all the information on the site to a content management system (CMS). The comprehensive scope of the task provided an opportunity to test presumptions about vocabulary and the organization of information on the site, as well as a chance to implement several desired interactive features. Because the conversion from an HTML-based site to a CMS-driven site was such a fundamental change, it was felt that a usability component was essential. At this point initial contacts with the university's Usability and Evaluation Lab were made.

The Art, Architecture & Engineering (AAE) Library is located in the Duderstadt Center, a building dedicated to developing new ways of bringing technology into the research and learning process in the lab and classroom. Alongside the AAE Library, the Duderstadt Center houses consultation labs such as the Collaborative Technologies Lab, the Usability Support and Evaluation Lab, and the Instructional Technologies Lab, as well as several audio and visual labs, and event and performance spaces. The decision to work with the Usability Lab was made easy by the physical proximity of these labs and their staff to the library and its staff, in tandem with the missions of each group to work collaboratively to improve the technological understanding on campus. This case study will trace the process of the redesign and will address the AAE Library's experience working with the Usability Lab and its consultants on the implementation of the website.

Literature review

Several case studies have been published recently describing usability testing during the redesign of academic library websites. Tests of library websites usually include a set of structured tasks that provides a representative sample of the types of information users would want to find on the website. Typically one develops about six to 12 tasks to provide sufficient coverage of the information on the website, yet minimize the testing time (Battleson *et al.*, 2001; Fuller and Hinegardner, 2001; Mack *et al.*, 2004; McMullen, 2001). In addition to the tasks, usability tests often include a questionnaire covering the user's background and experience and inquiring about their impressions of the functionality of the website. Examples of the types of questions asked in library website usability tests can be found in Clark (2004), Fuller and Hinegardner (2001), and McMullen (2001).

The number of participants needed for a usability test is reasonably small. Most recently published usability studies in libraries tested between five and 14 participants (Augustine and Greene, 2002; Battleson *et al.*, 2001; Fuller and Hinegardner, 2001; Mack *et al.*, 2004; McMullen, 2001). Nielsen (2000) and Krug (2000) both discuss the benefits of testing with a smaller number of users. Nielsen (2000) shows that testing with five users should find approximately 85 percent of the problems, and that testing with 15 users should find 100 percent of the problems. Generally, it is more

cost-effective to test fewer people and have more tests than to test a lot of people just once (Krug, 2000; Nielsen, 2000).

Battleson *et al.* (2001), Fuller and Hinegardner (2001), McMullen (2001), and Swanson (2001) describe some of the basic lessons learned from their tests. All of these studies concluded that usability testing was an extremely useful tool when redesigning websites, particularly in understanding how people use sites and in identifying confusing jargon. Augustine and Greene (2002) found that students relied on the search feature of the website rather than the structured hierarchy of the site.

Although much has been written about usability testing of library websites, very little has been written about consulting with usability experts when designing and implementing library usability studies. There is a growing literature available to inform librarians about usability testing, and the ASIS&T Information Science Education Committee reports that as of March 2003, 41 US and Canadian institutions offer course study in information architecture (ASIS&T, 2003). Many library and information science programs now offer training in information architecture, so that many librarians have the knowledge and skills to conduct usability tests. Nonetheless, there are advantages to consulting usability experts such as the time saved in self-education, the input of an expert's experience, and an unbiased viewpoint.

Two studies in particular refer to consulting usability experts in designing library websites. The most extensive of these studies is reported by The University of Texas General Libraries, where the staff first developed a redesign process for their website, and then employed a usability consultant firm (University of Texas General Libraries, 2001). The consultant evaluated their methods and offered recommendations on data collection, analysis and interpretation, and on making design recommendations for the site. The consultant also recommended using a trained usability engineer early in the planning process to help provide an efficient and effective usability-testing plan. Librarians at the University of Wisconsin Digital Collections Center (UWDCC) included two usability experts to help moderate and take detailed notes of an initial focus group session that was designed to uncover problems and offer suggestions about the Belgian-American Research Collection (Clark, 2004).

The redesign process

Consensus on the need to update the design and organization of the old AAE Library (formerly the Media Union Library) website and the shared desire to move to an open-source CMS instigated discussions about a new website. The team was necessarily large because of the need to include subject librarians representing the various disciplines served by the library, as well as circulation staff who better understood some of the services users expected. It was large also because there was no extra funding and the work would have to be done by many. The first step was to evaluate the existing HTML-based website, which had been in use since Summer 2000 (Figure 1). Although the old website had a simple, uncluttered look, the experiences of library staff indicated that users often had difficulty accessing information. It was agreed that the new site should provide more interactivity for the user, such as a search feature and a drop-down FAQ list, one with more content geared toward information literacy and instruction with less library lingo, and one that offered a stronger identity for the library. Whereas the old site required the user to choose a broad subject area to begin their search for resources, it was decided that the new site should have more

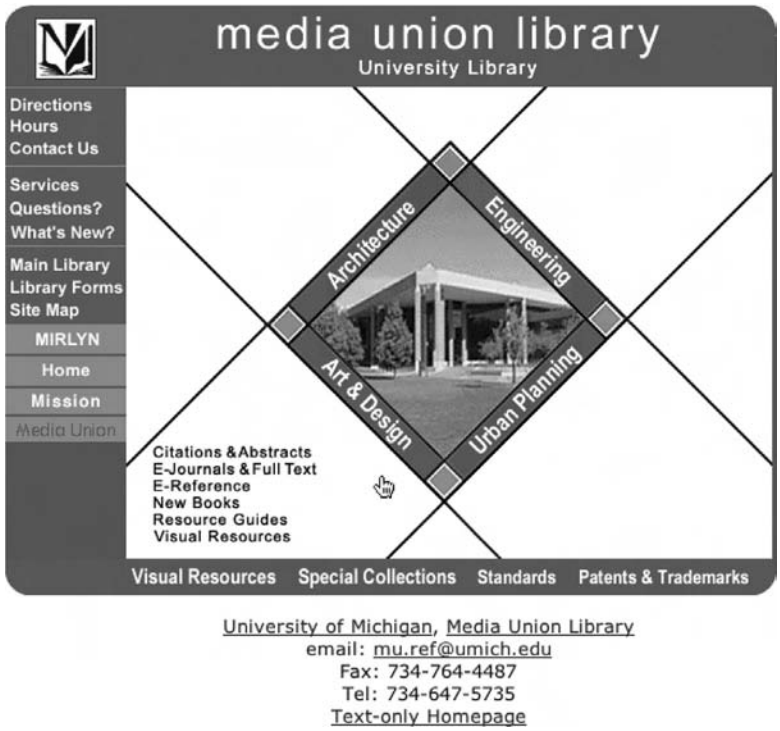

Figure 1.
Art, Architecture & Engineering Library (formerly the Media Union Library) website prior to redesign, showing rollover of Art & Design quadrant

ways to get into the resources. A review of other library websites helped illuminate the pros and cons of various approaches. Consultations with technology experts in the Library Web Services office about loading software and hosting the database on a library server helped in determining the required technology. Because of the magnitude of the change to the website, it was decided that usability testing should be part of the design and development process and not simply a step at the end.

The underlying and essential change to a CMS-driven website merits attention before discussing the usability component of the design process. Three principal reasons led the decision to use a CMS:

(1) the ability to reuse material on the site and offer multiple ways for users to find content;

(2) the flexibility for global updates to the site from changing a phone number or URL to redesigning a standard page layout; and

(3) the relative ease of basic administration and content management for multiple authorized users.

The CMS would allow anyone on staff to make changes rather than requiring all changes to funnel through one local "webmaster". While on the one hand daunting, the sense of ownership provided by the ability for all staff to participate in the site was enticing and was indicative of how the AAE Library functions.

The decision to use a CMS led to a review of several open-source solutions, ranging from database/form-driven systems to Wiki systems to blogging packages. None of these options met required needs "out of the box". Being in the fortunate position of having several technologically savvy staff members, the staff realized it could most efficiently meet specific needs by creating its own basic CMS solution. MySQL was chosen for the underlying database and PHP, a popular scripting language designed for interacting with databases, was chosen for scripting. Both technologies are open-source, supported by Library Web Services, and relatively easy to learn.

Running the website out of a database eliminates the need for individual HTML files, as pages are served up dynamically via PHP scripts. The staff responsible for designing the database prepared separate scripts for displaying different categories of information, e.g. resources, persons, places, news and events; a script for presenting the results of a search; and a browsing script that displays the items that match a particular division subject. These scripts are constructed modularly, so that for example there is a header sub-script that renders the header of a page, and this sub-script is then referenced by all of the other scripts. This facilitates the ease of making global changes to the website by requiring that changes be made only once.

The back-end administration of the system utilizes PHP scripts as well. Authorized users can use any web browser to enter the administration system (Figure 2) and make changes to the database by use of standard forms. The main challenge in adopting this new system was the need for staff to re-conceptualize a website. Rather than thinking of a site as individual pages, one has to think of a database-driven website as

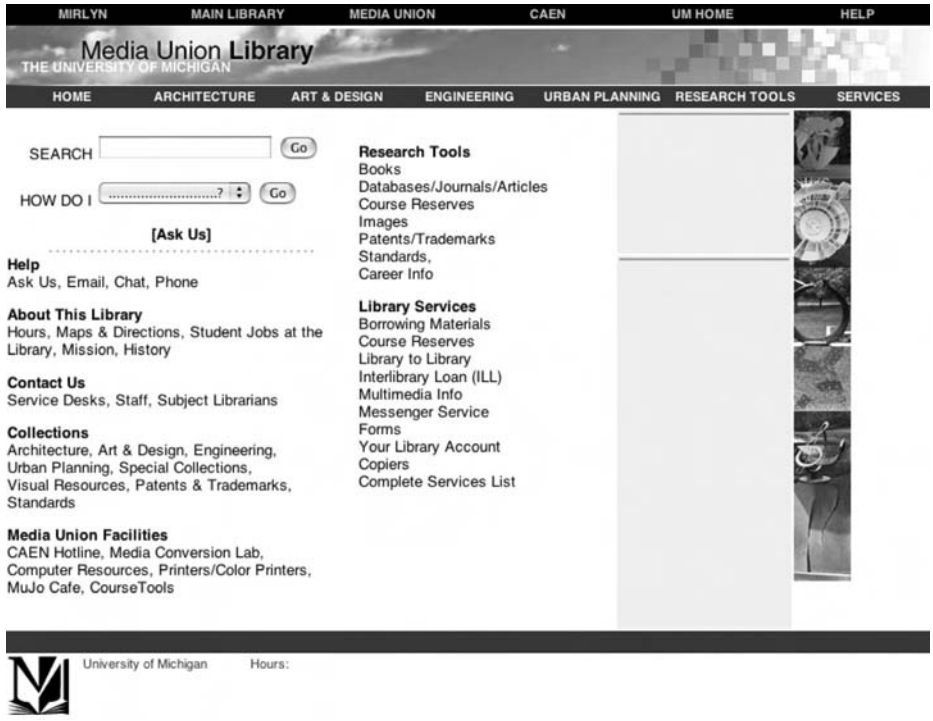

Figure 2.
Paper prototype home page for Art, Architecture & Engineering Library (formerly the Media Union Library)

dynamically related modules. While decidedly more powerful, such a website does not allow for infinite customization and trade-offs must be made to harmonize the structure of the website. This is particularly important in light of usability testing. Usability of the site was not just about one page or one feature it had to do with the entire site and its underlying structure, and it had to be addressed via the entire site.

Usability testing

The AAE Library website redesign project began by having a few library student assistants answer some commonly asked questions using the current site. This, combined with the library staff's experiences with the site, helped to identify major problems. With information obtained from these early, informal investigations, the AAE Library began working with the Usability Support and Evaluation Lab. Located just one floor below the library in the Duderstadt Center, the lab is a resource for University of Michigan faculty, staff, students and others interested in evaluating websites, web-based tools, and software. One consultant from the lab was assigned to the AAE Library project.

After listening to the needs of the library, the consultant from the Usability Lab proposed three options based on cost:

(1) a free option suggesting a heuristic analysis and sector interviews preliminary to design;

(2) a medium-range option which included a mix of analysis and testing before and during design; and

(3) a more expensive option which suggested additional information architecture evaluation and prototype testing.

The mid-range option was chosen as the one that offered the best cost-benefit ratio. The path the library initially chose included the following series of tests:

- *heuristic analysis* – a review of the proposed website design for adherence to commonly accepted usability principles;
- *sector interviews* – in-depth interviews with library staff to help the consultant understand how the library website was used, and how it was perceived that students, faculty, and staff were using the website;
- *card sorting* – a usability exercise where individual users group, prioritize, and identify cards containing website content: this would help to develop the overall structure and language for the site; and
- *wire framing* – creating simplified versions of a particular website to evaluate the effectiveness of site navigation, language, and consistency.

Due to time constraints (work began in March and roll out of the new site was scheduled for August) the preliminary heuristic analysis was omitted and a simpler paper prototype test was conducted in place of the wire framing test. In addition to these tests, done with the aid of the usability consultant, the library conducted finished prototype testing of the site with students and staff at several stages during and after the design process.

Sector interviews

The usability consultant conducted sector interviews with four library staff members representing the major areas of library information on the website. Interviewees included the Art & Design librarian, the Architecture & Urban Planning librarian, one of the engineering librarians, and a staff member from Access Services (circulation and reserve). The interviews allowed the consultant to become familiar with the site's content and with library terminology. This information was used in the card sorting to create mostly jargon-free labels, except where the library jargon was meaningful to users. The interviews also highlighted the types of assistance requested from reference librarians, common activities of information-seeking patrons, and specialty services provided by libraries.

Card sorting

The card sorting exercise provided insight into how users expected the website content to be organized. The usability consultant prepared the card sort by taking terms from the top, second, and third level pages of the site in use. Library staff added a few additional terms that were not on the current site, but which provided some useful options for the test. This resulted in 54 cards. Six participants were recruited, including undergraduate and graduate students, and staff representing the different departments the library serves. The participants were asked to sort the cards into groups that made sense to them. They were then asked to label each of the groups of cards by writing an appropriate label on blank cards. The consultant directed the tests, while two library staff monitored. Upon completion of the testing, the consultant provided the library with the test data and a brief report on the results, including a proposed content grouping for the site.

The consultant based the content grouping on the similarities in how five of the participants organized the cards. (One participant's results were rejected because they differed so significantly from those of the other five.) The remaining five participants generally divided their cards into four content groups:

(1) a library information and services group;

(2) an information resources group;

(3) a specialized resources group; and

(4) a miscellaneous group.

The library information and services group included terms related to library information and policies, special services, reference assistance, and forms. The information resources group included terms related to databases, indexes, dictionaries, and image and video resources. The specialized resources group included patent information and dissertation resources. The final group included such items as useful links, building services, career information, and site map.

Paper prototype

Paper prototyping is a useful and efficient testing method for determining the effectiveness of proposed nomenclature, organization, and layout before implementation begins. For this test, paper prototypes were created of the home page (Figure 2) and a variety of lower level pages using the information on content

organization obtained from the card sorting test. Based on discussions with the consultant, ten tasks were created and divided into two sets – one set for participants from Aart and Architecture and one set for students from Engineering. This allowed tasks to be tailored somewhat to the participants' backgrounds, although each set of five tasks covered similar basic information needs such as circulation services, finding assistance and searching for library materials. In this testing phase, eight participants were recruited from a variety of departments and included undergraduate students, graduate students, and departmental staff. The usability consultant created the testing materials, which included raw data sheets and follow-up questionnaires for each task. The consultant talked to the participants during the testing and led them through the tasks and follow-up questions. A library staff member took notes on the raw data sheets, included time, path taken, problems encountered, and other observations. After all of the tests were completed, the usability consultant compiled the data and provided the library with a report on the results of this test.

AAE Library staff were impressed both by the unpredictability of the testers' strategies and by what was learned from participants' experiences. Participants were successful in completing all but one task, and completed most tasks in less than one minute. Interestingly, all of the participants found alternate paths from the optimal path to answer some questions. Some labeling choices created confusion while others received positive feedback: for example, the label "Borrowing Materials" caused confusion for most of the participants, as it did not suggest checking out books. As a result, this label has been changed to "Checking Out Books, etc.". The label "Your Library Account" also caused some confusion. Some participants liked this label, while others were looking for the term "My". Some participants also expected this kind of information to be located on the upper right of the web page like many commercial sites, such as Amazon.com. For the present, the label has been left as it is, and an additional "Your Account" link to the top right of the website has been included. The choice of the heading "Research Tools" over links to index databases and other information sources received favorable comments from a number of participants. Interestingly, this is a case where the library staff's knowledge of the AAE Library users was important in choosing the best terminology, despite the concerns of the usability consultant who felt that the term might prove too ambiguous.

Finished prototype and follow-up testing

When the website was completed, the AAE Library conducted a usability test on the finished prototype before public roll-out of the new site. The usability consultant was not actively involved in this test, but provided feedback during the preparation of the test and allowed use of the testing forms that had been provided during the previous test. For this test, seven tasks were devised that represented a typical range of information that AAE Library users would try to find on the website. Six participants were recruited for this test, including both graduate and undergraduate students from a variety of disciplines.

One and a half years after the redesign, another usability test was conducted using these same seven tasks. A new group of ten participants was recruited, including undergraduate students, graduate students, and a faculty member from a variety of disciplines. Some minor changes had been made since the implementation and follow-up testing would help determine the effectiveness of the site (Figure 3).

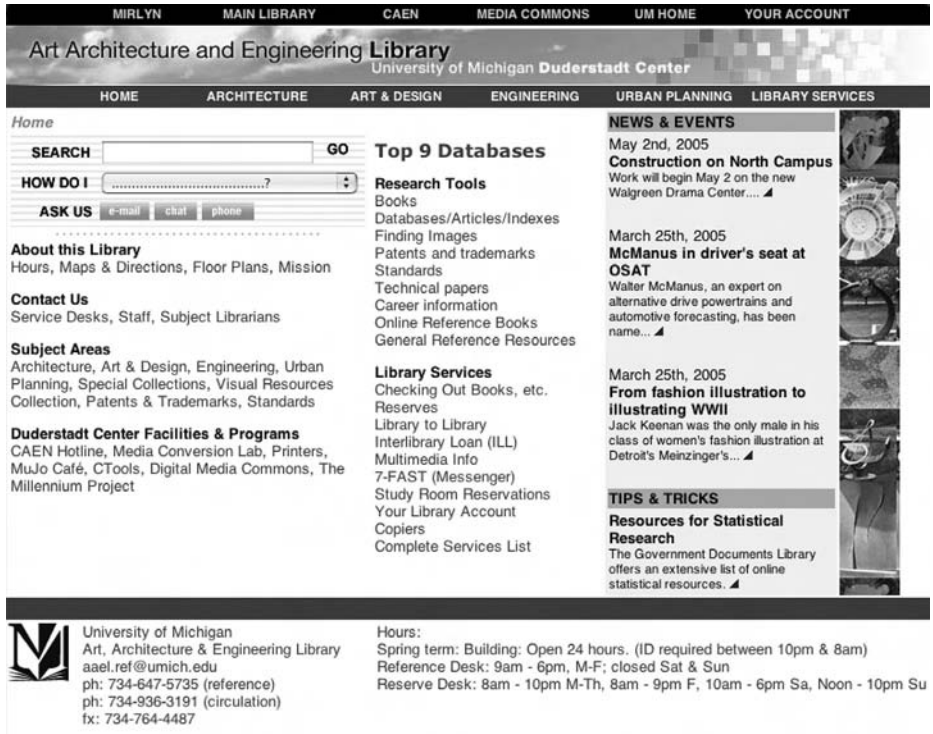

Figure 3.
Current Art, Architecture & Engineering Library home page

There were a number of differences noted between the first and second round of the testing. Interestingly, the users tested in the second round had a much harder time with a question about how to find the place where they could convert a video to digital format. Five of six testers in the first round got it right on the first try, whereas in the second round of testing seven of the ten users started off on the wrong path and six of those seven were unable to find the information on the website. The false starts of the second group may be a result of the fact that the first testers were familiar with the old site and were able to map that knowledge to the new site, or there could be another explanation. Because of the confusion of this terminology, this is an area that needs to be retested until an effective way to convey this information is found.

One interesting observation made between the first and second tests was the difference in the use of the search function. In the first round, only two of the six testers used the search function, and only on two tasks, whereas in the second round of testing, seven of the ten testers used the search function on at least one task, with two users opting to use the search function more frequently. Unfortunately, most users did not understand that they were searching the library website, rather than the entire web or the library catalog. The high and often ineffective use of the search function shows the need for a search feature and indicates that its scope needs to be clearly identified.

Conclusions: working with usability consultants

Working with the Duderstadt Center's Usability Support and Evaluation Lab allowed the AAE Library to take advantage of local experts and helped ensure that the website redesign would be functional and useful for patrons. Expectations that the consultants would bring knowledge and experience beyond the library setting and provide an unbiased viewpoint were met, although it was necessary to work closely and communicate often with the consultant. While the consultant was an expert in usability tests, it soon became apparent that the librarians were the experts when it came to understanding the content and to knowing what users needed. With this realization, the librarians took a leading role in determining the content for the tests and with the help of the usability consultant, created a testing structure that is reusable. Assuming a partnership role in the testing process brought results that were relevant, and that led to a substantive understanding of the dynamics of the website.

Given the increasing importance of a library's web presence and the multitude of electronic resources through which users must navigate, it is important for librarians to appreciate the value of usability testing, and using a professional usability consultant may provide a valuable foundation. As the AAE Library moves into the future, website usability testing will be repeated periodically and changes will be made to the site as needed by our users and as permitted by the CMS structure. The AAE Library exists within a cluster of four satellite libraries, and the site will next come up for a complete overhaul in two years, and by then the main library anticipates implementing a library-wide CMS system. At that point the library staff will evaluate how best to approach needed changes given the new library web environment. The lessons learned with the usability lab, to listen to users by testing the site and to trust librarians' instincts and expertise, will guide development in the next stage.

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Usability testing and design of a library website: an iterative approach

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Abstract

Purpose – The purpose of this paper is to provide a case study of the usability studies used by the Carnegie Mellon University Libraries during the redesign of their website.

Design/methodology/approach – The Libraries used a web-based survey to determine needs, proceeding to the prototype design, and completing the process with the final design and user testing. Think-aloud protocols, used to determine the strengths and weaknesses of the final design, asked participants to verbalize their thoughts as they completed a series of tasks.

Findings – The results of the protocols indicated several key weaknesses with respect to navigation, screen design and labeling, leading to more revisions and the final release. Testing indicated that color and graphics attract attention; font, labels, and placement increase visibility; chunking and leading with keywords increase readability; and consistency increases usability.

Research limitations/implications – This is a case study and therefore not necessarily representative to the general population of library website design efforts.

Practical implications – This paper describes several methods of gathering feedback during website design or usability testing with an emphasis on think-aloud protocols.

Originality/value – The techniques used here may be useful to others who are approaching redesign and usability testing of their own sites and interested in creating a user-centered design.

Keywords Academic libraries, Worldwide web, Design, User interfaces, Tests and testing

Paper type Case study

Introduction

The services provided by university libraries have extended well beyond those offered at an on-site facility. As the demand and consequently number of online journals, books, materials, services, collections and search options continues to increase, off-site use increases. The website has become a significant aspect of the libraries and the services they provide, with over 60 percent of students at Carnegie Mellon conducting their research in areas outside the library. The design, usability, and functionality of the website are critical if the Libraries are to continue providing essential services to their patrons in a timely and efficient manner. Responding to feedback from users and the Libraries' faculty/staff, the Carnegie Mellon University Libraries began an extensive redesign of their website, using a number of different methods in the process.

This effort, begun in 1999, is still in progress, although major changes have been completed. A range of measures and teams were used to design, evaluate and produce the current design. The first step was a needs assessment of the then current site using a web-based survey of users and seeking feedback that provided a basis for improving the site to meet the needs of the patrons. Next, a multidisciplinary team of students from the Human-Computer Interaction Institute (HCI) from Carnegie Mellon designed a student-centered prototype using an iterative research and evaluation process. Using

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this prototype as its starting point, the Libraries' Web Development Committee, along with the Library Information Technology department and input from library employees, created the final redesign for the site. Each step of the design process was an iterative approach of user feedback, design, and redesign drawing on user testing and feedback to measure the value and usability of design changes. This paper summarizes these efforts with a focus on the user testing of the final design.

Needs assessment – web-based user survey

Before proceeding with a redesign of the website, the Libraries conducted a needs assessment using a web-based survey. The 21-item survey, a paper and pencil design distributed in the Libraries and an electronic version available via the Libraries' website, was available to all Carnegie Mellon students, staff, and faculty. The survey of multiple choice and rating scales gathered feedback about navigation, visual elements, search options, databases, usability and functionality, with one open-ended item for suggestions and comments (see Appendix 1). Of the 367 eligible surveys, 90 percent were electronically entered.

Results

- Over 80 percent of responses were evenly represented by undergraduate students and graduate students, while faculty and staff represented the remainder. Nearly 80 percent accessed the website either daily (24 percent) or weekly (54 percent) using Internet Explorer or Netscape (99 percent).
- Most (82 percent) reported using the reference materials either often or very often, with library services accessed second (56 percent).
- Information was reported as above average in usefulness and supportive of research. Links to outside information were good.
- Most (80 percent) rated the vocabulary as above average, though some indicated that labeling was unclear. Only 40 percent rated visual appeal above average, with responses indicating that the front page would benefit from a simple, clear, uncluttered design in addition to better organization of links.
- Infrequent users might have some difficulty finding information and determining "where I have been and where I can go". Some indicated getting "stuck in a loop".
- Responses indicated a desire for an option to customize the site and improve functionality of Cameo (the library's online catalog), the organization of links, navigation, and searching the databases.

Design indications

- Focus on a simple uncluttered design; reorganization of links focusing on the reference areas; re-label for consistency and clarity; use color, fonts and positioning for emphasis.
- Re-categorize the links, create a global navigation system for a cohesive look and to provide a consistent exit from page, provide a site map and search the site option, provide librarian e-help throughout the site and improve functionality.
- Improve functionality of Cameo, provide a guide to using the databases and using the libraries' other references resources.

Based on the results of the online survey, the Libraries proceeded with a redesign of their website and, with the help of the Computer Science department, created a prototype design.

Prototype design and user testing

The design of the prototype was a collaborative effort between the University Libraries and the Human-Computer Interaction (HCI) Institute. An interdisciplinary team of five students in the final year of study led the project (Anderson *et al.*, 2001). The goal was to create a user-centered interface, enhance usability, and expand resources of the Libraries' website.

The prototype development consisted of three design phases:

(1) *ideation* – creating a plan based on the client's resources and analysis and evaluation of options;

(2) *architecture* – designing the technology, developing plans for building the elements, and systematically testing for usability; and

(3) *iteration* – building and testing the systems and processes while acquiring feedback from users.

Using heuristic examination, interviews with students and librarians, and think-aloud protocols, the team's initial findings and basis for the design included:

- over 60 percent of students reported using the library resources outside of the library;
- many students had difficulty navigating the website due to disorganized categorization: lists were sometimes unrelated items thus contributing to the confusion;
- many reported that the labels used on the front page didn't make sense: only 40 percent of students could correctly identify all 50 links with the content they provided; and
- students were not familiar with the extent of information on the libraries' website and indicated a need for easily accessible help.

The team focused on re-labeling and categorization, persistent navigation using global headers and footers, site consistency personalized to meet student needs, a clutter-free home page that used buckets, blocks of information in a right sidebar used for short bits of supplemental and sometimes short-term information such as features and news, and a global template that could be used on interior pages. To compensate for a lack of face-to-face communication with librarians, the team strove for clarity, efficiency, and easy access to electronic help. They conducted three iterations using think-aloud protocols to gather feedback and tested several different navigation bars, organizational links, etc. to create the final prototype design.

Final design – think-aloud protocols

Findings of the web survey supported the findings of the HCI team's research: both asked similar questions in a different way. The questionnaires surveyed a large group of users while the HCI team asked similar questions in a series of interviews and think-aloud protocols. Both indicated a redesign of the home page with an emphasis on

the most used areas, re-labeling and reorganizing the links, and creating a simpler, less cluttered look. Using the HCI prototype as a starting point, the libraries created the website design. This final design was tested before final release using think-aloud protocols described in this section.

Procedure

Think-aloud protocols were used to evaluate the functionality, usability, strengths, and weaknesses of the site and to make recommendations for revisions, if necessary, based on the feedback. Each session, approximately 30-45 minutes, was audio-taped with the consent of the participant. After piloting the tasks and making revisions, the live site was tested with representatives of the user community.

Nine participants were self-selected from a group who completed the Libraries' web survey and who expressed an interest in participating in further user testing. They included three males and four females; four undergraduate students, three graduate students, one staff member, and one faculty member. Computer expertise varied from average (2), good (3), to very good (4). Four had a non-English first language. Major study areas or departments included Arts (2), Business (2), Engineering and Sciences (4), and Humanities (1).

Using a live prototype of the redesigned website, participants were asked to verbalize their thoughts as they completed a series of tasks as directed by the researcher (see Appendix 2). Thinking aloud provided a mental model of the participant's use of the prototype and allowed a better understanding of how the prototype functioned (Nielsen, 1994). Early works in think-aloud protocols, most often attributed to K. Anders Ericsson and Herbert Simon (Ericsson and Simon, 1984), suggest a connection between thinking and verbal reports – thinking aloud. Verbalizing thoughts while completing tasks eliminates the need to rely on long-term memory that is necessary when asked to explain behavior after the task has been completed, thus providing a more accurate account of behavior (Ericsson, 2002).

The tasks were evaluated based using a rating scale developed by Jakob Nielsen that considers three factors:

(1) the frequency with which the problem occurs;

(2) how difficult is it for the users to overcome; and

(3) the persistence of the problem, i.e. whether it is a one-time problem or frequent occurrence (Nielsen, n.d.).

The researcher provided help only when the participant reached a roadblock and testing for the specific task was halted. The tasks continued through the website. The rating scale was as follows:

- 0 = I don't agree that this is a usability problem at all;
- 1 = cosmetic problem only: need not be fixed unless extra time is available on project;
- 2 = minor usability problem: fixing this should be given low priority;
- 3 = major usability problem: important to fix, so should be given high priority; and
- 4 = usability catastrophe: imperative to fix this before product can be released.

Visual display and screen design

The first tasks evaluated the effect of the front-page objects by asking users to state what they saw first and identify the actionable links. Because reference to these tasks might affect the users' behavior on following tasks, only four participants completed the following tasks:

1. Describe the first item you notice on the page. What do you notice next? ($n = 4$, rating: 0).
2. Using the mouse, show which elements are actionable or clickable ($n = 4$, rating: 3).

Observations

- Participants noticed objects with color (header) and images (photo) first and moved from left to right and top to bottom.
- They noticed the links as follows: all indicated the main sections, two indicated the header, all mentioned as least some of the links in the buckets, and two indicated the footer links. When searching for information, buckets and headers were often overlooked or searched last.
- All participants commented that they liked the design and thought it looked less cluttered and appeared user-friendly.

Discussion and response. Because the main navigational links were obvious to the user, no changes were made. The movement through the page suggests that important elements should appear in the main section. Color, graphics and placement can be used for emphasis while the buckets can be used for further and temporary information i.e. What's New, special collections, etc.

Cameo, the Libraries' catalog

The first section of the home page titled "Search" included links to Cameo, to the databases, and to other library catalogs. These are important links to the Libraries' holdings, so it was important that all participants complete the tasks successfully. The following three tasks were used to test the links:

3. Find out if the library has the book *The Art of Digital Photography* by Tom Ang. Return to the home page (rating: 3).
12. Find the database NetLibrary. Return to the home page (rating: 0).
15. Using this Website site, log in to the University of Pittsburgh's library catalog? (rating: 3).

Observations. Though participants had no problems finding the database links, some had problems finding the link to the Libraries' catalog and the link to other library catalogs. A freshman and a junior who still had a great deal of trouble finding the Libraries' catalog had not used the catalog frequently and one was not proficient in English. Comments included:

> I'm looking for a place to type in words.

> I'm used to using a … search box. Sometimes I get impatient to look for something and to look for the link, and I just go to the search box and type in the word or whatever.

Discussion and response. Responses indicated a need to make the catalog more obvious to new and infrequent users. As shown Figures 1 and 2, the label in the prototype was "Cameo", an unfamiliar word to new or infrequent users. The label was changed to more familiar terminology, the font was enlarged, color was used for emphasis and it was placed at the top of the home page as shown in the final version.

Research Help

Though less frequently used than the catalog and the databases, the "Research Help" links also are an important service and directly related to the research work of patrons. The "Research Help" section has two main divisions – the General/Reference Shelf and the subject-specific research help. The subject-specific pages have six classifications. All seven links in this section are treated with the same level of importance. The following tasks were used:

> 4. Find additional resources and help relating to a project you're working on for an Architecture class without using the library's catalog or the databases (rating: 2).
>
> 9. Find a page in the site for dictionaries, encyclopedias, etc. Return to the home page (rating: 2).

Discussion and response. Only minor problems were detected on these tasks: two participants had some trouble finding the research help by subject and two had minor problems finding the dictionaries, etc. located on the general reference pages. After this study another item, "ARF – Automated Resource Finder", was added to the list. No revisions were necessary though because the list now includes eight links, the following suggestions might be considered for future redesign:

- To make scanning the list easier, create three main classifications (see Figure 3). This creates a visual separation between the main classifications and the subject-specific links.
- Using a smaller font for the subject areas links and indentation will help to differentiate them from the main classification areas. Both lists are more easily scanned.

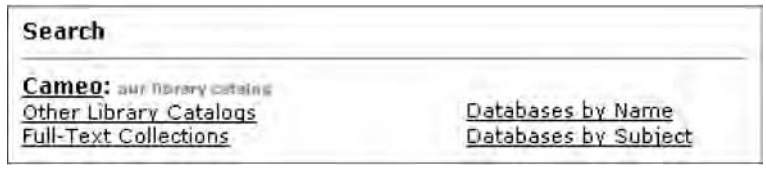

Figure 1.
Library's catalog link: Cameo in prototype

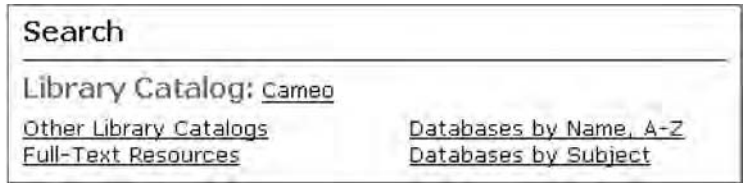

Figure 2.
Library's catalog link: Cameo in final version

Figure 3.
Research help: final version and suggested listing

User services

The user services section includes links to information about the Libraries' services such as borrowing and renewing, interlibrary loan, and managing accounts. It also includes other services available to patrons such as managing accounts. The following tasks were used:

> 11. Check your account to find out about such things as overdue books, books on hold, or to the change pin? Return to the home page (rating: 3).
>
> 7. Show me what you would do if you would like to borrow a book that is held by another library and have it delivered to one of Carnegie Mellon's libraries. Return to the home page (rating: 0).

Discussion and response. Though participants had no problems finding the "Interlibrary Loan" links and successfully completing task 7, they did have problems finding the link to account information as described below:

- Three participants had problems locating the correct page for account information. Two went to the "Borrow and Renew" page but couldn't find the correct information located in the bucket. All three had to use the site map to eventually find the correct link.
- Three participants suggested that the "User Services" link that leads to account information should be directly accessible from the home page.

To address these problems, the "Borrow and Renew" page of the website was redesigned for clarity and readability. Important links are now in the main section, the first place users look, while supplemental links and information are in the buckets. The top of the page (see Figure 4) shows that the "Manage Your Library Account" link with descriptive information is the first link in the main section of the page, making it easily visible.

Chunking of information, displaying information in small bits, and leading with links enables a quick scan of the page while users search for appropriate help. For future redesign the Libraries might consider adding "Manage Your Library Account" link to the home page in the header or to the list of "User Services".

Buckets

Buckets, blocks of information on the right sidebar, were designed to accommodate changing information, i.e. news, information sources. One task tested buckets on the front page, and the second tested the bucket information on the "Architecture" page, one of the subject specific research help pages. The following tasks were used:

> 5. Can you find help for the specific course titled "American Built Environment since 1860" with one click? Return to the home page (rating: 2).
>
> 8. Find a tutorial offered on the Website site. Return to the home page (rating: 2).

Observations. Minor usability problems were detected with these tasks. Participants examined the main section first and then continued to examine the page until they found the buckets. Once they found information in the buckets, they were more likely to continue to look at buckets on other pages. Some links were not obvious. One user, referring to the vertical line before the buckets, said:

> . . . this line really separated me from the right side of the page because I wasn't looking at that at all.

Another commented:

> This side [pointing to the main section] looks all neat and clean and this looks a little bit cluttered.

Discussion and response

- The results indicated that important information or links need a permanent place in the main section on the front page or lower level pages. Buckets can be useful in featuring new items and contact information.
- The redesign (see Figure 5) strives to keep bucket information (text) minimal: begin with keywords and links, and use bold font or color to aid in scanning and increase visibility.
- The redesign strives for consistency in font color and size, bucket labels, placement of links (preferably at the beginning of the text), and simple design. Consistency throughout the site is not only visually pleasing, but decreases the learning curve.

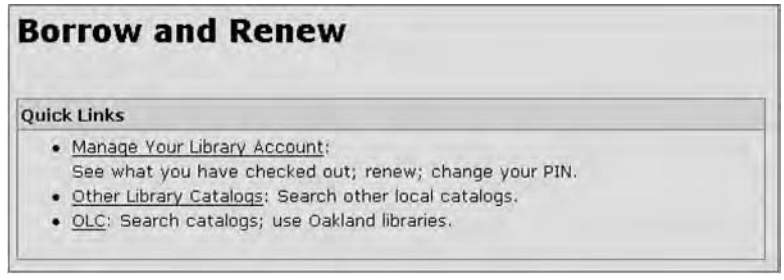

Figure 4.
"Borrow and Renew" in final version

Figure 5.
Buckets in the final version

Home page header
Interestingly, when participants were asked what they noticed first, they mentioned the header, but when asked to find the link "Ask a Librarian", which is located in the header, some had problems, though no-one had problems finding the site map, also in the header. The following tasks helped to point out these discrepancies.

6. Find online help to develop search terms from a librarian? Return to the home page (rating: 3).

13. Find an overview of what is included in the site. Return to the home page (rating: 0).

Observations

- Links commonly included in headers (e.g. site map) posed no problems, though links like "Ask a Librarian", which are unique to libraries, were difficult to find. Regarding the header links, one participant said: "It would be something to highlight . . . they did blend in".
- Another participant pointed out that the other links (Cameo, site map) were in other places in the site, while "Ask a Librarian" is only in the header.

Discussion and response. In the revision the links in the header that are unique to libraries, e.g. "Ask a Librarian", were included in the header and also within the main section as a main or secondary link. The "Ask a Librarian" and "Cameo" link were also included under User Services. Under consideration for the next redesign are the following:

- to make header links more prominent and readable to visually impaired, use buttons that have a light font on a dark background or dark on light; and
- using an icon for "Ask a Librarian" or a search box for "Cameo" (library catalog) will add additional emphasis and draw attention to the links.

University Archives and full-text materials
Though other research pages were linked from the home page in the category "Research Help", the University Archives section and the full-text collections available

from this page were accessed from an interior page. Some services provided by University Archives were also be accessed through other pages. Both methods of access were tested to determine if they were sufficient. The following tasks were used:

> 10. The website has full-text collections of archival materials highlighting the achievements of notable individuals. Find the Herbert A. Simon Collection. Return to the home page (rating: 2).
>
> 14. Find out about the services provided by the University Archives. Return to the Home page (rating: 2).

Observations. Though three participants had slight problems finding the University Archives, only one had significant problems. Only two participants had problems finding the Simon Collection, one of the full-text collections of archives (some clues were provided in the task statement). Those having problems tried to access the collection from the "Libraries and Collection" page. This path is a little longer, providing more opportunity for error.

A greater concern might be that patrons will not be aware of the vast services offered by the archives and the University Archives because this department link is hidden on an interior page. To get to the University Archives users had to follow this path:

> Libraries and Collections → Archives → University Archives.

Users also must be aware of the special collections housed on the site in order to find them or even know to look for them. For the tasks most went to the "Libraries and Collections" page and followed this path:

> Libraries and Collections → Archives → University Archives → Simon Collection.

Discussion and response. Two problems were detected as a result of the tasks:

(1) the University Archives and digital collections are not visible on the home page or on the pages as expected by the user; and

(2) the path to the collections was difficult to follow.

To address these problems the following adjustments were made:

- The archival digital collections are now featured on the "Libraries and Collection" page in the right sidebar. The links' labels are emphasized with a bold font and located the top of the right sidebar in a bucket labeled "Digital Collections". The tasks indicated that this is the page where users expected to find the collections.
- To alert users to the new digital collections, some are featured in the buckets on the home page on a rotating basis.
- The "University Archives" link continues to be available from the "Libraries and Collections page". Including a link to the University Archives on the home page will provide more visibility.

Comments and suggestions

Following the protocols, participants were asked to comment on what they liked or disliked about the site, and if they had suggestions or comments. This section provided

some insight into the reactions of the participants about elements not covered during the tasks: the following is a summary of these comments and suggestions.

What did you like about the site?

Many participants said they liked the redesigned site. They said that it was cleaner, clearer, more organized, appeared user-friendly, headings are bolder, and color is better:

> The site is well-organized. It looks better that the old one.
>
> It's not as busy as the other page was. It's a little more user friendly, has a photograph, Cameo at the top, which is good.
>
> I think the site is very clear, it's simple; it doesn't look complicated.
>
> I like the bold headings, the general headings that pulled me in.
>
> I like the colors better. The last time the colors were green and this time they're like the university colors.

Links to services are more obvious (e.g. "Ask a Librarian" and course-related research:

> The services are more obvious. More links to course related research/books is a good idea.
>
> I really like the Ask a Librarian. Depending on how fast they can get back to you, I think that's very valuable, when I'm at home, I really think that's great.

What do you dislike about the site?

Some links are still not obvious e.g. header links and the library catalog (Cameo) link:

> The one thing that I would change is that I really didn't notice what's on top in the banner. It would be something to highlight, but they did blend in.

Some had problems with usability and design of the Cameo interface (e.g. the back button, Cameo website page design):

> There's something wrong with the Back button in Cameo.
>
> The Cameo website page, the search page is not user-friendly at all.
>
> Cameo is probably what 90 percent of users use, and the interface is pretty ugly.

Some felt that the buckets were cluttered and difficult to scan:

> Maybe the right side with the links and What's New, maybe something could be done about that … this looks a little bit cluttered.
>
> It's hard to go through the buckets. Generally I would ignore most of the minor parts if it's not in the main part here.

Conclusions

Though no major problems were detected using the think-aloud protocols, some weaknesses surfaced that led to design changes and increased the usability of the site.

The protocols also provided some insight into how users navigate the site and what they consider priorities in the design. Major findings include the following:

- Users navigate from top to bottom and left to right. Color and graphics attract their attention. They expect to find conventional links in the header, e.g. site map and logo, but do not look to the header for links unique to the site.
- Font size, color, labels using common terminology, location, and spacing increase the visibility of important links such as Cameo, online assistance, and user services.
- Chunking information in sidebar buckets, placing keywords and links at the beginning of the text, and limiting descriptive text improves the visibility of the links or keywords in the bucket enabling quick scanning.
- Consistency in the form of global design, header, footer, and labeling decreases the learning curve for users and increases the usability of the site. This also increases usability for returning users, that is, once they learn to navigate the site, remembering the location is easier.
- A global header is useful in providing users with a sense of place, that is, where they are and how to get home, and is important to navigation.

Though the procedure was lengthy, used a number of different methods and involved a diverse group of people including library personnel, students and a design team, the results were worthwhile. The iterative process of user feedback, design, and user testing was necessary to provide user-centered services via the website. Currently, the Libraries are working on consistency in design and re-labeling on the interior pages. User testing will be useful on problem areas.

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Appendix 1

Please fill in the circle beside the response that best describes you or your use of the Website site.

1. What is your affiliation with Carnegie Mellon University?
   - O Undergraduate Student
   - O Graduate Student
   - O Faculty Member
   - O Staff
   - O Alumnus
   - O Visitor
   - O Other _____
2. How did you find out about the site? Mark all that apply.
   - O Carnegie Mellon home page
   - O Library workstation
   - O Search Engine
   - O Faculty member
   - O Library staff member
   - O Friend
   - O Other_____
3. In the last six months, **approximately** how frequently have you visited the Library Website site?
   - O Daily
   - O Weekly
   - O Monthly
   - O Less than once a month
   - O Never
4. What browser do you **usually** use? Mark all that apply.
   - O Internet Explorer
   - O Netscape
   - O Opera
   - O Other_____

Please rate the following by circling a rating from 1 to 5 with 5 as the highest rating. Circle NA for Not Applicable or Don't Know.

I use the Library Website site . . .	Frequency of Use					
	Very Often				Almost Never	NA
5. For accessing library catalogs, databases, reference materials, full-text books, journals, newspapers, etc.	5	4	3	2	1	0
6. For general information about services: reference, borrowing, reserves, Interlibrary Loan, etc.	5	4	3	2	1	0
7. For libraries' hours, job opportunities, copyright information, What's New, etc.	5	4	3	2	1	0
8. For information about staff, archives, the Carnegie Mellon Libraries, Oakland Library Consortium, etc.	5	4	3	2	1	0
	Very Clear				Confusing	NA
9. The vocabulary used on the Website site is	5	4	3	2	1	0
10. The information offered on the Website site is	5	4	3	2	1	0
11. How useful is the Website site is for your research?	Very Useful				Not Useful	NA
	5	4	3	2	1	0
12. How useful is "Search This Site", the option to search for things that are available on the site.	5	4	3	2	1	0
13. Librarian assistance on the Website site is	5	4	3	2	1	0
14. The visual appeal of the Website site is	Excellent				Poor	NA
	5	4	3	2	1	0
15. Links to outside information are	5	4	3	2	1	0

Figure A1.
Website user survey

Appendix 2

Tasks	To determine if . . .
1. Describe the first item you notice on the page. What do you notice next, and next? Participants 1, 2, 3 9 only	. . . major items are easily recognized
2. Using the mouse, show which elements on this page are actionable or clickable. Participants 1, 2, 3 9 only	. . . the links on the page in the navigation bar and the footer, within the page and in the buckets are recognized
3. Find out if the library has the book *The Art of Digital Photography* by Tom Ang. Return to the home page	. . . participants can find and use the online library catalog and return to the "home" page
4. Find additional resources and help relating to a project you're working on for an Architecture class without using the library's catalog or the databases.	. . . participants are aware of additional resources and the reference librarian available in their content field in "Research Help". Are participants aware of the information in the buckets?
5. Can you find help for the specific course titled "American Built Environment since 1860"? Return to the home page.	
6. Find online help to develop search terms from a librarian? Return to the home page	. . . participants find and recognize the objective of the link "Find a Librarian". If participants fail to complete Item 4, then try optional. This item will observe if participants can find the link
7. Check your account to find out about such things as overdue books, books on hold, or to the change PIN? Return to the home page	. . . participants can find and use the personal account services available on the website
8. Find a tutorial offered on the website. Return to the home page	. . . usability of buckets
9. Find a page in the site for dictionaries, encyclopedias, etc. Return to the home page	. . . . participants can find and use the Virtual Reference Shelf (or other reference materials) in the virtual reference shelf. Desired action: General/Reference Shelf → Almanacs, Dictionaries . . . Back or Home
10. The Libraries' Website site has full-text collections of archival materials. Some highlight the achievements of notable individuals. Find the Herbert A. Simon Collection. Return to the home page	. . . . participants can find the special online collections and return Home
11. You would like to borrow a book that is held by another library and have it delivered to one of Carnegie Mellon's libraries. Show me what you would you do in this site to borrow this book? Return to the home page	. . . . participants are aware of the services provided by Interlibrary Loan
12. Find the database NetLibrary. Return to the home page	. . . . participants can find the databases. Desired action: Databases by Name → N → NetLibrary Back → Home
13. Find an overview of what is included in the site. Return to the home page	. . . . participants can find the Site Map
14. Find out about the archival collections and what services the University Archives provide. Return to the Home page	. . . participants can find the University Archives and the services provided by archives
15. Using this website, how would you log on to the University of Pittsburgh's library catalog?	. . . participants are can find the links to other library's catalogs

Table AI.
Think-aloud protocols: tasks

The Emerald Research Register for this journal is available at
www.emeraldinsight.com/researchregister

The current issue and full text archive of this journal is available at
www.emeraldinsight.com/1065-075X.htm

Usability analysis of Northern Illinois University Libraries' website: a case study

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Abstract

Purpose – To describe the process and present the findings of a usability assessment of the Northern Illinois University Libraries' website.

Design/methodology/approach – After significant planning, Northern Illinois University Libraries conducted a usability analysis using a trilateral approach: usability testing, focus group sessions, and survey questionnaires.

Findings – Quantitative and qualitative data are presented and discussed. Quantitative data does not adequately reflect what the test moderators and recorders observed during test sessions. Thus, qualitative data prove to be more valuable. Results were used to redesign the library's website.

Research limitations/implications – Questionnaire return rate was extremely low, and therefore these results could not be compared with the results of the other two data collection methods.

Practical implications – The detailed methodology section can provide guidance for other libraries considering performing usability test analyses.

Originality/value – This study utilized a unique combination of usability testing, focus group, and survey questionnaire data collection methods to solicit feedback from users. Discussion of the results leads to a new and important question for future research: what can usability testing reveal about patrons' level of information literacy skills?

Keywords Tests and testing, Academic libraries, Focus groups, User studies, Worldwide web

Paper type Case study

Introduction

The Northern Illinois University (NIU) Libraries' website design has undergone multiple revisions since its first inception. Starting in 1996, the Digital Library Committee, a group of librarians chaired by the library's webmaster, gathered at the end of each spring semester to discuss the virtues and shortcomings of the website. The results of these meetings frequently resulted in design changes, most notably in 2002 when the home page graphic was designed to look like a chambered nautilus shell. As depicted in Figure 1, the nautilus was divided into four main sections, each one representing an area of the site: Research, Services, Libraries, and Projects.

Patrons activated additional pop-up menu options by positioning the mouse arrow on one of the four sections. Many patrons, however, did not know they were supposed to do this, and never saw the pop-up menus. They concluded the nautilus shell was a static graphic and they looked for links or buttons to help them proceed to another page. Those patrons who did get the pop-up menus were aggravated by their constant flickering and quick disappearance from the screen.

In the late 1990s, the number of websites on the internet was growing exponentially. Technology was quickly improving and advancing, and web designers were

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Figure 1.
NIU Libraries' 2002 chambered nautilus home page design

experimenting with splash pages (pages that aren't functional and merely "set the stage" for the home page or provide a welcome message), animated graphics, mouse-over effects and elaborate graphic art. The chambered nautilus idea was born of these trends. Immediately after the launch of this new site, the library was inundated with calls, e-mails and verbal complaints from frustrated users. The library quickly reverted to its previous text-based design to calm the uproar. Following this failed design, the library administration encouraged the Digital Library Committee to change its approach to web development from "librarians know best" to a user-involved process. At the same time, the Vice Provost's office was offering funding for assessment projects. NIU Libraries used this as an opportunity to conduct website usability testing.

Literature review

There is an entire body of literature devoted to the practicalities of usability testing. Rubin (1994) promotes the user-centered design (UCD) philosophy, and describes five attributes common to organizations practicing UCD:

(1) a phased approach that includes user input and feedback at all crucial points;

(2) a multidisciplinary team approach;

(3) concerned management;

(4) a "learn as you go" perspective; and

(5) usability goals and objectives.

User-centered design theory shifts the focus away from merely validating a "product's" features and capabilities, and emphasizes the user's perceptions of usefulness and feeling of satisfaction.

Additionally, Rubin (1994) offers a detailed overview of the entire process including all aspects of planning, budgeting, test design and execution, as do Barnum (2002) and Dumas and Redish (1993). Norlin and Winters (2002) also provide an excellent "how to" guide aimed specifically at libraries and library staff who wish to conduct usability testing.

A fair amount of library literature exists on usability testing. Letnikova (2003) introduces an excellent annotated bibliography of usability assessment sources. Chisman *et al.* (1999), Augustine and Greene (2002), Dickstein and Mills (2000) and Battleson *et al.* (2000) present comprehensive case studies which include detailed descriptions of the planning and implementation phases of usability testing at their institutions. They also provide thorough data analyses and discussion of their results. Common website problems discussed in the findings include the excessive use of library jargon or terminology, an overabundance of information on opening pages, complicated or distracting graphics, poor site organization, and lack of breadcrumb trails. Web designers use the term "breadcrumbs" to describe navigational clues that show users where they are on a website. They trace the path the user has taken from the home page to their present location.

The case study authors emphasize how much they learned from the qualitative data analyses and praise the overall worth of performing usability analyses. Test results help webmasters develop design strategies that eliminate usability problems in later websites. Dickstein and Mills (2000) state it simply and well:

> Testing works [. . .] It ensures that the product works for those who will be its harshest critics – the users [. . .] Indeed, your users are the experts, listen to them.

The results of these usability projects can help interested librarians and staff present their administration with convincing reasons for performing website usability testing. Furthermore, institutions that have already decided to conduct usability assessment projects need not reinvent the wheel. They can benefit from the experience of those who have preceded them.

Planning

An appointed four-member subcommittee led the assessment project. Working with the Digital Library Committee, the subcommittee (henceforth the Usability Committee) developed two objectives for the usability testing endeavor:

(1) to identify the chief strengths and weaknesses of the existing site; and

(2) to incorporate the results and participant feedback into a redesign that was user-friendly not necessarily for librarians, but for patrons.

The Usability Committee wanted to test a wide range of users, from those who never or rarely used the library website to those who used it often. While the Committee received $5,000 in funding, they had only two months in which to spend it. The Committee decided, therefore, to implement a bilateral usability project comprised of individual usability test sessions and a series of focus groups led by a consultant. Despite usability expert Jakob Nielsen's (2000) dictum of testing no more than five

users to prevent repetitive observation of the same results, the Committee opted to test as many participants as possible in order to obtain as much qualitative feedback as possible. Volunteers would have the option of participating in the usability testing, the focus groups, or both. Usability sessions would provide concrete evidence of the strengths and weaknesses of the website. Focus groups would allow users a forum in which to voice positive and negative criticism of the site in more detail, as well as to provide input into what they want in their library's website.

At this time, the Usability Committee realized that since the staff and facility resources were located in Founders Memorial Library on the university's main campus, the usability tests and focus group sessions would all be held there. This, unfortunately, would severely inhibit participation by patrons at branch campus libraries. Not wanting to exclude this important population, the Committee chose to develop a survey questionnaire to be placed in the libraries of all branch campus locations (see Appendix 1). The combination of usability testing, focus groups, and surveys transformed this project into a trilateral one.

Using the theories and suggestions of Rubin (1994), Dumas and Redish (1993), and Norlin and Winters (2002), the Usability Committee developed a task list, modifying it several times in response to in-house pilot studies which identified ambiguities in the wording of some items. Appendix 2 shows the final task list, consisting of 11 items, each one representing a regular task for which a user would access the library website.

The Committee was careful to include tasks that tested only website content and structure that were within its control and could be modified in response to the assessment results. For example, tasks assessing the usability of the online catalog itself were avoided, because the NIU Libraries has a consortium-based integrated library system, meaning there are vendor- and consortium-imposed restrictions on what can and cannot be modified within the OPAC. Pilot testing on Committee members, library faculty and staff, and patrons who were also student workers, indicated that the maximum amount of time allotted to complete each test item should not exceed five minutes. Not only would this prevent the participants from "burning out", it would also keep the actual test time at about one hour or less (discounting the introduction and debriefing process).

The Committee next developed a consent form to be signed by all study participants. The form disclosed the purpose of the study, outlined how the Committee would ensure participant privacy, provided an "escape clause" giving participants permission to stop the test and leave at any time, and provided participants with contact information for two members of the Committee, as well as the University's Office of Research Compliance, should they have any questions or concerns after completing any phase of the study.

To ensure that all participants experienced the usability assessment in exactly the same way, the Usability Committee next composed scripts that were read to volunteers before and after each test session and/or focus group. This standardized protocol was developed in order to combat a common pitfall in experimental research known as "experimenter bias", whereby researchers unwittingly influence the behavior of their subjects (Corsini, 2001). The Committee rehearsed the entire usability test and focus group processes in mock sessions before the project commenced. With the usability planning portion of the project complete, the Committee was ready to prepare the focus groups.

The Usability Committee hired a professional consultant to help execute the focus group portion of the assessment. The Committee and library administration met with the consultant to discuss the goals and objectives of the project and how focus groups would help achieve these goals. In a later meeting, the Committee and consultant came up with eight open-ended questions to guide the focus group discussions. These questions are listed in Appendix 3.

To solicit volunteers, the Committee created fliers advertising the project to be placed in public buildings across campus. The fliers stated that each participant would receive compensation of $10.00 upon completing the usability test. Focus group participants would receive free pizza and soft drinks. The fliers had a series of tear-off slips at the bottom containing the name and phone number of the person to call to schedule a test or focus group time. The text itself also advertised the contact information in case someone happened to see it after all the tear-off slips were removed. To maintain privacy, the scheduler asked callers for their first names only, and assigned a random ID number to them. The scheduler affixed this ID number to a file containing all materials necessary for the subject's test session, including the questionnaire, videotape, and consent form. All participant consent forms were maintained in a separate file, since subjects signed their complete names.

Because the study involved research on human subjects, the Committee submitted the entire proposal, including all forms, advertisements, and questionnaires, to the University's Institutional Review Board (IRB) prior to beginning. The IRB recommended minor changes to the wording of the volunteer consent form, and upon its modification, approved the study.

Usability testing methodology

There were three components to the website assessment project. The first was a series of individual usability testing sessions in which a volunteer used the library's website to complete the 11-item task list. One member of the Committee conducted the test (the moderator), and another member was present to observe and take notes during each test session (the recorder). A Committee member met the test volunteer at the library's Information Desk and escorted them to the testing room since it was somewhat difficult to find. The testing room was equipped with a PC and adjustable chair. An audio-video camera was set up ahead of time and precisely positioned so that only the monitor display of the computer being used and the participant's voice were recorded. The sessions were taped for later in-depth review and statistical compilation.

The moderator welcomed the subject and asked them to be seated. The moderator then read the introductory script. The subject reviewed the informed consent sheet and signed and dated it, thus signaling his or her agreement to all points conveyed and desire to proceed with the test. The moderator placed the consent form in a sealed drop box. The moderator read the instructions to the subject and the test commenced. As part of the instructions, all participants were encouraged to speak aloud throughout the test, verbalizing their thought processes and rationale behind decisions.

During the session, the moderator noted the time the participant started and completed each task. Participants were told not to skip tasks and were occasionally reminded to speak aloud. The moderator told the participant to move on if he or she

had not completed any task after five minutes had elapsed. The recorder noted everything the participant said and all data he or she entered (mouse clicks, keystrokes, etc.).

Upon completing the final task, the moderator read the debriefing script to the subject, gave him or her $10.00 in cash, and encouraged him or her to ask questions and make comments about the test experience. The moderator next invited the subject to participate in the focus group portion of the study if interested. Undecided subjects received a phone number to call should they later decide to sign up for a focus group. Finally, the moderator invited the subjects to call the Committee chair if they wanted to participate in the planning and testing of future websites.

Focus group methodology

The second component of the project was a series of focus groups, jointly conducted by the hired consultant and the chair of the Usability Committee. Groups were comprised of a mixture of usability test participants and other volunteers. Participants were told the assigned room number and location when they scheduled their sessions. Upon arriving, they were greeted and offered free pizza and beverages. When all participants had arrived, the consultant (moderator) and Committee chair (recorder) introduced themselves to the group. Using their first names only, the participants then introduced themselves. The recorder read the introductory script outlining the purpose of the group, and the subjects signed the consent form. The moderator then proposed the first in the series of guided questions. The recorder took detailed notes on the responses the participants provided. A laptop connected to the internet was available for participants to use if necessary to clarify what sections of the website they were discussing, or to otherwise illustrate their criticism. Each session ran for about an hour to an hour and a half.

When the last question had been discussed, the recorder read the debriefing script and again provided participants with names and phone numbers to call should any questions or concerns arise regarding their participation in the study. The moderator asked subjects who were interested in participating in the planning and testing of future website designs to call the Committee chair after a certain date.

Branch campus survey methodology

Library staff at the branch campus locations invited library patrons to complete the survey and place it in a drop-box. The Committee chair sent e-mails to branch campus faculty asking them to announce the project in their classes. Faculty, staff and students who had cause to visit the main campus were strongly encouraged to call and sign up for a usability test or focus group session. The Committee asked branch campus library staff to return the completed questionnaires to them no later than May 1, 2002.

Results

A total of 62 subjects completed the usability test portion of the project. Overall, the results confirmed known weaknesses of the NIU Libraries' website: excessive use of library jargon, a home page that looked like a "wallpaper" screen, and complicated pop-up menus. The results also uncovered problem areas on the site of which the Committee was previously unaware, such as misleading wording on the personnel and

subject specialist lists. Furthermore, Augustine and Greene (2002), Battleson *et al.* (2000) and Chisman *et al.* (1999) indicated in their case study analyses that many patrons failed to successfully complete some usability tasks due to a lack of understanding of, confusion by, or unfamiliarity with library resources. The researchers of this study noted similar results and took the previous case study observations one step further. Using the quantitative and qualitative data, this author demonstrates that usability assessment offers surprising insights into the range of information literacy skills and approaches to research employed by many of the participants.

Basic quantitative statistics are deceiving, as demonstrated by Table I, which shows a success rate of over 50 percent on all tasks except 7 and 9.

The qualitative data is impossible to quantify but is nevertheless of great value. Post-test examination and analysis of the session notes and videotapes demonstrate that even when subjects found the correct answer within the allotted time, they experienced considerable problems in doing so. For example, 33 total subjects were able to find an article on the death penalty; however, 14 of those 33 used ABI/Inform (a business database) because it appeared first in the alphabetical listing of databases. Subjects did not utilize the subject pages, browse the alphabetical list of databases, or read the database descriptions to determine which databases might be more appropriate. Therefore, it is more revealing to present success rate data in two categories: "successful" and "successful with qualifications", as shown in Table II.

When broken down into three categories, the success rate is still over 50 percent for six out of the 11 tasks, but the combined numbers in the "successful with qualifications" and "unsuccessful" categories are of great concern. Were subjects truly successful if they completed a task only after trying every possible option on the website, or if they just happened to stumble across the correct section of the site? How much of the data in the "successful with qualifications" and "unsuccessful" categories can be attributed to poor website design, and how much might be attributed to a lack of information literacy skills?

Task (abbreviated)	Successful[a] (within five minutes)	Unsuccessful[b]
1. Own specific book?	55 (88.70)	7 (11.29)
2. Death penalty article	33 (53.25)	29 (46.77)
3. Education database	34 (54.83)	28 (45.26)
4. Academic Universe database	51 (82.25)	11 (17.72)
5. Own this print journal?	44 (70.96)	18 (29.03)
6. Own this e-journal?	31 (50.00)	31 (50.00)
7. Interlibrary loan request	21 (33.87)	41 (66.12)
8. Reference assistance	47 (75.80)	14 (22.58)
9. Art Librarian[c]	22 (35.48)	39 (62.90)
10. Library building hours[c]	53 (85.48)	9 (14.51)
11. Reference desk hours	50 (80.64)	12 (19.35)

Notes: Figures given in parentheses are percentages; [a]successful: subject located the correct information within the time limit; [b]unsuccessful: time ran out, or subject gave incorrect answer; [c]participant 002 did not respond to this question

Table I.
Usability test results: successful versus unsuccessful task completion

Table II.
Usability test results: successful, successful with qualifications, and unsuccessful

Task	Successful	Successful with qualifications	Unsuccessful
1. Own a specific book	40 (64.51)	15 (24.19)	7 (11.29)
2. Death penalty article	19 (30.64)	14 (22.58)	29 (46.77)
3. Education Database	17 (27.41)	17 (27.41)	28 (45.16)
4. Academic Universe Database	32 (51.61)	19 (30.64)	11 (17.74)
5. Own this print journal?	39 (62.90)	5 (8.06)	18 (29.03)
6. Own this e-journal?	29 (46.77)	2 (3.22)	31 (50.00)
7. Interlibrary loan request	11 (17.74)	10 (16.12)	41 (66.12)
8. Reference assistance	39 (62.90)	8 (12.90)	14 (22.58)
9. Art Librarian	6 (9.67)	16 (12.90)	39 (62.90)
10. Library building hours	45 (72.58)	8 (12.90)	9 (14.51)
11. Reference desk hours	38 (61.29)	12 (19.35)	12 (19.35)

Notes: Figures given in parentheses are percentages

For example, Task 7 required subjects to locate interlibrary loan request forms. Like many websites, the NIU Libraries' site fell into the trap of using a lot of library jargon. In this particular case it was worsened by the fact that the jargon phrase "interlibrary loan" was abbreviated "ILL". While speaking aloud, one subject pointed the mouse arrow to the "ILL Forms" link (the correct path for completing the task) and said, "Hmm. Illinois forms. Those must be tax forms or other state documents", and then moved on to investigate other areas of the site. The subject never clicked on "ILL Forms" to explore what was actually there and ended up running out of time on that task. This example illustrates a case of inappropriate use of jargon, and thus poor website design.

In contrast, 21 subjects attempted to locate an article through the online catalog, indicating that many users do not make a distinction between books and articles when it comes to performing research. Since the online catalog and research databases were clearly labeled under a broader heading of "Research" on the site, this example illustrates a lack of information literacy skills rather than poor website design. Analysis of the qualitative data collected during the focus groups again raises the issue of poor web design *versus* patrons' lack of information literacy skills.

Four focus group sessions were conducted, with four to eight participants in each group. Again, the data collected during these sessions proved to be invaluable, but difficult to quantify. For example, a review of the recorders' session notes indicated that most subjects agreed that the pop-up menus were frustrating, unstable (flickered and did not stay up on the screen long enough), complicated, and confusing. Many subjects also described the nautilus design on the opening page as attractive and sophisticated, yet deceptive. Upon not seeing any links, menus or other navigational tools at first glance, many subjects concluded that the opening page was wallpaper, and not functional at all. Furthermore, since there was no "site search" or "site map" option on the home page, subjects were unsure of what to do. Out of frustration they began moving their mouse around the page. Only then did the pop-up menus appear. Other comments by participants suggested that there was a rich but overwhelming amount of information available on the library's website: the four main sections with numerous pop-up menus made it difficult to know where to start.

Specific suggestions for improvement included reducing the number of clicks necessary to get to main areas of the site, such as the online catalog and research databases. Subjects further recommended designing an opening page with standard links as opposed to the pop-up menus and including a breadcrumb trail to easily move between sections. Finally, many focus group participants also suggested that the "Ask-A-Librarian" and other "Help" links be placed on every page.

Unfortunately, no branch campus faculty, staff or students participated in the usability testing or focus groups. The responses given to Questions 4 and 5 of the branch campus survey questionnaire supported what was learned in usability testing and focus group sessions – people at the branch campus found the site attractive but difficult to use. However, only five branch campus surveys were completed and returned, making further comparisons or generalizations impossible.

The Committee analyzed the combined results of the usability tests and focus group sessions and used them to guide the redesign process the NIU Libraries' website. Prior to launching the new website, a small sample of 15 volunteers completed the usability task list with a beta version of the new site, enabling designers to find and eliminate numerous coding errors. Once the errors were corrected, the Committee solicited feedback from additional beta testers. Finally, the site was ready to go live. Feedback received by the library after the new site was launched was extremely positive. Students, faculty and staff were pleased with the simplicity of the library's new home page and especially liked the navigational aids that were place atop each subsequent page. They applauded the multiple access points to "Ask-A-Librarian," appreciated the elimination of simple straightforward "natural language" the designers utilized. The problems inherent in the old website had been eradicated. Northern Illinois University Libraries has maintained the same site with updates and minor adjustments for three years.

Conclusion

The results of the usability studies of the NIU Libraries' website were extremely useful, and participating in the process was a worthwhile experience for the Committee members and test volunteers alike. Website usability testing is something that should be done by every library. Even small-scale and informal testing is within the means of most academic institutions, and would provide invaluable information, feedback, and insight. Incorporating what is learned through usability testing into website modification or redesigns leads to user-centered websites, which lead to more successful researchers.

Review of the recorders' notes during both test sessions and focus group sessions provided great insight into the strengths and weaknesses of the website and also offered cues as to how shortcomings might be improved. Close examination of the qualitative data, however, poses the greater question of how much of patrons' struggling or unsuccessful attempts at using the library website are due to poor or weak website design, and how much struggling could more fairly be attributed to lack of information literacy skills. This question is an excellent starting point for further research.

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(Appendices appear overleaf.)

Appendix 1

Please complete the following information and return to the library information desk before May 1, 2002.

1. I use the library web site:
   _____ Never
   _____ Occasionally (several times a month)
   _____ Frequently (more than once a week)
   _____ Daily

2. I primarily use the web site:
   _____ at the branch campus library
   _____ at the main campus library
   _____ at work
   _____ at home
   _____ other

3. Please rank your usage of the web site for the following purposes:
   [Scale: 1 – Frequently 2 – Occasionally 3 – Never]
   _____ to find books
   _____ to find journal articles
   _____ to use interlibrary loan
   _____ to find out library hours
   _____ to contact library personnel
   _____ other (Please describe in the space below)

4. Rate the ease of use of the library web site:
   _____ Very easy
   _____ Easy
   _____ Average
   _____ Difficult
   _____ Very difficult

5. What recommendations do you have for the web site?

Thank you for you feedback!

Figure A1.
Branch library questionnaire

Appendix 2
Usability task list
Use the NIU Libraries website to complete the following:

(1) Does our library have the book *Catcher in the Rye*?
(2) Find an article on the death penalty.
(3) Find a journal article on special education.
(4) Find the Academic Universe database.
(5) Does our library own the journal *Aztlan*?
(6) Does our library own the journal *Headache: The Journal of Head and Face Pain?*
(7) Request an article from a journal NIU does not own.
(8) If you need assistance on a research question, what would you do?
(9) Who is the Art Librarian?
(10) When does Founders Memorial Library (FML) open this Saturday?
(11) Is there anyone working at the General Reference Desk at 9.00 pm on Thursdays?

Appendix 3
Focus Group Discussion Questions

(1) What would you tell someone coming to campus for the first time about the library?
(2) How did you learn about the library when you arrived?
(3) How do you use the library?
(4) What are some strengths of the NIU library website?
(5) What are some weaknesses of the NIU library website?
(6) What other websites do you use? What features from those sites would you like to see included on the NIU library site?
(7) What's missing from the NIU library site?
(8) What other thoughts or comments do you have?

Library homepage design at medium-sized universities

A comparison to commercial homepages via Nielsen and Tahir

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Abstract

Purpose – Website design guidelines which have proven effective throughout the commercial sector could be adapted for library homepage design. Acceptance of industry standards for homepage usability, specifically Nielsen and Tahir's criteria, would give library users recognizable features and increase their confidence and comfort levels when using library websites. The paper aims to present a comparison of library homepages with these criteria to provide an assessment of how libraries fare in comparison with the commercial sector.

Design/methodology/approach – Little research has been undertaken to evaluate the appeal and efficacy of homepages of libraries associated with medium-sized universities, which have different audiences than do larger universities. The dataset of 80 academic libraries associated with medium-sized universities (8,000-13,000 students) was compiled with data from the National Center for Education Statistics and Peterson's College Bound. Data on 14 variables derived from Nielsen and Tahir were examined on these 80 library homepages. Variables are grouped into four categories: search, navigation, design, and general features.

Findings – Based on Nielsen and Tahir's criteria, library homepages fared well in comparison to business homepages. Statistical analysis of the findings revealed that library homepage designs were significantly different from businesses for only four variables: the ability to search the website, the use of a search box or a link, the use of animation, and a change of link colors to indicate viewed links. A greater amount of business homepages used a search box as opposed to a search link. Fewer libraries facilitated navigation by creating links that changed color after use. Library homepages generally had fast download times, and avoided animations and automatic music.

Research limitations – A comprehensive review of all of Nielsen and Tahir's design characteristics for homepage usability cannot be fully considered in a study of this size.

Originality/value – Information-seeking behaviors of college students and internet users within this age range suggest that design conventions established on the web and tested by usability experts may provide a framework for effective library homepage design.

Keywords University libraries, Worldwide web, Design, Standards, Information retieval

Paper type Research paper

Introduction

An institution's homepage is its face to the world, its building's lobby, and the company receptionist (Nielsen and Tahir, 2002, p. 3; Nielsen, 2002). Such analogies can be broadened to include a library's physical presence (the building) and its virtual presence (the website). John Cotton Dana spoke eloquently about his concept of the free public library:

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> . . . a building perhaps erected [. . .] [as] a monument and of use only as a monument; or constructed in accordance with the views of an architect whose ideas of beauty are crude and whose thought of utility is naught; ill-adapted to the purpose for which it is intended; poorly lighted; badly ventilated. In it are stored a few thousand volumes, including, of course, the best books of all time – which no one reads (Dana, 1990, p. 68).

Although originally written over a century ago about the physical library building and its traditional collections, these concepts apply to the library's web presence today. Links transform a website into "a house in which every single window is also a door" (Nielsen and Tahir, 2002, p. 3); the focus on the library's homepage is well-founded as "the most important page on any website, getting more page views than any other page". Nielsen and Tahir acknowledge that "users don't always enter a website from the homepage" but "one of the first actions these users will take after arriving at a new site is to go to the homepage".

Today's college students are familiar with the internet. According to the Digital Future Project (Cole *et al.*, 2004, p. 31), "the highest levels of Internet use are for those age 24 and under, with use among those 18 and under approaching 100 percent". College students may stumble onto the library's website from the university's website more generally. Enticing and then capturing students who inadvertently "discover" this gateway to the library's resources is crucial. In his biweekly online column "Alertbox: Current Issues in Web Usability", Nielsen (see www.useit.com/alertbox/980920.html) reminds readers that "any individual website is an insignificant speck of dust in the universe of the Web: you cannot override habits formed while browsing hundreds of other sites". Web designers and usability experts outside the library community have made substantial monetary and time investments researching efficient, effective web design. Academic libraries may similarly devote significant portions of their budgets to electronic resources but may benefit from lessons learned in the business community in order to capitalize on student use of library websites.

Proven website design guidelines can be adapted for library's homepage design in order to make full use of these resources. In turn, acceptance of industry standards of web design would give library users recognizable features that increase their confidence and comfort levels when using library websites. According to Nielsen and Tahir (2002, p. 52), a major finding in usability studies is "that sites work best when they follow the convention users know from other sites". In addition, they concluded that usability will usually increase when websites are compliant to principles set by other sites. Even if a convention is not considered theoretically sound, "in practice it will work well because users know how it works" (Nielsen and Tahir, 2002, p. 52).

Information professionals recognize that appropriate and credible resources are important for research. However, the 24/7 availability of the internet does not always allow librarians the luxury to intercept, interpret and intervene for users, so library instruction is not always possible. Nevertheless, the Digital Future Project claims that "the internet has become one of the most important sources of information for the vast majority of users" (Cole *et al.*, 2004, pp. 14, 49). In addition, 66.9 percent of very experienced users (seven or more years) rank the internet over all other media as a very important or extremely important source of information; while 32.3 percent of new users (less than one year) share this view (Cole *et al.*, 2004, pp. 14, 50). In its study of the internet's impact on higher education, the Pew Internet & American Life Project (Jones and Madden, 2002, p. 2) notes that 20 percent of college students began using

computers by age eight and all had begun using computers by the time they reached 18 years of age. The study also claims that 86 percent of college students use the internet on a frequent basis, with 73 percent of all of the students using the internet more than the library for research:

> College students have confidence in their abilities to locate information for their assignments (OCLC, 2002, p. 3).

For most of these assignments, however, they choose "search engines (such as Google or Alta Vista), web portals (such as MSN, AOL, or Yahoo!) and course-specific websites" (OCLC, 2002, p. 3). Similarly, Adams and Dougherty (2002, p. 591) discovered that their students were more likely to use Yahoo or Google than the library resources. The OCLC study also noted that these students make their own decisions about which web resources to use unless their instructors direct them to a specific site. Thus, to encourage these experienced internet users to utilize library homepages, those pages should be recognizable and efficient. Borrowing from Nora Rawlinson's philosophy to "Give 'em what they want!" (Rawlinson, 1981), library homepages need to "give 'em what they're familiar with!".

Literature review

Thus, an examination of literature and practices of website designers outside of the library community is warranted. In this study, the focus was on four-year, medium-sized universities (institutions with 9,000-13,000 total student population). Libraries of larger universities, either in consortia, such as the Association for Research Libraries (ARL) or individually, are already well-represented in the literature. Recent website literature on ARL libraries has addressed content and design of library websites (Adams and Cassner, 2002); focused on access to the library from the university's homepage (Astroff, 2001); homepage design similarities and differences (King, 1998); and navigational paths from the library website to reliable resources outside of the library (Wright, 2004). In addition, ARL SPEC kits have gathered survey results on ARL libraries' current practices on staffing (Ragsdale, 2001) and development and management of the library website (Yaping, 1999).

Comparison of libraries with vastly different objectives and sizes, however, is inappropriate. Since medium-sized institutions focus more on curriculum and less on research than do ARL libraries, users of their websites may be savvy web users but not sophisticated researchers. Libraries serving medium-sized colleges are poorly represented in much of the research on website studies and management. Tolppanen *et al.* (2000) examined features and core components of web sites for medium-sized universities. Detailed information on library services outlined and featured on the entire library website was provided. Literature on usability testing, which examines the steps that library users take in navigating the website, was prevalent (Battleson *et al.*, 2001; Campbell, 2001). Except for the study of 133 websites (Tolppanen *et al.*, 2000), studies undertaken on medium-sized institutions have generally focused on usability at individual institutions only (Marquette University – McCready, 1997; Roger Williams University – McMullen, 2001).

This paper will focus on guidelines to increase homepage usability. Because the homepage itself is a web page, design guidelines for general web pages, web content and web navigation also contribute to the homepage's usability. Homepage designers

are advised to consider all guidelines and consult other resources (Nielsen, 2002) for web usability in general. Technical issues related to web page design, such as source code or software used to create web pages, will also not be discussed.

Specifically, use of criteria set out by Nielsen and Tahir (2002) in their monograph, *Homepage Usability: 50 Websites Deconstructed* will be examined. These criteria have been demonstrated to contribute to homepage usability and are a basis for well-designed and effective homepages.

Methodology

Library data set

A data set of homepages from four-year, medium-sized universities with a total enrollment of 8,000 to 13,000 students (full-time and part-time undergraduates and graduate students) was analyzed. Institutional type and enrollment size of the author's home institution (Hofstra University) was used as a baseline for comparison to other medium-sized universities. Hofstra University, a private, non-sectarian co-educational university, is located 25 miles east of Manhattan on Long Island in Hempstead, NY (see www.hofstra.edu/Admissions/adm_hofstra_summary.cfm). Total enrollment at Hofstra University, including part-time undergraduate, graduate and School of Law, is approximately 13,000. Full-time undergraduate enrollment is 8,067.

In order to insure that a robust data set was obtained, two resources were used to generate the list of libraries:

(1) The "Compare Academic Libraries" tool from the National Center for Education Statistics (NCES) website (see http://nces.ed.gov/surveys/libraries/compare/index.asp?LibraryType = Academic).

(2) Peterson's College Bound Online (see www.petersons.com/ugchannel/). The NCES comparison tool used data from the *Academic Libraries Survey* for the FY2002 (ALS), which collected information from 3,700 academic libraries in the United States and outlying regions. The ALS gathered data on libraries with "accredited degree-granting institutions of higher education and on the libraries in non-accredited institutions with a program of four years or more" (see http://nces.ed.gov/surveys/libraries/compare/index.asp?LibraryType = Academic).

The comparison group included libraries within 20 percent of Hofstra's total enrollment of 13,000 students; the NCES generated list was comprised of 168 libraries with enrollment ranging between 9,023 and 13,534 undergraduates. Four Carnegie Classification levels were retained:

(1) Doctoral/Research Universities – Extensive (Class 15);

(2) Doctoral/Research Universities – Intensive II (Class 16);

(3) Master's Colleges and Universities I (Class 21); and

(4) Master's (Comprehensive) Colleges and Universities II (Class 22).

All Associate of Arts Colleges (Carnegie Classification 33) and Schools of Engineering and Technology (Class 54) were deleted from the list because these categories are not comparable to Hofstra University's Carnegie Class 16. The final list from ALS contained 103 libraries.

Peterson's College Bound Online (see www.petersons.com/ugchannel/) was used to augment the list from the *Academic Libraries Survey*. Similarly, the list was limited to colleges with 9,000 to 13,000 full-time students, excluding Canada and Puerto Rico, and community colleges. After institutions that were duplicated on both Peterson and ALS were removed, the list contained 90 institutions. Because ARL libraries are already studied elsewhere (see above), ARL libraries were also excluded.

A dataset was formed with all libraries that appeared on both lists. Finally, because Hofstra University is a private university with a Carnegie Classification 16 (Doctoral/Research Universities – Intensive II), institutions with this level were retained if they appeared on either list. Eight additional libraries were eliminated from the dataset because they were either online colleges or colleges that focused on the health sciences only. The final combined list contained 80 libraries.

Software, hardware and retrieval

In order to more closely simulate the technical capabilities and information-seeking habits of typical internet users (based on Cole *et al.*, 2004), homepages for libraries were retrieved at various times of the day and night using equipment often found in a home setting. In its study of information habits of college students, OCLC determined that over 90 per cent of students access the web remotely using their home computers and "the majority of students (78%) prefer that form of access" (OCLC, 2002, p. 5). Additionally, OCLC noted that over 40 percent access the internet with high-speed connections, such as a "cable modem, T1/T3 line, ISDN, or ADSL/DSL" (OCLC, 2002, p. 5). The Digital Future Project found that the majority of users were accessing the internet via a telephone modem "while access via broadband (cable modem or DSL) has increased 300% since 2000" (Cole *et al.*, 2004, pp. 13, 36). Thus, a DSL high-speed connection (via Verizon Online) was used to access library homepages.

Hardware used included a Dell Pentium 4 (CPU 2.66 GHz, 384 MB of RAM) with a 16 inch, 32 bit color Intel Plug and Play Monitor with $1,024 \times 768$ pixels screen resolution. Software included the operating system (Microsoft Windows XP Professional ver. 2002) and browser (Microsoft Internet Explorer ver. 6.0.2600.000). In order to determine download time and other attributes, PageSleuth ver. 2.2 (Visualware, Inc. 2002-2006) software was used. PageSleuth collects and averages download time for each URL requested.

Nielsen and Tahir criteria

The 80 library websites were compared with web design criteria prescribed by Nielsen and Tahir (2002). Nielsen is "widely recognized as one of the world's leading experts on making technology and online content easier to use" (Pack, 2001, p. 44). His biweekly online column "Alertbox: Current Issues in Web Usability" (see www.useit.com/alertbox/) provides numerous guidelines and suggestions for homepage design. These concepts are elaborated in the book *Homepage Usability: 50 Websites Deconstructed* (Nielsen and Tahir, 2002), which presents statistical analysis, discussion and full-page colorful screen shots of homepages for companies such as IBM, FedEx, and ESPN. One hundred and thirteen design guidelines for homepages were provided. Some of the categories of these guidelines, such as advertising, listing job openings, communicating excessive information about the company, and stock quotes, are not applicable to the library setting. Nielsen and Tahir (2002, pp. 52-3) also presented a list

of 40 recommended homepage design criteria: research was based on a subset of these recommended criteria and focused on items relevant to the libraries.

Nielsen and Tahir (2002) ranked their 40 recommendations into three categories:

(1) essential;

(2) strong; and

(3) default.

Their recommendations are not theoretical but are based upon "what user testing has shown to work best with the way people behave online" (Nielsen and Tahir, p. 52). Basically, their advice was to follow essential recommendations in virtually all projects, while strong recommendations should be followed in most projects, and default is a safe guideline to follow.

Data were collected on relevant items which were rated essential and, in some cases, strong. This subset of recommendations resulted in a total of 14 variables that were examined using the library homepage dataset. The questions asked for each of the 80 library homepages, along with Nielsen and Tahir's ratings and recommendations, are given in Table I. The questions can be naturally grouped into four categories:

(1) search;

(2) navigation;

(3) design; and

(4) general features.

One category in the list of essential criteria was search attributes. Because the library user's primary goal is to locate information, search characteristics were considered to be an important area for examination. All relevant search attributes from this category within Nielsen and Tahir's list were included in the analysis. Three essential characteristics and preferences were:

(1) the availability to search the site via a search box;

(2) the search box background color; and

(3) the search box location.

Search attributes that were strongly recommended included:

- a button following the search box labeled "Go" or "Search";
- search box size; and
- the ability to do a simple search (i.e. keyword).

Nielsen and Tahir maintained that any advanced or scoped searches should be on subsequent pages. Due to the hierarchical nature of academic institutions, it was necessary to determine whether the search feature applied to the library or the university's website by using the term "students" as a search.

As an aid to the user in navigating the website, Nielsen and Tahir suggested that unvisited links be designated blue with visited links as purple; unvisited links should not be light gray. As with the search category, site map recommendations also required that the specific level within the hierarchy was identified. For example, at the

Criteria examined	Nielsen and Tahir rating	Nielsen and Tahir recommendation
I. *Search*		
Is the site searchable?	Essential	Always include
Is it a search of the library or of the university site? Or both? (N/A to Nielsen)		
What kind of search is possible?	Strong	Simple search; advanced search should not be shown on homepage
Is there a search box? Or is there a link that leads you to a search box?	Essential	Should be a box. Link is not obvious enough
What term is used for the search button or link? Or is the word "search" used in the link?	Strong	Use a box with a button labelled "Search" or "Go"
What color is the search box?	Essential	White
How many characters are visible during the search?	Strong	At least 25 characters (30 better) so users can see and modify search
Where is the search box or link placed?	Essential	Upper part of page; preferably in right or left corner
II. *Navigation*		
Is there a link to the site map? Is the site map for the library site or the university? Or both? (N/A to Nielsen)	Strong	Always include
What is the link called to the site map?	Strong	Call it "Site Map"
Do the link colors change to indicate visited and unvisited links?	Essential	Preferrably blue for unvisited; purple for visited
Are frames used in the homepage?	Essential	No
III. *Design*		
Where is the logo?	Essential	Upper left corner
What is the primary background color?	Strong	White
What is the primary color used for the body text?	Strong	Black
Is the body text size frozen?	Essential	No. Users should be able to make the text larger or smaller as desired
Does music play automatically?	Essential	No. Too distracting
Is there a splash page preceding the homepage?	Essential	No. Always take users directly to your homepage
Is animation used on the homepage?	Strong	No. But may be used sparingly
IV. *General features*		
Is there information given so the user can contact the business?	Essential	Always include
If there is a term, does it contain "contact"?	Essential	Should be "Contact Us"
How long does it take to download the web site?	Essential	Ten seconds at the prevalent connection speed for your users

Table I.
Criteria examined

homepage of one library, the site map link led to a site map for the university: there was no site map for the library itself. At another library homepage, there were two different links to site maps: one university site map and one library site map. Nielsen and Tahir also recommended that the link to the site map should be labeled "Site Map".

Design recommendations included:

- logo placement;
- background colors;
- body text colors; and
- "unfrozen" body text.

In addition, automatic music, animation, and splash pages were discouraged. Nielsen and Tahir strongly recommended use of a white background color with black body text color, because white or a very light background is best for highlighting information. A dark contrasting color for the body text is also acceptable.

The ability to manipulate the size of the text in the body of the page was another essential design criterion. Users should be able to make the text larger or smaller as desired. Reduced readability of text occurs when the browser's "change font size" function is disabled in the style sheet (Nielsen, 2002). Specific design issues related to accessibility for those using assisted technologies were not considered for this investigation. Graphics or illustrations were also not examined; Nielsen and Tahir considered these as a default characteristic taking from 5 to 15 percent of the homepage space. Several other studies have addressed these characteristics sufficiently in the library literature (King, 1998; Stove and Zink, 1996).

For general features, homepages were checked for "Contact information", which Nielsen and Tahir recommended should be labeled "Contact Us". Although an "About the company" link was also considered essential, users would already be familiar with the concept that the library is affiliated with their school. A download time of less than ten seconds was also recommended.

Data and discussion

An examination of homepages of 80 academic libraries at medium-sized universities (9,000-13,000 total student population) was undertaken in early 2005. The resulting data and discussion are arranged into four main categories:

(1) search characteristics;

(2) navigation;

(3) design; and

(4) general features.

Discussion will focus on search characteristics, on variables which were statistically significant, and on variables that merit more attention.

Chi-square tests were used to determine if data from the library homepages examined were significantly different from the business homepages examined by Nielsen and Tahir. Statistical comparisons were made in every case when comparable data were available from Nielsen and Tahir and when observed counts were large

enough to allow for statistically valid comparisons. Difference were judged as being significant at the $p = 0.05$ level.

Search characteristics

As noted earlier, a library user's primary goal is to locate information. This led me to examine all search characteristics presented in Nielsen and Tahir. A total of 35 percent of the library homepages did not have a way to search the website. Tolppanen *et al.* (2000) reported similar findings (55 percent) in their study of libraries at medium-sized universities. Out of the 65 percent that were searchable either by a link or search box (see Table II), 12 percent also had a mechanism for searching both the library website and the university website.

In the cases where only the university's website was searchable on the library homepage, these homepages were discarded from further analysis of search characteristics. This type of hierarchical structure was not found in the business websites from Nielsen and Tahir, but 86 percent of the business websites were

Criteria examined	Responses	Library homepages	Number (*n*)	Nielsen and Tahir homepages (percent)	Number (*n*)
Searchable	No	35	80	14	50
	Yes	65		86	
Search of library site?		62	52	N/A	
Search of university site?		25		N/A	
Search of both?		12		N/A	
Type of search	Simple	97	38	70	43
	Scoped	3		30	
Search box or link	Link	53	38	20	43
	Search box	47		80	
Search button or link term	Search	55	38	42	40
	Google search	18		0	
	Find/Find it	5		14	
	Go	19		40	
	None	3		4	
Search box color	White	95	38	97	40
	Other light color	6		Not given	
Search box width	<25 characters	53	38	Not given	40
	>25 characters	47		Not given	
Search placement	Upper left	10	38	30[a]	40
	Upper right	8		35	
	Upper center	34		14	
	Middle	8		12	
	Lower	40		12	

Note: [a]Percentages add up to more than 100 percent because one site had two locations for searches

Table II.
Search characteristics

searchable. This difference between the library homepages and the business homepages was statistically significant: more library websites were designed to be searchable.

To avoid confusion during complicated searches, Nielsen and Tahir recommended that only simple (or keyword) searches be executable from homepages, although a link to an advanced or scoped search could be provided for the sophisticated user. Almost all of the libraries (97 percent) allowed only simple searches directly on their homepages; the business homepages did not fare as well (70 percent).

Because "users often overlook 'Search' on the homepage when it's accessed through a simple link", use of a search box is advised (Nielsen and Tahir, 2002, p. 119; Nielsen, 2002). A total of 47 percent of the library homepages met this recommendation; 53 percent of them used a link instead. The majority of the business homepages (80 percent) had a search box. The percentage of businesses that used a search box as opposed to a search link was significantly greater than that for libraries.

Characteristics of the search box itself can affect the usefulness of this feature. Because white often signals a field that requires user input (Nielsen and Tahir, p. 42), the background for the search box should be white. Both groups met this recommendation on their homepages at 95 and 97 percent, respectively, for libraries and businesses.

Nielsen and Tahir recommended that 25-30 characters remain visible in the search box so that a user can still see the entire search and modify it during the search. Forty-seven percent of the libraries met or exceeded the 25-character benchmark. Nielsen and Tahir did not present data in detail for the business homepages. The quartile distribution they supplied for this variable, however, is nearly identical to the quartile distribution found for libraries, and the median was 18 characters and 22 characters for libraries for businesses and libraries, respectively.

Location of the search box or search link can also inhibit or highlight the search. Nielsen and Tahir assert that the search feature and the logo are two items users seek immediately upon entering the site. Therefore, the box or link should be located in the upper part of the page in either of the top corners. Findings in the Poynter Institute's Eyetracking III study (see www.poynterextra.org/eyetrack2004/index.htm), which examined how internet users read newspapers online, indicated that eyes gravitate into the upper left corner of a webpage. The majority of businesses (75 percent) placed the search function in the upper right or left. Only 18 percent of the libraries used the upper right or upper left corner. Most of the libraries (40 percent) placed their search in the lower part of the page, which often required users to scroll.

Nielsen and Tahir recommended that the search box be followed by a button labeled "Search" or "Go". When a search link is used, the term "search" should be obvious and jargon should be avoided. The terms used by the libraries and businesses to identify the search link or button included "Search", "Go", and "Find" or "Find it". The data show that the majority of libraries (55 percent) used the term "Search" while the businesses were split between "Search" (42 percent) and "Go" (40 percent). Combining the terminology for the button and the link does not provide a clear picture of this attribute. In other words, using the word "Go" for a search link without a search box may cause confusion.

Navigation

Nielsen (1996a, b, 1999, 2003, 2004a, b) has long been a proponent of using different link colors for visited and unvisited links for easier navigation. A total of 74 percent of business homepages adhered to this concept, while only 26 percent of the library homepages changed link colors after they were visited. The percentage of library homepages using different link colors to indicate viewing was significantly different than for businesses; more businesses than libraries changed link colors (see Table III).

Nielsen and Tahir recommended that the homepage should have a site map with the label "Site Map", but noted that the helpfulness of site maps for navigation is not clear. When users were asked to find out more about a website's structure, only 27 percent referred to the site map (Nielsen, 2002). This uncertainty about use of site maps was further demonstrated in this study; half of the libraries and businesses supplied a site map. Many of the libraries that used a term other than Site Map or Site Index labeled the map as an "A to Z link". Data from an earlier study (Tolppanen *et al.*, 2000) reported that only 18 percent of their sample size provided a site map.

Design

Splash pages are generally annoying to users because such pages don't take users directly to the homepage. All of the libraries and most of the businesses (94 percent) met Nielsen and Tahir's recommendations for avoiding splash pages (see Table IV).

Most of the businesses (96 percent) and all of the libraries avoided playing music automatically upon entering the homepage. Nielsen and Tahir suggest that this criterion may change in the future as audio effects improve, particularly if these effects increase usability and communication with the user. The purpose and advantages of automatic music on library homepages, however, is open for exploration.

Nielsen and Tahir recommend that the use of animation on the homepage be kept to a minimum so that the user is not distracted from the purpose of the visit. Although it may not unduly surprise users, they believe that it's rare to see animation used well.

Criteria examined	Responses	Library homepages (percent)	Number (*n*)	Nielsen and Tahir homepages (percent)	Number (*n*)
Site map link	No	50	80	52	50
	Yes	50		48	
Site map to library?		78		N/A	
Site map to university?		15		N/A	
Site map to both?		7		N/A	
Site map label	Site Map	35	34	53	24
	Site Index	53		7	
	Site Guide	0		36	
	Other	12		4	
Link color change	No	74	80	26	50
	Yes	26		74	
Frames	No	100	80	96	50
	Yes	0		4	

Table III.
Navigation

Criteria examined	Responses	Library homepages (percent)	Number (*n*)	Nielsen and Yahir homepages (percent)	Number (*n*)
Logo placement	Upper left	50	80	84	50
	Upper center	39		6	
	Upper right	9		6	
	Center	1		0	
	Other	1		4	
Primary background color	White	83	80	84[a]	50
	Multi	3		Not given	
	Black/dark	14		Not given	
Body text color	Black	41	80	72[a]	50
	Dark	40		8	
	White	0		4	
	Light color	19		8	
Body text size frozen	No	79	80	Not given	50
	Yes	21		Not given	
Music	No	100	80	96	50
	Yes	0		4	
Splash page	No	100	80	94	50
	Yes	0		6	
Animation	No	89	80	70	50
	Yes	11		30	

Table IV.
Design

Note: [a]Incomplete data presented; these will not add up to 100 percent

Few of the libraries (11 percent) had any type of animation, and most of these consisted of unobtrusive scrolling of announcements or figures highlighting new services. In one case, however, the library had a large advertisement for ARTstor which was quite distracting. More of the business homepages used animation (30 percent); the difference between the library homepages and the business homepages was statistically significant. Nielsen and Tahir did not specifically identify the type of animation but it seems logical to assume that more businesses would use advertisements.

General features

As recommended, most of the libraries (85 percent) and businesses (90 percent) provided a way for users to contact them (see Table V). Nielsen and Tahir also recommended that homepages should download in less than ten seconds. They suggest that a slow homepage will cause users to conclude that the entire site is slow, and perhaps desert the site altogether. Slowness with servers and the web in general are an additional incentive to keep page sizes down. The majority of library homepages (98 percent) loaded within the ten-second goal. Nielsen and Tahir, however, found that

Criteria examined	Responses	Library homepages (percent)	Number (*n*)	Nielsen and Tahir homepages (percent)	Number (*n*)
Contact information given	No	15	80	10	50
	Yes	85		90	
Contact information label	"Contact us"	32	68	53	45
	"Contact" used	7		7	
	Customer Service or "About Us"	12		36	
	No term used	49		4	
Download time	Ten seconds or less	98	80	28	80
	11-29 seconds	2		46	
	Over 30 seconds	0		26	

Table V.
General features

only 28 percent of business sites loaded within ten seconds, and 26 percent took more than a half a minute to load. Several factors may contribute to this difference between libraries and businesses. Although Nielsen and Tahir initially used a regular analog modem, they re-tested the slow sites using a DSL line or a cable modem and obtained similar results. Discrepancies may also be attributed to differences in measurement software, the actual size of the sites (affected by animation), and advances in telecommunications.

Conclusion

As aptly noted by King (1998, p. 463), data presented in this examination are not meant to "show what is being done right in library Web pages, but simply what is being done". In addition, the criteria examined here represent only a small portion of possible criteria that could be examined. In general, the library homepages met or matched the business homepages for many of Nielsen and Tahir's criteria. For example, in design characteristics, logo placement was in the recommended positions of upper left or upper right for 89 percent of the libraries and 90 percent of the businesses. In the search characteristics, most of the library (95 percent) and business (97 percent) homepages used a search box with a white background. Although businesses have most likely had and invested more capital into improving the usability of their homepages, libraries have met or matched Nielsen and Tahir's criteria with limited resources.

Statistical analysis of this criteria demonstrated that library practices for homepage design were significantly different from businesses for four variables:

(1) the ability to search the website;

(2) the use of a search box or a link;

(3) the use of animation; and

(4) a change of link colors to indicate viewed links.

More library websites were designed to be searchable. A greater amount of business homepages used a search box as opposed to a search link. Animation was used on

more of the business homepages. The percentage of library homepages using different link colors (26 percent) to indicate viewing was significantly different than for businesses (74 percent); more businesses than libraries changed link colors. Further investigation into the colors of visited and unvisited links is warranted; re-examination of these homepages and review of additional libraries is suggested.

Nielsen and Tahir (2002, p. 38) noted that their design concepts are not random but are "something that works in the real world". Accommodating human behavior is an additional, but necessary, design constraint. These constraints, however, should encourage creativity, not dampen it. Following design conventions does not mean that all homepages will look the same. "Homepages that address different audiences or different companies will look different, even if they promote ease of use by sticking to the conventions".

Of course, library staff may have limited control over some of the design features. Particularly in smaller and medium-sized universities, the systems department may not be associated with the library. Bureaucracy within the university may make it difficult to meet the libraries' design goals. Homepage design responsibilities of the library and the systems departments in medium-sized universities merits further examination.

Design goals determined for the entire university website may not correlate with design goals of each department, including the library. Software applications used to achieve the university's goals may force common features on homepages for each department. For example, several of the universities in this study used a floating bar or menu for links to main divisions of the university which appeared on every webpage for the university. Many of these bars and menus carried a site map or a search box that applied to the entire university. When a site map or search box was also used on the library homepage for library services, user confusion was inevitable.

Considering the information-seeking behaviors of college students (OCLC, 2002; Jones and Madden, 2002) and internet users within this age range (Cole *et al.*, 2004), it is prudent to observe design conventions established on the web and tested by usability experts such as Nielsen and Tahir. If libraries ignore conventions, library webpages face a threat similar to that conceived by Dana (1990) for library buildings; library webpages could become containers for collections of information for that which no one has much use. It may be argued that the philosophies of Dana and Rawlinson apply only to satisfying the "masses" and therefore cannot and should not be equated to an academic library setting. In the case of the internet, it certainly can be. The web is not "owned" by libraries but used by scholars, casual users, and those who just want to be entertained. Libraries are no longer competing solely with bookstores but with the entire internet. In addition, users may expect more information to be readily available in one place. Changes within the social structure and the use of technology suggest additional changes in information-seeking behavior and suggest topics such as open access archives and federated searching merit further investigation.

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Content matters: analysis of a website redesign

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Abstract

Purpose – To examine the redesign of an academic archive and manuscript repository's fourth-generation website.

Design/methodology/approach – A review of the process used by a task force to revamp a website, including determining the goals of the site, its main features, audiences, vendor and software selection, relationship to the parent institution's design guidelines, and user testing results.

Findings – Only with the cooperative effort of staff, interested outside parties, and users will web redesigns be worthwhile efforts that translate into sites with depth and meaning.

Originality/value – Article provides background information and analysis of a series of website redesigns.

Keywords Worldwide web, Design, Project management

Paper type Case study

Introduction

In March of 2004, the University of Wyoming's American Heritage Center released an updated design for its fourth-generation website. As its manager since nearly its inception in March 1995, the author's goal is to avoid having it appear at Web-bloopers.com, Webpagesthatsuck.com, or worse, *Son of Web Pages That Suck* (Flanders, 2002). These sites and accompanying publication poke fun at bad websites and explain how to avoid following in their footsteps. Sometimes avoiding design, content, and technology mistakes are what makes a site worthwhile for visitors and an improved reputation for your institution. Common errors include edgy visual and dynamic effects that do not meet the needs of users; overwhelming users with too much information; ignoring structure, navigation, and content integrity; forgetting the users in testing and design; and poor site maintenance. As Webpagesthatsuck.com founder Vince Flanders asserts, "Web design is not about art, it's about making money (or disseminating information). [. . .] you don't want to design a site that might confuse someone. You want your visitors to quickly find what they're looking for" (Flanders, n.d.).

Archival websites, like museum and library sites, have large amounts of great content, graphical user interfaces that encourage exploration, and often reflect the organization's internal structure. Studies of web design for content, functionality, interfaces, and presentation (Alexander and Brown, 2004) are plentiful for library (Mack *et al.*, 2004; Association of Research Libraries, 2004) and museum (Marty and Twidale, 2004; Bowen, 1999; Harms and Schweibenz, 1001; Marty, 2004; View, 2005) websites. Relatively little has been written about these topics for archives and manuscript repositories (Landis, 1995; Wallace, 1995; Abraham, 1996; Abraham, 1997; Yakel and Kim, 2003/4), some of it ten years in age. These scant articles are concerned with collection descriptions, presumed audiences, interface design, inclusion of finding

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aids, and lack of contact information. Obviously, concerns have grown since then to include searching capabilities, metadata to support the site, delivering a wide variety of information about collections or the collections themselves, and trying to meet research methods and expectations. But little has been discussed about the process of going through a series of web redesigns and the results. This article will examine the work of the University of Wyoming's American Heritage Center (AHC) to revamp its website during 2003-2004. The task force analyzed the structure and content of the site to improve navigation, prioritized the presentation of content, and also researched the costs and benefits of outsourcing the design and maintenance of the site. The AHC also identified opportunities for expanding useful content with a relatively small investment of staff time and budgetary resources.

AHC website background

The AHC went online with the web and GOPHER at approximately the same time in March 1995 (see Figure 1; also available at: http://digital.uwyo.edu/webarchive/ahc1996/Ahcinfo.htm), and the author took over managing the site in November of that year. The second-generation site went online in December 1996 (see Figure 2; also available at: http://digital.uwyo.edu/webarchive/ahc1997-1999/default.htm), and the third in June 1999 (see Figure 3; http://digital.uwyo.edu/webarchive/ahc1999-2004/default.htm). An updated and redesigned second-generation site included six main areas:

(1) general information about the AHC such as hours, location, and staff;

(2) a section on what's new on the site;

(3) a Telnet connection to the catalog;

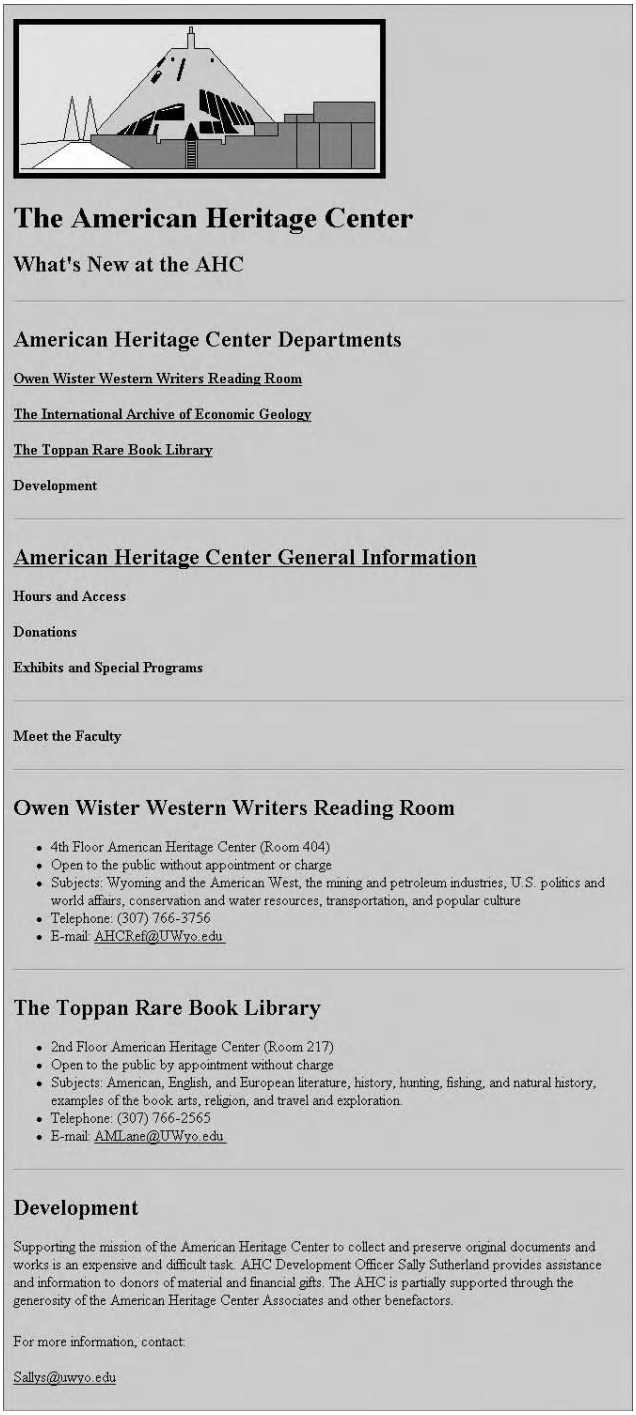
(4) online exhibits;

(5) facts about different departments, their functions and services; and

(6) a page with links to other archival, library, history, and affiliated sites.

Lacking a university web style policy, the AHC followed the guidelines provided by university relations to use sandstone block images with a link to the university's homepage. Overall, it served as a straightforward site – even if it was a little dull visually – with useful information that followed conventional, standard web style creation. The AHC, like the rest of the university, did lack access to visitor logs, which would have been helpful for assessment. By June 1999, the AHC's third-generation site made its appearance. Again, it took advantage of the lack of a formal university web policy to provide a cleaner appearance and ease of navigation through graphics. The new look was more flexible, simplified navigation, and made it easier to feature special projects, other additions and services. The style featured a logo of the building and a graphic menu bar on the left-hand side of the page. Other added features included access to visitor logs, search functions, audio and video clips, in addition to delivering a live web broadcast from the AHC's distinguished lecture series in 2000.

By 2002, the site still continued to be managed by the author, using Microsoft's FrontPage for page creation and site management, while the site resided on a university-controlled server. The site manager's responsibilities, however, had grown significantly since the previous redesign. Despite this, visitations increased from 17,000 visitors in 1998 to nearly 119,000 visitors or 897,000 page views in 2002. The site



The American Heritage Center

What's New at the AHC

American Heritage Center Departments

Owen Wister Western Writers Reading Room

The International Archive of Economic Geology

The Toppan Rare Book Library

Development

American Heritage Center General Information

Hours and Access

Donations

Exhibits and Special Programs

Meet the Faculty

Owen Wister Western Writers Reading Room

- 4th Floor American Heritage Center (Room 404)
- Open to the public without appointment or charge
- Subjects: Wyoming and the American West, the mining and petroleum industries, U.S. politics and world affairs, conservation and water resources, transportation, and popular culture
- Telephone: (307) 766-3756
- E-mail: AHCRef@UWyo.edu

The Toppan Rare Book Library

- 2nd Floor American Heritage Center (Room 217)
- Open to the public by appointment without charge
- Subjects: American, English, and European literature, history, hunting, fishing, and natural history, examples of the book arts, religion, and travel and exploration.
- Telephone: (307) 766-2565
- E-mail: AMLane@UWyo.edu

Development

Supporting the mission of the American Heritage Center to collect and preserve original documents and works is an expensive and difficult task. AHC Development Officer Sally Sutherland provides assistance and information to donors of material and financial gifts. The AHC is partially supported through the generosity of the American Heritage Center Associates and other benefactors.

For more information, contact:

Sallys@uwyo.edu

Figure 1.
1995-1996 AHC website

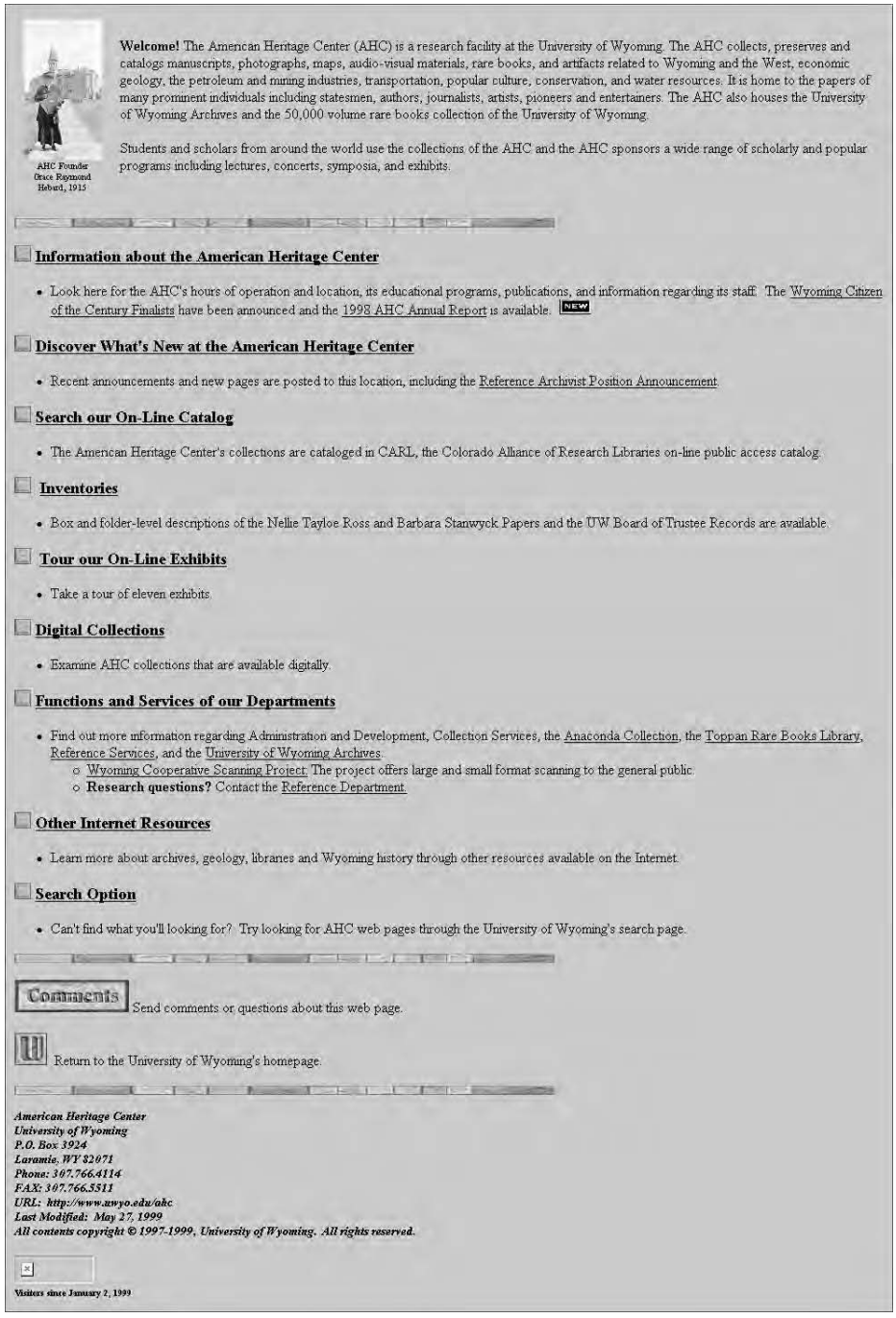


Figure 2.
1997-1999 AHC website

Figure 3.
1999-2004 AHC website

also managed to win two national awards: the San Francisco-based museum The Exploratorium, which honors exceptional educational sites, named the section on filmmaker Fritz Lang one of its "Ten Cool Sites"; and the *Chronicle of Higher Education* named the site an internet resource for the section on blacklisted Hollywood producer Adrian Scott. Suggested redesign of graphics and presentation of information went unnoticed and unattended in 2002, but later that year, a new director, coupled with stringent web server storage allocation from the university's information technology division, prompted the AHC to take action.

Redesign goals

A web task force composed of five AHC faculty and staff members convened in 2003 with the purpose of analyzing the structure and content of the current site and to make recommendations to improve the public's ability to navigate the site. Specifically, the task force looked at:

- the primary purpose of, and who the priority audiences are, for the website;
- how the design and content of the website could match that purpose and the needs of those audiences;
- what categories could be placed on the homepage and how many were enough;

- whether the words used to identify topics were easy for the public to interpret and whether they clearly suggested most or all that lay behind them;
- whether the existing collection guides, or some other form of subject-oriented presentation of collections, should be added to the site to facilitate browsing; and
- how to make the AHC faculty more visible on the site.

Redesign activities

Site map by AHC

The task force began with an introductory meeting discussing the website file structure, visitor statistics, the earlier proposed test page, and readings on optimal web design. Splitting up the institutions available on the Repositories of Primary Sources website at the University of Idaho (Abraham, n.d.), task force members reviewed sites for content, visual appeal, features not found on the AHC website, and site complexity. Members compiled a list of 75 US and Canadian sites they reviewed, along with a commentary and a list of features that the task force members found useful.

Site purpose, features

Being a research and educational institution, the purpose for the AHC's site is to make information about collections available, but to also strive for a balance in providing information about functions and programs. The notable features from the reviewed sites include the following, along with a priority list for features to be added to the new site:

(1) *Notable features on other sites*:
   - clean, simple design that makes good use of images and colors;
   - frequently asked questions;
   - collections presented by subject;
   - multiple options for accessing collections: subject guides, finding aids, catalog; and
   - an online store to consolidate the items available for purchase.

(2) *List of additions/deletions*:
   - make the site more visual, especially on the homepage and top-level pages;
   - clean, simple design that makes good use of images and colors;
   - fewer layers, more cross-listing/linking;
   - paths provided for audiences: teachers, visitors, and priority audiences;
   - more online forms, policy documents, FAQs, self-service information;
   - section on homepage dedicated to new features or areas to highlight;
   - section to highlight newly acquired/processed collections;
   - information on how to use an archives;
   - teacher packets;
   - faculty presentations and other information;

- add images of staff on the contact information pages and on departmental pages – video or audio welcome for the Director's Welcome and on departmental pages; and
- online store/shop.

Audience

Making use of AHC reference and visitor statistics along with a web log analysis, the task force generated a list of top audiences, plus other potential audiences for the site. The top audiences are the following:

(1) *Top five audiences, not in any priority order*:
   - UW faculty and staff;
   - UW students;
   - researchers (scholarly, UW faculty, UW students, general public, K-12 students and teachers, Anaconda Geological Documents Collection, commercial);
   - general public;
   - donors – current and potential; and
   - donors of collections and monetary support.

(2) *Other audiences, not in any priority order*:
   - "museum" and exhibit patrons;
   - Wyoming/Front Range visitors;
   - AHC staff;
   - travel grant applicants;
   - symposium attendees;
   - other archivists and librarians; and
   - nostalgia browsers (i.e. the AHC's Ozzie and Harriet Web exhibit, which receives up to 1,000 visitors per month).

Request for proposal

By late February 2003, the task force had completed much of the preliminary work and analysis for the site. The AHC had also arranged to host its site on the University of Wyoming Libraries' web server to accommodate additional growth, obtain better statistics, and avoid high per-megabyte charges from the University's information technology division. Given the complexity of the site and work remaining with the interface design, the AHC issued a request for proposal (RFP) in March 2003 to web development companies along the Front Range of Wyoming and Colorado who had completed other work for non-profits or other educational organizations. The RFP specified a plan of work to consult on the organization of information, interface design and content management systems, design and development of a series of web templates, and assistance with the development of the site. Two companies responded to the RFP with essentially the same bid price and the AHC selected a local firm. This vendor had more attractive templates, graphic designers with portfolios in web and multimedia design, experience with different content management systems, and they

had completed work with other university departments. The two parties agreed to terms in late March 2003 with a project goal of a redesigned website that would be visually appealing, easy to navigate, provide needed content for the AHC's top audiences, and be completed before the start of the 2003 fall semester.

Site map

Given the earlier work completed by the task force, completing the site map seemed within easy reach. Terminology over archival functions perplexed the vendor, which is notable, since the founder is a university history graduate. The vendor tended to view the site solely from a marketing perspective, which did and did not help to focus on how users could approach the site and to organize information. The final navigation approach included paths that were general-purpose, audience-specific, and hierarchical navigation about collections and collection information. The proposed site map is shown in Figure 4.

Content management system

The vendor, following discussions with the AHC concerning current technical architecture, standards, and future trends, assessed three web-based content management solutions[1] in June 2003. Basing the assessment that the product would be used to make regular and ongoing changes submitted by several editors, the comparison examined the following criteria:

- functionality;
- ease of use;
- integration with current systems;

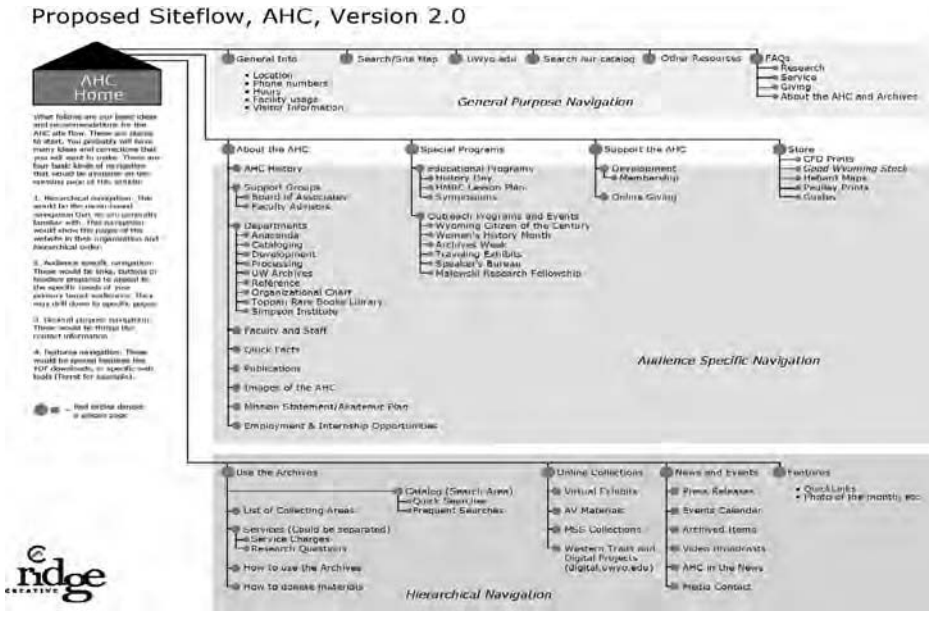


Figure 4.
Proposed site map for the redesigned site

- technical support; and
- company staying power and cost.

Operationally speaking, each product performed every major function the AHC would need:

- text editing;
- picture placement;
- new page creation and security management; and
- use of XHTML as a baseline.

Technical support became an issue with one product, whose company is based in Germany, as well as cost, which would have been out of the AHC's budget. While this exercise exposed us to different applications on the market, the AHC settled on an established product and company, Macromedia's Dreamweaver for the site manager and Contribute for assistant editors.

Templates and build

The original schedule called for the templates to be completed by June 2003 and the build to begin in July. That summer, however, the vendor became an acquisition target and another firm that specialized in video management to provide stock footage and production-ready commercials to the cable industry bought them out. This distraction, and the vendor's move out of web consulting, caused the templates to be pushed back to later that summer and, following user feedback, work began on building the site in November 2003 and was completed in late January 2004. The site manager devoted as much time as possible to the creation of the site, but with other pressing duties, work on the site took place largely at nights and on weekends. In the process of adding and removing materials from the old site, the AHC obtained a leaner site with about 6,600 files compared to 10,000 files; and built upon the site's earlier metadata set, settling on 50 tags, of which 31 are for subjects, reflecting the AHC's collecting areas. The AHC completed user testing with a survey distributed to UW students, faculty, staff, and its board of associates. The evaluation centered on four sections:

(1) user information;
(2) organization of information on the site;
(3) site page design; and
(4) open-ended commentary.

The survey also asked the users to complete a series of tasks to test navigation and labeling. We received commentary from nine individuals, who on a scale of 1-5 were considered experienced web users with a score of 4.4. The site received above average scores for the organization of information (3.7 on scale of 1-5) and very good scores on page design (4.3 on a scale of 1-5). Following the site's release, the AHC publicized it through standard channels such as press releases, listserv announcements, newsletters, and internet search engine listings. During the next release the AHC plans to provide a tour of the new site providing explanations of the design process and the revisions[2].

Remaining work

Two new areas in which the AHC plans to proceed with the improvement of the site include implementing a secure payment system to collect funds for goods and services that integrates with the university accounting system. The other initiative is to begin marketing the AHC's digital images through an online merchant that sells made-to-order custom products, including shirts, posters, and other goods. University legal counsel has approved the contract, which includes provisions for up to 17 percent royalty (10 percent for contributing content and an additional 7 percent for directing users from the AHC's website to the vendor's site). The AHC sees this as a responsible means of generating revenue for public domain material and allows the vendor to market and deliver them based upon user needs and demands while the AHC provides metadata, context, and assurances of authenticity (Hirtle, 2003). The 2004 AHC website is shown in Figure 5 (also available at: http://ahc.uwyo.edu).

Figure 5.
2004 AHC website

UW considerations

In June 2004, three months after the AHC completed its redesign, university public relations released a series of web templates incorporating the university's integrated marketing concept for use on college, department, and program home pages. The templates reflected the university's communications campaign to enhance its ability to recruit students, improve perceptions about the institution, and add to recent fundraising successes. The templates recommended that key marketing messages be the focus of departmental home pages with an emphasis on strengths and accomplishments. The webpage for the UW Summer Session is shown in Figure 6 (also available at: http://web.archive.org/web/20040302024220/uwadmnweb.uwyo.edu/Summer/default.html).

While university public relations conducted testing for accessibility – the site also works with PDAs and cell phones – and gathered limited feedback on the overall appearance of their printed works with a small group of high school students, they did not complete any user testing or seek any input from the campus community on the new web design. While university public relations did acknowledge that university units have different and numerous audiences, they suggested departments have their homepages redesigned using the templates before the fall 2004 semester and other top-level pages by spring 2005. To date, the AHC has politely ignored the university web guidelines, as it has with any previous guidelines. The lack of usability testing, the intended audience – prospective students – not entirely matching the AHC's

Figure 6.
University of Wyoming 2004 Summer Session

audiences, and since the AHC just finished a redesign that it feels best meets its users' needs, has given the AHC reasons not to adopt the guidelines. Further, the AHC's website is not just for marketing, but its goal is to provide information. To date, the AHC has not been forced to adopt the integrated marketing communications campaign, largely since its site has been the third to seventh most visited site on all portions of the university's site – more than any of the colleges or departments, the online directories, and Wyoming Public Radio (see Table I for 1998-2004 statistics).

Results

One mean for measuring results is through web linkages to the AHC's site. TouchGraph.com provides a graphical representation of links directed toward a site and interrelationships between other sites (see Figure 7). The results for the AHC's site indicate that it has a number of links with other archival, library and historical institutions. The number of links from US Navy related sites indicates links for the AHC's journalism collections, many of which are the papers of wartime correspondents. Links can also be counted by popularity checkers such as LinkPopularity.com. This free service checks links to a website address in AltaVista, Google, MSN, and Yahoo. The AHC ranked fourth out of 13 regional and national comparison institutions (see Table II).

Trends and new developments

The internet after ten years

During the redesign, discussions with the task force involved routine web design issues such as pop-up windows, redirects, Alt tags, relative or absolute links, and color

Year	Counter software	No. of pages counted	Dates in use	No. of visits	Page views	Hits	Yearly total
1998	Freeware from Counter.com	21	August 15-December 31	8,073			17,428 (daily average of 67 × 365)
1999	Freeware from Counter.com	36	January 1-December 31	41,532			41,532
2000	Sawmill	Entire site	August 1-December 31			240,000	
2001	Sawmill	Entire site	January 1-December 31			255,485	
2002	Sawmill	Entire site	January 1-December 31	118,992	897,405		
2003	LiveStats	Entire site	April 1-December 31	38,538	155,606	394,654	
2004	LiveStats	Entire site	January 1-December 31	247,151	555,477	1,766,654	

Table I.
AHC web statistics, 1998-2004 (does not include the online catalog or digital collections catalog)

Note: University Information Technology did not initially make available log statistics and due to security reasons, discouraged use of third-party applications until 1998. From 2000 onward the university has used the Sawmill log analyzer, and in March 2003, the AHC moved to LiveStats from DeepMetrix. Not all of the applications captured the same information so comparisons are difficult, but from 2004 onward the AHC will have consistent data

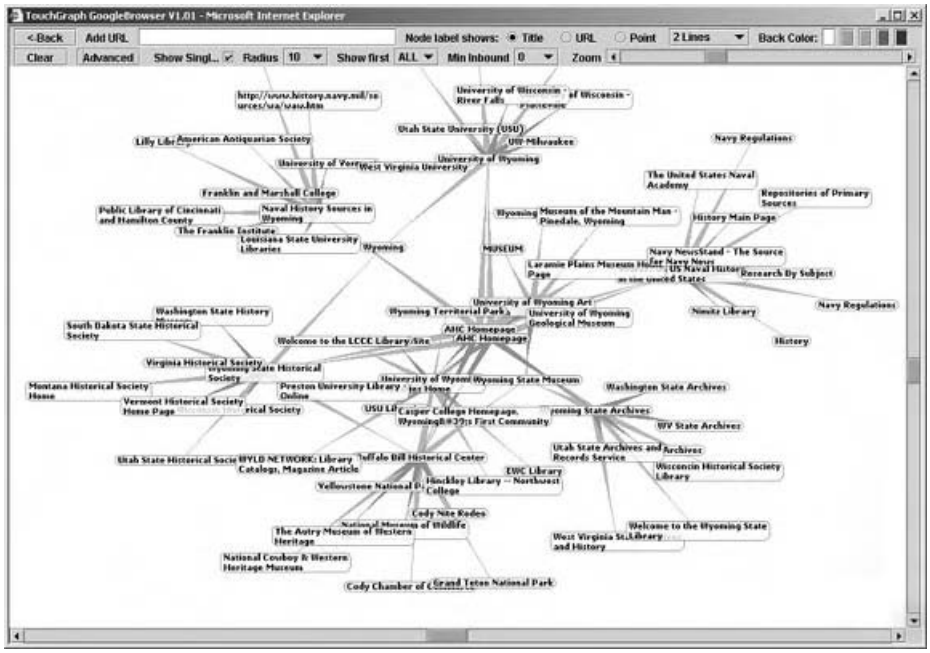


Figure 7.
AHC link results from TouchGraph.com

Institution	URL	Results
Arizona State University	www.asu.edu/lib/archives/	1,194
Brigham Young University	http://sc.lib.byu.edu/	794
Colorado State University	http://lib.colostate.edu/archives/	224
Princeton University, Mudd Manuscript Library	www.princeton.edu/mudd/	1,573
San Diego State University	http://infodome.sdsu.edu/about/depts/spcollections/	74
University of Colorado	http://ucblibraries.colorado.edu/archives/index.htm	148
University of Denver	www.penlib.du.edu/About/collections/SpecialCollections/index.cfm	42
University of Kansas, Spencer Library	http://spencer.lib.ku.edu/	964
University of Michigan, Bentley Historical Library	www.umich.edu/ ~ bhl/	6,952
University of Montana	www.lib.umt.edu/dept/arch/arch.htm	222
University of Nevada-Las Vegas	www.library.unlv.edu/speccol/index.html	144
University of New Mexico, Center for Southwest Research	http://elibrary.unm.edu/cswr/	817
University of Texas, Harry Ransom Center	www.hrc.utexas.edu/	22,640
University of Wyoming, American Heritage Center	http://ahc.uwyo.edu	1,663
Utah State University	http://library.usu.edu/Specol/index.html	1,889
Yale University	www.library.yale.edu/special_collections/	290

Table II.
LinkPopularity.com check on April 26, 2005

hex codes. As any good web manager would attest, such discussions matter given the public's increasing usage of the web, and since a site may be a user's first and only interaction with an institution. A 2004 study by the USC Annenberg Center for the Digital Future (USC, 2004) on the internet's usage found the following:

- three-quarters of Americans now go online, for an average of 12.5 hours per week;
- more than 40 percent of users believe that only about half of the information on the internet is reliable and accurate;
- most users trust information on websites they visit regularly, and on pages created by established media and the government;
- television viewing continues to decline among internet users, and among experienced users the internet outranks all other media as a very important source of information;
- broadband usage has increased 300 percent since 2000; and
- as internet experience increases, perceptions of the importance of it as an information resource also increase: eventually, almost every American will be an experienced user. How will that change the perception of the Internet as an information resource? And how will that ascendance affect other sources of information?

A Pew Internet & American Life Project's "Trends 2005" report also found the web to have become "the 'new normal' in the American way of life", with increasing usage of broadband translating into more time online and increased frequency of activities (Pew Internet & American Life Project, 2005a). Moreover, people are making use of their always-on broadband connection to practise "infosnacking", or just to get what they need and leave (Pew Internet & American Life Project, 2005a; Jesdanun, 2004).

RSS, wikis and podcasting

Real Simple Syndication (RSS) is a low-overhead way to provide current awareness services, and efforts are just beginning to explore how to integrate it into an institution's workflow to take advantage of this technology (McKiernan, 2005; Tennant, 2003; McKiernan, 2004; Coehen, 2003). *Wall Street Journal* technology columnist Lee Gomes warns that while some major internet players, such as Yahoo, Firefox (referred to as Live Bookmarks), and Microsoft have signed on to support RSS feeds, they may ultimately change the traditional web economics, because readers can skip frequent visits to their sites to check for new content. And while most RSS boosters describe the technology as an antidote for information overload, it could make things worse (Gomes, 2004). The AHC has released an RSS feed for its events calendar, and is also considering feeds for news releases, newly acquired and newly cataloged collections. These are obvious actions, but other applications for AHC services include feeds for web subject resources and a feed for checked out or renewed items from the online catalog.

Wikis and podcasting also hold opportunities for the AHC to interact with its customers. As the recipient of two grants in 2004 from Institute for Museums and Library Services and the National Endowment for the Humanities to create digital audio and encode finding aids in Encoded Archival Description, the 50 finding aids and

200 hours of audio can be made available as wiki-enabled finding aids and by podcasting oral histories as MP3s. The finding aids could serve as a collection that researchers can add commentary to, and the audio files can be downloaded by the growing number of Americans – 22 million according to a 2005 survey (Pew Internet & American Life Project, 2005b) – that can choose the audio files of their choosing.

Conclusion

The AHC Web Task Force, through its work identifying the site audiences, review of other archival websites, completion of a site map, and user testing, has created a web design that the AHC believes is easy to use in addition to being relevant for visitors. The task force identified content to be added to the site without significant labor investments and examined the possibility of outsourcing. To date, creating and maintaining the site in-house remains cost-effective, but the AHC has also made the site easy to manage for the near future with a style guide for establishing standardized appearance and consistency, coupled with use of Cascading Style Sheets. In addition, the use of Contribute by assistant editors allows several staff to update pages with little knowledge of HTML, web-editing tools, or file management. The author is also hopeful that through the AHC's online store and proceeds from the online merchant, a new source of funding – however modest – will be created, to at least support needs such as software purchases or upgrades, staff training, and the university's digital program hardware.

Some of the less successful areas of the redesign included user feedback indicating that some portions of the site were not entirely up to date: this has been a great frustration, for the areas referred to ought to be in the forefront of providing archival services via the web. Relatedly, the AHC's user testing did not include more of the general public, but the AHC's efforts to include them went unanswered. The AHC has also adhered more closely to the university style guidelines due to the merger of its catalog with a close partner, the UW Libraries, into a combined catalog that reflects a shared yet unique identity for both units. Moreover, the AHC and UW Libraries have been deemed "tab worthy" in a new university portal, which undoubtedly will use the university style guidelines.

The web has become an integral part of archival institutions' everyday routine in support of providing access to collections, information on programs, interpretive exhibits, and a means of fundraising. The reality is that organizations will be undergoing website redesigns as frequently as every two to three years for style – content is ongoing – and only with the cooperative effort of the staff, interested outside parties, and users will this be a worthwhile effort. Consultants can provide polish, but only the experience and talents of archivists can translate into websites that have depth and meaning. Whether the AHC's website has met those goals is up to its users, but the AHC's site has yet to show up on Webpagesthatsuck.com.

Notes

1. The three content management system products evaluated were Macromedia's Dreamweaver MX and Contribute; Fog Creek's City Desk; and Icoya's OpenContent 1.5.
2. See the Minnesota Historical Society, "Web tour" (available at: www.mnhs.org/tour/) and c|net, "We've remodeled and here's why" (available at: http://reviews.cnet.com/4520-3000-5512723.html).

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Usability testing for web redesign: a UCLA case study

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Abstract

Purpose – The purpose of this paper is to describe the processes the UCLA Library Website Redesign Team used to develop a new library website responsive to the needs of the broad population of UCLA Library users.

Design/methodology/approach – Using a combination of structured analyses of the previous library website, user surveys, a card sort protocol and a think-aloud protocol, the Website Redesign Team procured sufficient information to meet its redesign goals: established clear site organization and navigation, utilized user-centered nomenclature, ensured easy access from the library homepage to relevant information, developed a unified institutional visual identity throughout the site, and enabled a content management system.

Findings – Standard usability methods such as surveys and the card sort and think-aloud protocols are essential tools for evaluating and redesigning complex multi-layered websites. Since the redesign process is not finite, these tools contribute to keeping a website current and responsive to the needs of its users.

Originality/value – This case study provides an example that the Redesign Team hope will empower readers with tools and knowledge that they can use to perform similar tasks in their own environment.

Keywords Worldwide web, Design, Academic libraries

Paper type Case study

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Introduction

In 2003, the UCLA Library initiated a redesign of the UCLA Library website. The goals of the redesign were:

- to establish clear site organization and navigation;
- to utilize user-centered nomenclature;

- to ensure easy access from the homepage to information relevant to the entire user population;
- to develop a unified institutional visual identity throughout the site; and
- to enable a content management system.

The guiding principle throughout was to move from many individual websites representing units and departments to a single UCLA Library website with consistent design and information organized in as predictable a manner as possible.

The previous website (see Figure 1), which had been in place for about three years, had the following problems:

- Overall organization of the site reflected the library's organizational chart rather than the way users might look for information. The site modeled administrative reporting lines and the geographic distribution of library buildings, organizing information by department or the unit library responsible for collecting and maintaining it.
- A lack of consistency and standards for the placement and labeling of navigational elements made it difficult for users to find information in a predictable location.
- Inconsistent nomenclature on various linked pages within the site and a heavy use of library jargon made it difficult for users to find the information they sought.
- Differences in graphic design and layout across departmental, resource, and service pages due to decentralized planning and management and a lack of coordination among individual library units resulted in as many different visual identities, navigation schemes, and vocabularies as there were individual personalities creating them. Design inconsistencies ranged from color palates

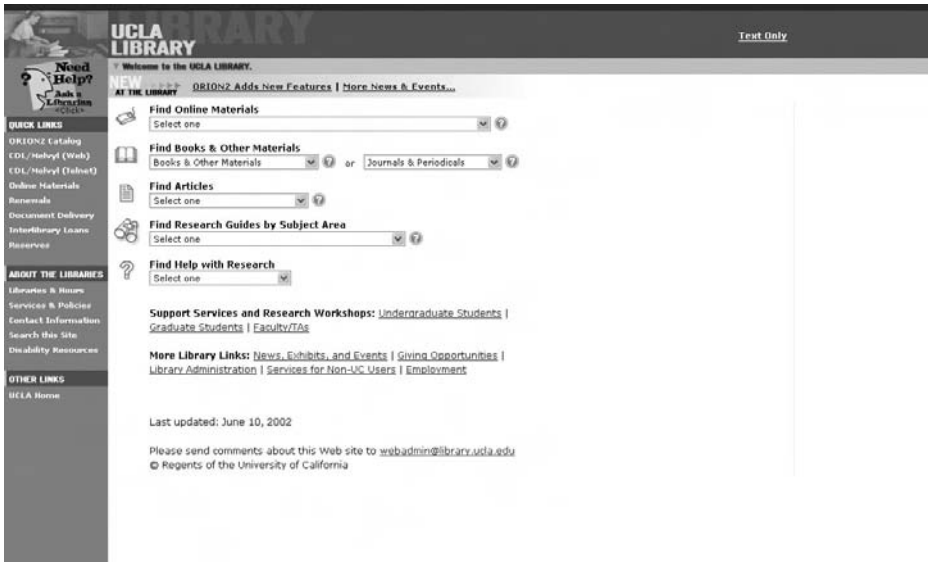

Figure 1.
UCLA Library website, 2002-2004

and versions of the library logo to the placement and labeling of links to crucial services such as the online catalog.

- Decentralized planning and management among library departments and units led to an overall unresponsiveness to rapid change and varying depth, type, and accuracy of information. The site made it difficult for users to ascertain which pages to trust as authoritative. This confusion resulted in a significant amount of redundant effort and wasted time.

The problems had been identified by library staff using the site daily in their interaction with UCLA Library users and in their day-to-day job responsibilities, by members of the UCLA community, and by Library administration.

That these problems were real and in some cases acute was reinforced by the survey data and user testing undertaken by the Website Redesign Team appointed by the Library administration. This paper describes the processes the team used to develop a website responsive to the needs of the broad population of users of UCLA Library users. This paper will describe the surveys and user testing undertaken to ensure that the site is organized to anticipate user's questions, that terminology and labels are familiar to most library users, that the design is simple and appealing, and that the site as a whole promotes the important collections and services offered by the library.

Methodology

Structured analysis

The work toward a redesigned UCLA Library website began with an inventory of existing library web pages. A structured analysis identified key information links across unit library websites, information that should appear on upper page levels, and duplication of information among existing pages. The analysis consisted of a systematic sweep of the main library web page and all individual unit and department pages. A spreadsheet of the top and lower level links on each page was created in Microsoft Excel to show the organization of the entire site. The spreadsheet allowed easy comparison of pages from the various libraries and departments. It also showed variations in nomenclature describing information, variations in page architecture, and inconsistencies in the organization of links. The Redesign Team used this information as a basis for surveys and user testing.

Surveys

The team conducted two surveys during the redesign process. The first survey collected information on why and how the existing library website was being used, by whom, what information was found easily and what not, and what information was missing. The survey consisted of 18 questions administered online via a link from the library's homepage. It was open to all library users. UCLA staff, students, and faculty members who completed the survey were entered into a draw for a $250 gift certificate at the UCLA Store. Three hundred people responded to the survey. Unfortunately, due to poor survey design, the responses were not as useful as they could have been. Most of the useful data came from answers to four open-ended survey questions:

(1) What other services or functions would you like to see available on the UCLA Library website?

(2) What do you like most about the current UCLA Library website?

(3) What do you like least about the current UCLA Library website?

(4) Do you have any other comments about the UCLA Library website?

The second survey investigated the terms users might choose for key library services from among the various terms appearing on the Library's own web pages, including traditional library terms (Interlibrary Loan) as well as functional terms (Request Materials from non-UCLA Libraries). The survey listed 12 key library services for which the respondents were asked to choose from one of several suggested terms for that service. They could also supply their own. The survey was conducted on paper, rather than electronically, to facilitate even distribution across libraries. The survey was given to undergraduate students in library instruction sessions and made available to all users in campus libraries. The survey asked the status of the respondent (undergraduate, graduate, faculty, or staff) as well as the name of the library where the survey was completed so that the team could identify any patterns in terminology choice based on these factors.

Three and hundred seventy-one users responded to the survey. For eight of the services, there was a clear preference for one of the terms over the other choices. For the other four, two or more of the terms were very close in respondent preference. In many cases, the preferred term or terms were in fact common library service labels, possibly indicating that the survey was answered by experienced library users. The results did not indicate a difference in terminology preference by user category. The terms from the structured analysis as well as the terms identified in this survey laid the groundwork for the next analytical tool, the card sort protocol.

Card sort protocol

The card sort protocol was the first step in planning the organization of the new website. Jakob Nielsen describes this usability method as "generative" and one used when you "don't yet have a design, and [your] goal is to find out how people think about certain issues" (Nielsen, 2004) – the issue for the Redesign Team being how to organize the vast array of library-supported collections and services on the website. The protocol allowed the team to focus solely on the information architecture of the site (i.e. where to put what) without concern for the design.

A card sort protocol is executed using note cards containing words or phrases. Participants are asked to organize the cards into groups most meaningful to them, putting cards with similar concepts together in the same group. Depending on the goals of the protocol the categories are predefined and named, or the participant determines the number of the categories and their names.

The structured analysis of the existing website provided 76 essential links. The names of the links, informed by the terminology survey, were printed on one side of a white index card. Each card was numbered for identification purposes. The reverse side of the card provided the definition of the link. The definitions were created by team members but were also informed by the previous surveys. For example, the link named "Article Databases" had the definition "online index to the contents of magazines and journals" on the reverse side of the card. Participants were provided these definitions so that their sort was not hindered by a lack of knowledge of library services or of the term provided.

The primary user groups of the Library's website are UCLA faculty, students, and campus staff from all academic departments. Administrative faculty and staff as well as library staff, although heavy users of the site, were considered secondary for purposes of the redesign and therefore not recruited for the card sort. Recognizing the valuable input library staff could provide, however, as well as for political expediency, several library staff participated in the card sort protocol.

Using figures provided by the UCLA Office of Analysis and Information Management (within the Department of Budget & Finance), the team determined that 40 participants would be necessary to accurately reflect all targeted user groups (despite the fact that the literature recommends between 15 and 20 or 30 participants; Nielsen, 2004). With target numbers for all user types in hand, recruiting for the protocol could begin.

Since the majority of participants needed were undergraduate and graduate students, the team approached students across campus in areas where they gather – primarily the student union and various eating areas near science, humanities, and social science classrooms. The target participant number for students was 28. Faculty and staff were recruited using departmental listservs. For consistency while recruiting, the team used recruitment scripts. Those who agreed to participate were given an informed consent sheet with maps to the test sites. As an added incentive, all participants who completed the card sort were given a gift bag valued at $15.00 that included a library mug, a copy card, candy, pens, and pencils. Recruiting a sufficient number of participants took two weeks.

The UCLA Institutional Review Board (IRB) requires that anyone using human subjects for surveys or experiments clear their research protocol if the results will be discussed outside of the immediate survey team, delivered in a conference paper, or published. The clearance procedure ensures that test participants will not be harmed and that any personal identifying information gathered will be kept completely confidential. Most institutions have an Office for the Protection of Research Subjects (OPRS) where one can obtain the necessary procedures, forms, etc. Because the Redesign Team's testing was cognitive-based, it was able to file for an exemption and its research did not have to receive a full review from the Review Board. Personnel in the OPRS reviewed the Redesign Team's submission, which included copies of the survey instrument and all related parts of the experiment – recruitment methods and scripts, the informed consent form, the calendar for scheduling participants, an explanation of how the confidentiality of test participants was to be preserved, incentives, etc. – and granted it an exemption.

Participants were given one hour to complete the card sort, i.e. to organize the 76 cards into any number of sets that made sense to them and to name the card sets. Participants seemed to approach this task in two different ways. Some immediately started making sets and moving the cards around accordingly; others looked through the entire stack of cards before making any decisions about how to organize them. The team member facilitating the sort noted the cards for which participants referred to the definition printed on the back before sorting the card. Once all of the cards were sorted and the participant seemed satisfied with the results, they were asked to create names for each set and write them on a yellow index card. (The yellow index card is analogous to a category on a web page, and the set of cards it identifies to the links in that category.) At the end of the session, the facilitator noted the terms on each yellow card and the numbers of all of the cards in each pile.

The card sort results were input into SPSS®, a statistical analysis tool. Since participants created many different words and phrases to identify their card sets, the Redesign Team quickly realized that to make meaningful comparisons it would need to standardize the terms, reconciling various phrases used by participants for similar concepts. A second card sort protocol by team members served this purpose. The team compiled a list of all of the labels used on the yellow cards identifying the sorted terms, gathered similar terms together, and then created labels to bring similar participant-created terms together. (For example, "library info", "general information", etc., were normalized into "general library information".) Standard library terminology as well as terms from the structured analysis were used.

The Redesign Team was now able to see trends in how participants organized their cards:

- In a majority of sorts, certain cards appeared in a similar category. For example, about half of the participants put a card that said "Copying and Printing" under the category they called "Services".
- Some cards appeared in a variety of categories. For example, participants put "Subject Experts" in many different categories, including "About the Library", "Contact Us", "Help", and "Reference and Research Help". This indicated a link to information on subject librarians needed to be made from most, if not all, of these categories on the new website.

The results of the card sort protocol were extremely useful in making decisions on organizing the website. When the team began to refine the large general organizational categories for the new site, the input from the card sort was essential to making initial design decisions.

Think aloud protocol

Based on the information gathered from the structured analysis, the surveys, and the card sort protocol, a professional website designer, Guerard Design Office, developed a prototype of the new UCLA Library website. This prototype served as the basis for another usability test known as a "think aloud protocol". For this test, participants are asked to complete tasks using a prototype website and to "think aloud", i.e. to say everything they are thinking while they complete the tasks. One observer notes everything the subject says and if and how the participant completes the task. Another observer directs the participant and answers any questions asked. This type of user test provides essential real-time feedback on potential problems in the design and organization of a website.

Although Nielsen (2000) and Krug (2000) contend that only five participants are needed for significant results from a think aloud protocol, the team opted to use ten subjects, allowing more than one participant from each of the primary user types. The team used similar recruitment methods to those used for the card sort but did not use any participants from any previous tests.

Participants in the think aloud protocol were asked to find information about the following:

- hours for library units;
- departments served by subject libraries;

- how to obtain an article through interlibrary loan;
- how to place materials on course reserve (faculty) or locate them (students);
- how to access electronic resources from off-campus;
- identify a subject specialist for a research consultation session; and
- how to find a wide range of materials for a research project on a specific subject.

As described above, two facilitators conducted the individual sessions: one read the questions and interacted with the participant while the other recorded the participant's actions, including:

- the path taken to find the answer;
- anything said while navigating the site; and
- any observations of the participant's behavior.

After completing the tasks, the participants were asked about their general impression of the site, suggestions for the designer, or any other comments about the website. Finally, there was a brief survey about the participant's previous use and knowledge of the library and the library's website.

Results from the think aloud protocol were collated to pull out quantitative data based on success, partial success and failure, and qualitative data based on comments and observations. The results showed that participants overall navigated the site successfully and answered the questions quickly. (The average think aloud took 30-40 minutes.) Many participants moved on to the next question or even used the "Ask a Librarian" link when they were unable to complete a task after two or three attempts. Participants generally liked the five navigational categories with the corresponding drop-down menus that forced them to look at all of the choices and explore the site when looking for information. The categories seemed to provide a good sense of the included content and were intuitive so that even if the participant was not sure where to look, they could scan easily the categories, menus and sub-menus for the information they sought. The think aloud protocol did not result in any major changes to the design or content of the prototype website. Examples of the changes made include:

- corrected inconsistent terminology (e.g. off campus access versus Bruin Online Proxy Server);
- duplicated links under more than one category (e.g. Subject Librarian list added to "Ask a Librarian");
- moved certain links up in the menu hierarchy (e.g. Proxy Server);
- added arrows, print links, and other functional and navigational clues.

The Current UCLA Library website is shown in Figure 2.

Website design

With work on the site structure and nomenclature underway, the Team focused on hiring a professional graphic designer to provide a strong visual identity and logo that could be applied consistently across all library web pages as well as the online catalog interface screens. In addition, the graphic designer was asked to provide a standardized page template to be used with our content management system.

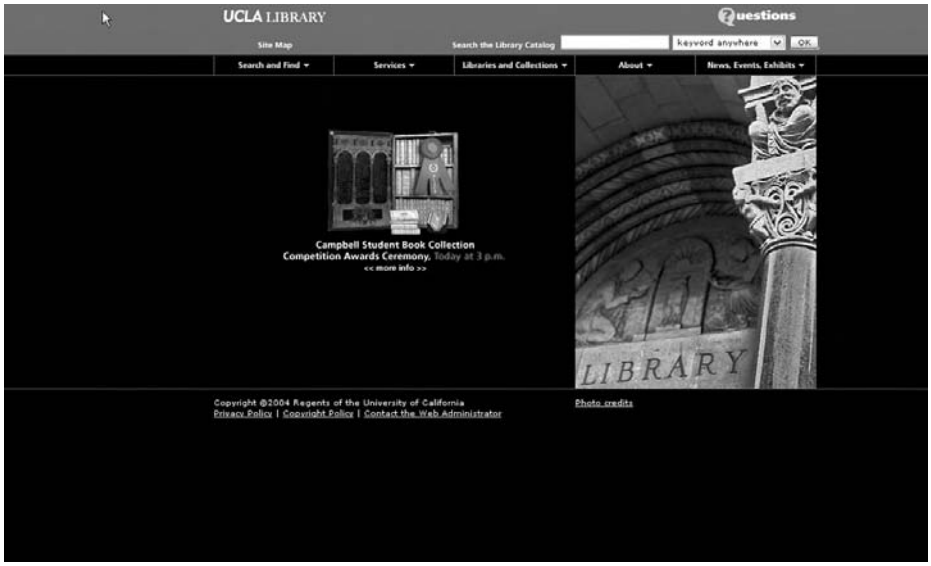

Figure 2.
Current UCLA Library website

One of the challenges in developing the standardized page template was to create a device that enforced design consistency but was not confining and monotonous. The initial structural analysis revealed a wide range of page types serving different purposes, e.g. informational pages, instructional pages, pages that served as interfaces to databases, media-intensive pages framing digital collections and exhibits, etc. A successful design would be flexible enough to present many types of information and enforce enough restrictions to assist content creators lacking visual arts training in creating professional pages.

The designer developed a five-column grid system to serve as the underlying framework for every page. The grid system can be reconfigured easily and adapted to the nature of the information being presented on the page. A two-by-three column configuration serves as the template for most pages. Navigational links within the site and informational content consistently appear in designated areas, while another section is reserved for graphics. There are variations on the grid system, such as a page spanning five columns to accommodate the presentation of tabular information.

All of the page templates are managed and enforced by a content management system. RedDot Solution's Web Content Management Software (CMS) was selected for its enterprise-class features, scalability, and reasonable price tag. A major advantage of a CMS is the separation of content from its presentation layer. All content is stored in a database while the HTML templates into which it is poured for presentation are managed by the CMS. Content creators and editors are granted limited permissions to reconfigure or edit elements on a page, thereby reducing variability in location of key navigation and labeling elements. While it is difficult to quantify the effectiveness of the graphical layout of grid-based pages, once problems are identified through formal usability testing and/or empirical observations, modifications to the grid system can be easily and globally implemented utilizing the CMS template system.

Conclusion

The new UCLA Library website, the end product of this work, was released in August 2004. Following the release, the team began soliciting feedback in the following ways:

- directed e-mails to faculty asking for comments;
- comments solicited directly via a link on the new website; and
- library staff feedback sessions.

Over the past year, the website has changed in small ways based on this feedback, but the team is reserving larger changes after users gain more in-depth experience with the site and provide it with their comments. Website design is an ongoing process that requires continuous usability testing as the institution it represents and the information it provides evolve and change. To test revisions of the site, the Redesign Team will create a new prototype and conduct a think aloud protocol to test it. At this time, only the central site has been redesigned; unit libraries and internal department pages have not yet been converted. The team and library staff are still discussing the nature of certain pages, whether they are primarily internal to the library or of interest to the campus or outside users. The UCLA Library is not unique in facing internal changes and external pressures. As the Redesign Team continues to improve the Library website, however, it is confident that it has the tools and methodologies to ensure that it provides library users with the information they seek in the easiest and most direct way, and in terms they understand.

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Redesigning for usability

Information architecture and usability testing for Georgia Tech Library's website

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Abstract

Purpose – To describe the efforts by the Georgia Institute of Technology Library to keep its website relevant and current by incorporating user testing, both outsourced and in-house.

Design/methodology/approach – A chronological history of the Library's web presence with a discussion of how user testing was conducted with a vendor and how future testing will be conducted by the Library itself.

Findings – Illustrates issues the Georgia Institute of Technology Library has faced in regards to its website in the past, and future plans to test the site to maintain currency and strive to meet the users' needs.

Originality/value – This paper offers practical information for undertaking usability testing of a library website.

Keywords Tests and testing, Academic libraries, Digital libraries, Worldwide web

Paper type Case study

Library websites cannot afford to be static informational sites; rather, they must be fluid and ever-changing. In many ways a library's website is the library. It used to be that library websites contained information about resources, not the resources themselves, but that's all changed. Now users can, for instance, retrieve full-text articles without leaving the comfort of their homes or dorm rooms. Gone are the days when they had to travel across campus and into the library itself to retrieve a copy of an article. With the increased popularity of distance education and users' demands for online research, it is essential that library websites meet their clients' needs and provide access to a wide variety of information. Currency is thus a major issue for library web designers.

As libraries add an increasing number of often complex resources to their websites, it can become difficult for users to find what they need online. With the addition of databases and other resources, users are faced with searching through a barrage of search interfaces, which can lead to confusion and wasted time. Of course, library websites contain, or provide links to, vendor sites, databases and catalogs, many of which utilize their own interfaces. Library web designers need to focus on creating pages that set and reinforce expectations of searching technologies by supporting screen-to-screen learning while reducing branding changes and maintaining design consistency. Streamlining, therefore, is a second major issue for library web designers.

Two major concepts that apply when designing or redesigning library websites are information architecture and usability. Information architecture is defined as "the structural design of an information space to facilitate task completion and intuitive

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access to content" (Rosenfeld and Morville, 2002). Usability refers to the measure of success a user achieves when utilizing a product or system, such as a website. Usability combines the following five aspects (Usability.gov, n.d.):

(1) ease of learning;
(2) efficiency of use;
(3) memorability;
(4) error frequency and severity; and
(5) subjective satisfaction.

A successful library website features a solid, sensible information architecture, and is highly usable to non-expert users. This has been the Georgia Tech Library's goal when redesigning its website.

In the last several years the Georgia Tech Library has undergone two major redesigns of its website, the first focusing on utilizing web design best practices and creating a solid information architecture. The second, and current, redesign has been focusing on usability for its non-expert users. The first redesign resulted in soundly organized information. Once it was confident that the information available via the website was organized well, it focused its attention on how it could make that information easily accessible to its non-expert patrons. In other words, the information was there; how could the Library help users find it?

Early attempts at a Library website

The Georgia Tech Library has had a website since the early 1990s. The very first website was designed and maintained by a number of Library employees. At that time, the website primarily consisted of information about the Library and provided access to the Telnet version of the Library Catalog. In the late 1990s the Library created the position of Web Developer. With the web resources growing at a rapid rate, the Library decided it needed a point person to implement procedures and maintain consistency across pages. A committee was formed, and a redesign to the very first Library website was underway. The committee consisted of reference librarians, a systems employee and various other staff members. While the committee worked hard to develop the website, the primary input was from in-house expert users. For the next several years, the website continued to grow by adding informational pages and a variety of online resources, including an online catalog interface, databases and electronic journals. At that time, the focus was more on quantity instead of quality – content was added to the site with no overall vision for how it would impact the users and their quest to find the information. The site was occasionally tweaked to make everything fit together, but the only suggestions and input were from in-house expert users (i.e. librarians and other staff members who were using the site on a daily basis), without feedback from their student and faculty population. This informal, unorganized methodology continued until the site reached a point where the technology within the site was no longer robust enough to sensibly hold all of the resources added during the past several years. It eventually became obvious that a major overhaul was needed (Figure 1).

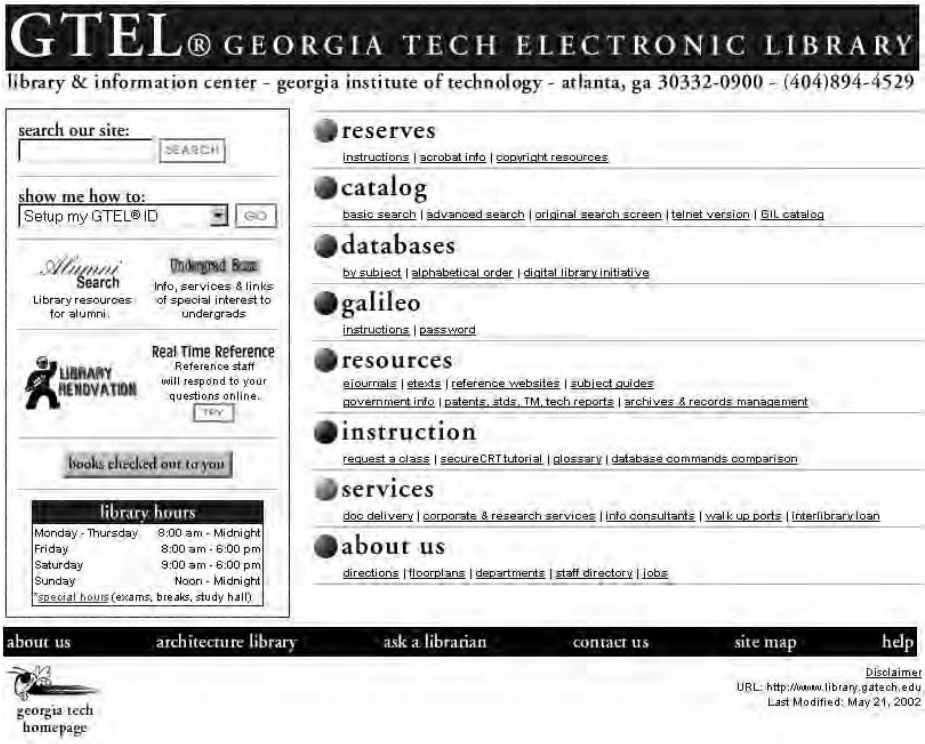

Figure 1.
Front page before initial redesign

The first redesign: focusing on information architecture and best practices in website design

In early 2002, Georgia Tech announced it was working with a local web development and consulting firm, MacQuarium Intelligent Communications, to assist in redesigning the campus website, and the university asked all its departments and colleges to keep their pages consistent with the university's main site. The Library, recognizing the magnitude of a website redesign and agreeing with the need for consistency, hired this firm as well. MacQuarium helped the Library create an entirely new information architecture that utilized the new campus template as a design guide. Together, MacQuarium and the Library performed a competitive analysis, which involved looking at what peer institutions were doing, ran user surveys (focusing on library terminology/jargon), and implemented web design best practices. Once the Library had some rough wireframes (or prototypes), its Web Developer met with campus faculty, students and librarians to get their reactions. Using their feedback, the Library continued to fine-tune the wireframes until it had a final structure and design that seemed to meet everyone's needs (Figure 2). All of the pages were created from scratch. In other words, the Library did not simply convert existing pages; rather, it created new pages for the entire site. This allowed the Library to rewrite content, create entirely new content, and delete unnecessary sections and pages. The successfully redesigned website was launched in Autumn 2003 (Figure 3).

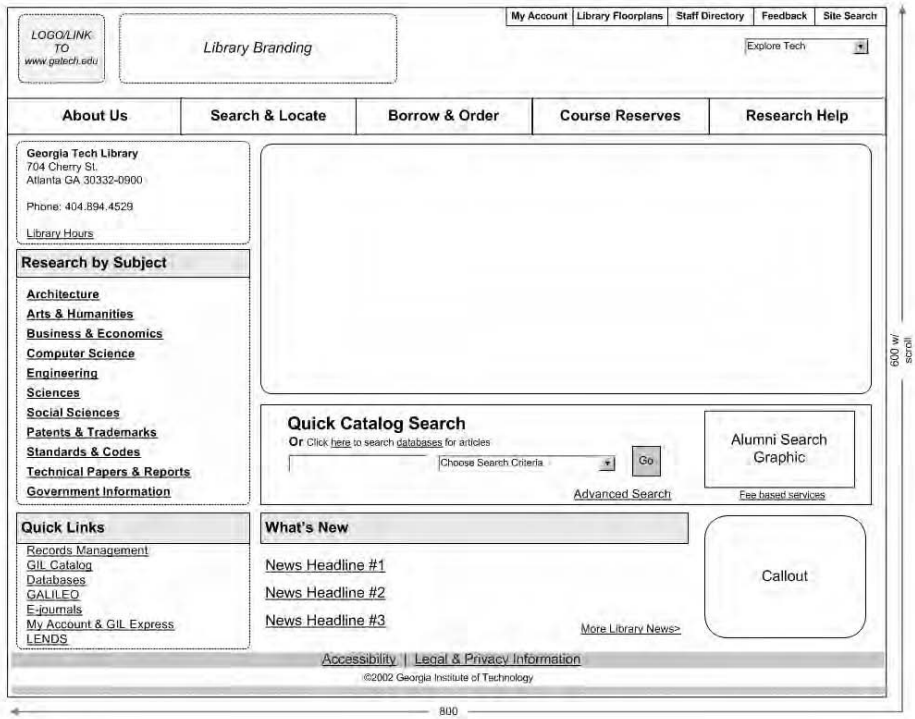

Figure 2.
Home page wireframe from initial redesign

The current redesign: focusing on usability

In Fall 2004, Georgia Tech redesigned the campus site once again. In an effort to stay in line with the campus image, the Library was prompted to take another look at its web design. Before converting to the new campus design, the Library decided to conduct a formal usability study, so its changes would be focused on assisting their users to find the wealth of information available within the Library's multitude of pages and interfaces. It did not want to start reorganizing and redesigning without first getting feedback from their non-expert users.

The Library contracted with a local usability company, User Insight, to assist in this process. By conducting a formal usability study using the talk-aloud method, actual Georgia Tech Library users provided insight that would help as work was begun on the new design. Once User Insight was hired, creation of usability documents started immediately. Their first challenge was to get at least one member of the usability team certified by the Institutional Review Board (IRB), so the study could get approved. IRBs review research studies, and ensure that the rights and safety of human subjects participating in the study are protected. The next hurdle was determining the Library's typical user. The Library thought it would be best to focus on undergraduate and graduate students with little or no experience using the website. It felt these users would provide the most telling data because they would not be familiar with the site and not have established patterns of use. At that point, a screening document was created that would help User Insight recruit the study participants. Next, Georgia Tech

Figure 3.
Home page after initial redesign

Library and User Insight developed the scenarios or tasks that would be used during the user test. Once they had all of the documents created they had to submit them to IRB for approval. After everything was signed off by IRB, they were ready to start the recruitment. The Library sent out an e-mail to 600 randomly selected undergrads and 300 randomly selected graduate students. The e-mail asked the students to respond via e-mail if they were interested in participating. The response e-mails went directly to User Insight. User Insight then randomly phoned potential participants and screened them according to the approved screening document. They recruited a total of eight participants, two for each time slot. This was to ensure they would have participants present for each session. Jakob Nielsen's (2000) research showed that the best usability

results are obtained by testing no more than five users. Nielsen (2003) also surveyed usability professionals and they reported an 11 percent no-show rate among recruited study participants, which is why User Insight double-booked each timeslot.

On the day of the study the usability team assembled at the testing facility, where they would observe each user test and participate in breakout sessions, during which they would discuss what they had observed and create a list of findings that would then establish a list of action items. The following day the team met to discuss how they would handle each action item and determine its priority. Most of the action items would be addressed in the design recommendations provided by User Insight.

Luckily, information architecture on the site as a whole seemed to work quite well. The main problem, it was believed, was guiding users to the appropriate search interface (e.g. catalog, databases and e-journals). The usability test that User Insight conducted showed that the users had no idea why they would visit one resource or interface versus another. This indicated that information literacy was a problem, but the Library could not expect its users to seek out instruction from a librarian when accessing their site remotely, so it would have to focus on ways to guide its users to the right sources via the website. User Insight provided the Library with design recommendations that attempted to guide the user through clear navigational choices. These redesigns would assist the user in informed decision-making by using consistency and screen-to-screen learning. The recommendations supported the user's mental models, not the interface-based searching strategies or the Library's expectations of how users approach the site. The recommended home page design (Figure 4) reflected the new Georgia Tech campus branding. It also utilized consistent content columns. It provided links to the Catalog and Database search instead of subject search. The "Quick Catalog Search" was removed from the home page because all of the users treated it like a Google search, which ultimately led them down the wrong path, resulting in failed searches. The "Quick Links" mainly used by librarians were featured in a drop-down menu, thus cutting down on the clutter and reducing the distraction of our users. The recommended Search & Locate landing page (Figure 5) highlighted the primary ways to locate resources. It featured "3 ways to find what you are looking for". The page maintained consistency in the design and the layout. It presented a visual hierarchy in the menu. It utilized a breadcrumb trail for easier navigation, and it alerted the user of external links by using a visual cue or icon that would appear next to all external links throughout the site. This was important because it communicated to the user that they were leaving the Library website.

Continued usability testing at Georgia Tech

One of the desired outcomes from the Georgia Tech Library's work with User Insight was learning more about usability testing so it could conduct testing itself. The Library is planning a small "lab" in which to conduct these tests. Once the testing area is established, it will test the results of its redesign. After finalizing the top-level site redesign, it will not abandon further iterative testing; however, it will also redesign and test other areas of its domain in an effort to improve its entire website presence. One of the first areas it hopes to redesign in the image of the Library site and then test is that under the auspices of the Digital Initiatives Department.

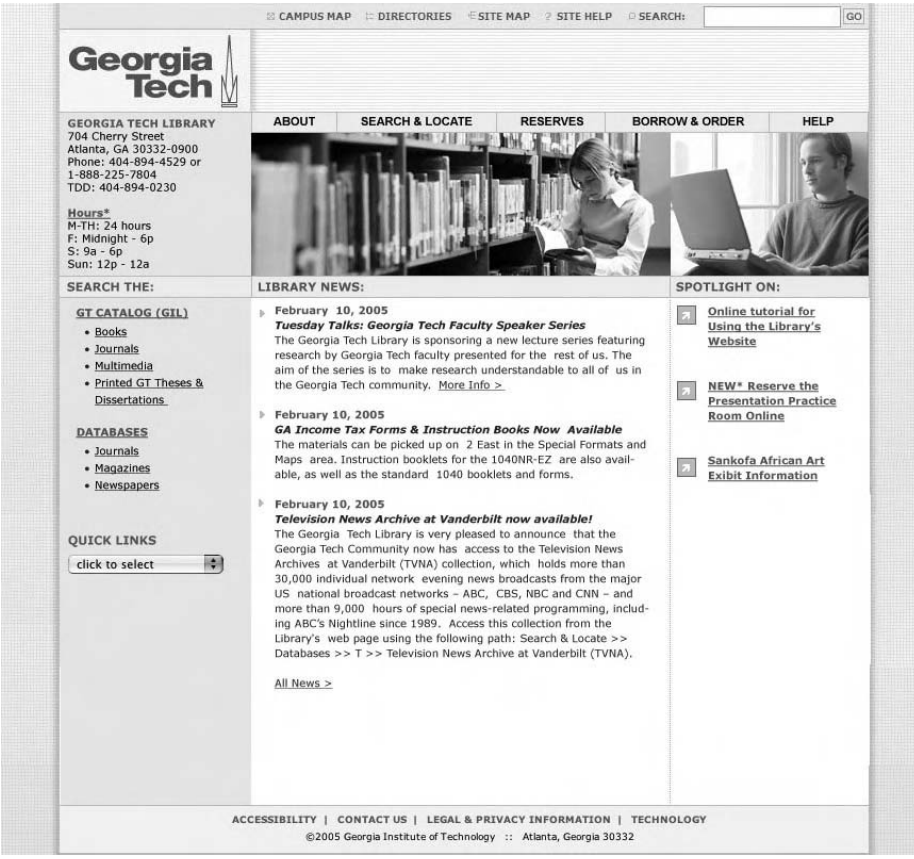

Figure 4.
Recommended home page from current redesign

Incorporating Digital Initiatives

The current Digital Initiatives Department was formally created in January 2003 when a Digital Initiatives Manager was hired. Georgia Tech Library had completed digital projects in the past, led by the Associate Director for Technical Services. These projects had their own site labeled "Digital Library Initiative" within the library's website. This site looked very much like the library's old site – basically a text-heavy list of links which belied some of the interesting and useful information contained in the site.

For the first eight months of its existence, the Digital Initiatives Department consisted of one librarian. Charged with creating an electronic theses and dissertations (ETD) program followed by an institutional repository program (see http://SMARTech.gatech.edu), the department worked closely with other Library departments on these projects but, in the beginning, did not concern itself with usability. The one concession the department made was to have the Web Developer change the digital projects website. The site was redesigned to look more like the Library's new site.

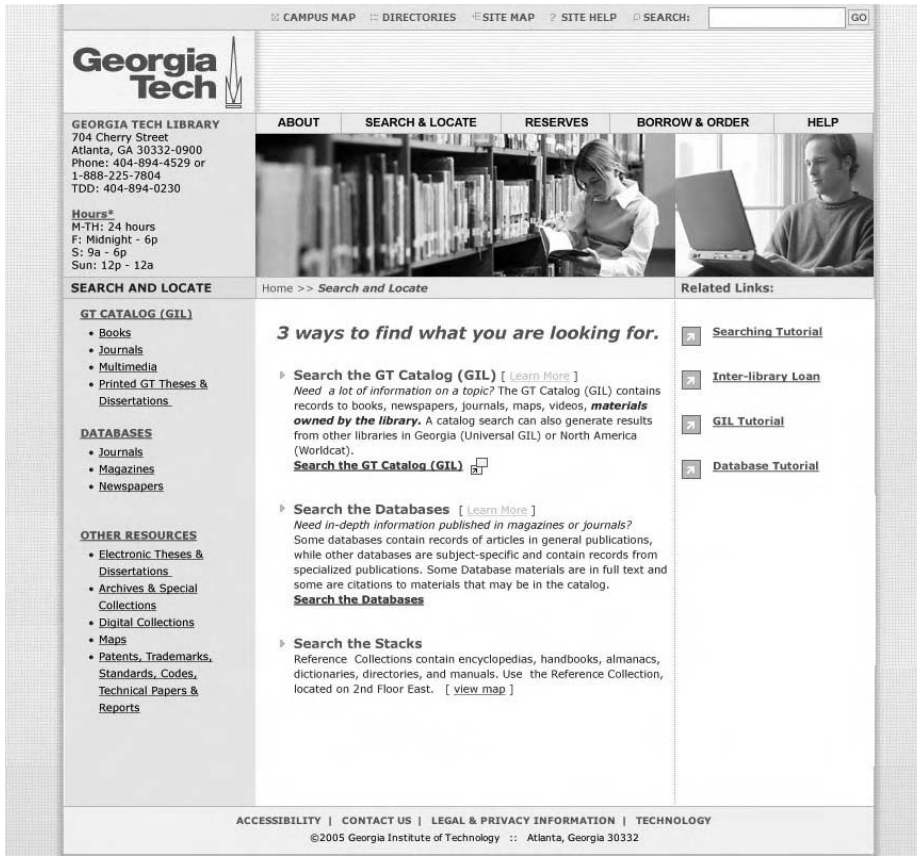

Figure 5.
Recommended Search & Locate landing page from current redesign

Using Virginia Tech's ETD software for theses and dissertations and MIT/Hewlett-Packard's DSpace for SMARTech made usability concerns less important for the moment, as information architecture took a back seat to merely getting these initiatives to program status. Using these two out-of the-box solutions allowed them to concentrate on the content of the projects without having to start from scratch designing user interfaces. It became evident, however, that there are usability issues involved with the out-of the-box solutions as well as branding issues in moving between the various sites of the different projects and the library's page. Compounding these problems is the desire to use the Virginia Tech ETD software only for submission of theses and dissertations, then loading these resources into and having users search for these works in SMARTech.

Conclusion

Armed with recommendations on design and information architecture based on usability test findings, the Library will now be redesigning the digital initiatives site and the repository site. Once those sites are redesigned, it will undergo testing in their in-house lab. Digital Initiatives present some difficult challenges for testing. One issue

the department anticipates is that the concept of an institutional repository is a new one, and users may have no background for understanding what they will find there. They will start by testing the repository site itself. Once the Library determines that the SMARTech site works for its users, it will develop scenarios where it asks users to begin at the library's site and retrieve an item from the repository – testing the terminology and the functionality.

Over the past decade and a half, Georgia Tech Library and Information Center has had increasingly more complex and better designed websites, and is currently working on a redesign with the help of a usability testing firm. The need for a site streamlined from the top level down to vendor-provided resources that are current and relevant for their students motivated the latest redesign. Through this process, the Library hoped to learn enough about usability testing to apply best practices throughout its site in an in-house testing lab. The Library plans to establish this lab to follow-up on the work accomplished on the main site and begin testing other areas, including its digital initiatives programs and exhibits, and offerings to distance education students.

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Usability training

An overlooked component in an on-going program of web assessment and development

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Abstract

Purpose – To provide a model for implementing an on-going program of training in usability topics for staff throughout the organization.

Design/methodology/approach – Drawing on best practices and thinking of industry leaders, a model for implementing an on-going training program is developed based on learning theory, training practices, and the unique issues related to usability engineering.

Findings – Provides a model for developing a localized training program for usability.

Originality/value – This paper addresses an area of usability, training in usability, which has not been addressed directly. It fills a vacuum in the literature by offering a practical model for beginning an on-going program of usability training for staff.

Keywords Worldwide web, Training, Communication technologies, Academic libaries

Paper type General review

Most librarians would agree that their website is an important, and in many cases the most important, point of interaction with their patrons. Recognizing this, most libraries understand the importance of usability testing. Many libraries, even the smallest public libraries, have performed at least some rudimentary usability testing of their website at least once. In addition, many large libraries, both public and academic, have sophisticated programs for performing usability testing on some regular basis.

Usability, however, is more than just testing. Usability is a process as well as a set of tools and practices that are used to develop a website and its constituent components throughout its lifecycle. By definition, usability is not a one-time exercise, but an on-going endeavor.

Usability testing is a function that typically occurs more than midway into a website design (or redesign) project. However, the librarians involved in providing web-based services need to be familiar with the principles of usability from the very start if they are going to develop effective systems. This is because usability must be designed into a website; it is not something that can be tacked on later.

When people are not involved with usability from the start, they often see it as just adding to the cost of the effort without delivering much value in the end (Henneman, 1999). Whether they are public services librarians, technical service librarians, collection management libraries, it makes no difference. Everyone, at every stage, involved in the development or evaluation of a web-based interface, must understand (at least) the basic principles of human-computer interaction.

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Further complicating things, in addition to the pervasive impact of usability throughout the system development lifecycle, staffing in our libraries is not static. Librarians and other staff join us as people assume new job responsibilities or leave the library to pursue other opportunities. This creates an environment where the members of our web teams are constantly changing. We cannot assume that every new staff member will have the necessary skills to perform tasks related to usability effectively.

Usability training – an organization-wide endeavor

We know that organizations that provide on-going training tend to have better hires, increased retention of qualified staff, and improved patron service (Massis, 2001). It seems imperative, then, that we have ongoing programs in our libraries to develop the skills of staff engaged in usability activities.

Ongoing training programs seem to be most self-evident for application developers and web designers because usability is a major component of their jobs, as usability must be designed into products in the first place (Nielsen, 1999). Equally important, though, is that staff members who work directly with the public also be included in on-going usability training. Public services staff and collection managers cannot make intelligent decisions about how to design information resources or services if they do not have an understanding of how people interact with computing environments. Anecdotal evidence gathered in conversations is not enough of a basis upon which to make the most effective decisions. It is critical, therefore, that when usability testing and training programs are designed, these staff members are integrated into the process right from the start.

Today, unfortunately, most libraries do not have any formal methodology in place for developing usability skills in their staff, let alone on an on-going basis. In many cases, usability skills are not developed within staff in an organized manner and may constitute nothing more than handing a new member of the team a bunch of photocopied articles and, if they are lucky, a book on usability testing.

Some would argue that this is better than nothing. Perhaps, but not by much. The problem is that staff developed in this haphazard manner will almost assuredly not have the necessary background to speak to the many issues that will arise during usability testing. Additionally, when most people think of usability they immediately associate it solely with usability testing, which is only part of the process. Staff developed in this model (if it can even be called that) will never have the opportunity to develop the skills to understand the complexity of many issues, and tend to reduce issues to simplistic terms that will not stand up to rigorous testing, thereby undermining the entire usability enterprise.

Developing a formal usability training program brings many benefits to the organization. In addition to the obvious benefit of ensuring that involved staff members have the required skills, another major benefit of an on-going program of usability training is that it makes the concept of usability pervasive throughout the culture of the organization. This, in turn, enables usability to be a consideration in everything that is developed within the library and not just web-based services. This is critical if we are sincere in our desire to listen to and address the needs of our patrons. Usability training provides a perfect opportunity for enabling this because that is the whole point of developing usable applications – delivering the products and services our patrons desire and can use.

Knowledge-based versus skills-based training

Assuming that the library has committed to developing a training program, the first question that will come up is "What kind of training do we need?". The answer will depend on the nature of your organization and the extent of your web-based services.

In general, training can be divided into two types:

(1) knowledge-based training; and

(2) skills-based training.

In knowledge-based training, staff do not learn about specific tools but instead learn about the theory and principles of usability. For example, staff may learn about the concepts of information architecture, principles of site navigation, how color affects design, and standards for web development. Skills-based training focuses on the actual tasks involved in usability, such as how to design the information architecture for a site, perform a heuristic analysis, or use specific tools to design a taxonomy.

Having completed a knowledge-based training session, a person will have an appreciation of the topic area and should be able to identify the tasks and factors associated with it. Stated another way, knowledge-based training is about enhancing awareness. It is generally a prerequisite for skills-based training. After skills-based training, a person will know how to do something. Not surprisingly, not all staff will need training in all areas.

In developing an organizational training program, understanding the differences between these two types of training is critical. Knowledge training does not have to be extremely complex or time consuming. In general, a half-day is probably sufficient for most staff. Most of the staff in a library will receive knowledge-based training, as they simply need to understand the importance of usability and what is involved in the process. One advantage is that knowledge training typically does not require a lot of instructor-participant interaction: therefore, large classes can be just as effective as smaller classes (Schaffer, 2004).

Skills training is more complex to manage because different skills are used throughout the lifecycle of a web design project, and there are many more aspects of training that need to be addressed. Some of these aspects include usability testing itself, analysis of the existing site, and designing navigation from a conceptual perspective to name just three. Yet again, not all staff require training in every skill, so it is not as daunting an effort as would first appear. For example, staff developing the site design and graphics need advanced training in graphic design. On the other hand, representatives (but not all librarians) from reference, instruction, and other patron liaison positions need a more detailed understanding of the overall design process so that they can bring this knowledge back to their local constituent groups and act as "bridges" from the content stakeholders to the personnel actually doing the development. Add to that, in a large web team, the senior management may only need to understand the process, philosophy, and design rules of usability in order to evaluate and support web development staff effectively. In this case, skills-based training may not be appropriate for this level of employee.

Developing a training plan

A key factor in developing a usability training plan is that it must account for continuous training. Most plans fail to do this and approach usability training as a

one-time event. Additionally, the training offered is limited as it only encompasses training in usability testing. Neither of these conditions, one time event or limited to usability testing training, will suffice if usability is to become an ingrained part of the organizational culture.

As is the case in developing most training, designing a training program for usability follows a general set of steps:

(1) determine the groups of staff to be trained;

(2) define their training needs;

(3) develop learning objectives, activities, and training strategies;

(4) outline training content or course tracks;

(5) plan for evaluation; and

(6) carry out follow-up activities.

In step 1, the person developing the training program must determine who among the staff needs to be part of the training process. Typically, staff members are grouped into general areas, such as application programmers, web designers, content specialists, service providers (i.e. reference staff) and so forth. Once that has been done, it is possible to move onto step 2.

In step 2, the training developer defines the training needs for each staff group. For knowledge-based training at the general staff level, many libraries will decide to develop in-house training that can be offered on a periodic basis. For other areas based on skills, typically it will be neither possible nor desirable to develop and deliver training in-house. In that case, the task of the training developer is to identify appropriate external development opportunities for staff. This may be through commercial providers or through local college programs.

For training developed in-house, the training developer moves to step 3 and creates instructional activities which allow the outcomes identified by the training objectives to be achieved. These activities may be short one-hour courses or full-blown training courses. Regardless of length, it is important to develop activities in a structured manner incorporating an introduction to the topic, an activity using the topic, and a segment that puts the topic in context related to prior and upcoming learning. Keep in mind that skill development is best done through practice. Modeling, practice, and feedback, therefore, must be integral components of the learning activities. Additionally, methodologies for teaching should encompass a number of methods. Bear in mind that most instructors will design their courses around a very narrow range of practices (Joyce *et al.*, 1987), but not everyone learns in the same way, so activities must be critically evaluated to ensure they incorporate listening, reading, as well as doing activities.

Whether developed in house or externally, in step 4 the training designer defines the course or learning activity sequence that each group of participants must follow in order to gain all the skills and knowledge they need. For example, the learning sequence for upper managers may simply be attendance at an "Introduction to Usability" seminar. On the other hand, the sequence of courses for web developers may be extensive and include multiple courses based upon the specific tools used in the local environment.

Step 5 involves planning for evaluation. Most evaluation is typically focused on assessing the learner's perception of the learning activity. While it is useful to know how learners perceive the experience since that can provide valuable feedback and

corrections to the training plan, evaluation should also consider how the organization as a whole will assess the effectiveness of the program and individual performance after attending training programs. One possible approach is to evaluate staff performance based on the stated outcomes of the training they attend. For example, if one of the stated outcomes of a training module is to "be able to conduct a cognitive walkthrough with diverse groups of library staff", one option would be for the library staff attending this module to be evaluated on this factor in their formal performance evaluation.

Finally, step 6 incorporates follow-up activities to training, which typically consist of activities that continue to keep people engaged in the topic areas. Although newsletters and website postings can be used to provide general "update" types of information, these do not provide for on-going deep learning and absorption of skills. More effective means of developing in-depth understanding include peer observation and coaching, which is where people observe one another on a regular basis and then meet to discuss and reflect on their observations. Similarly, regular study groups and booster sessions can be used to bring people together on a regular basis to reinforce the knowledge and skills acquired. Ideally, once the program has been in place, mentoring, where newer members of the team could receive one-on-one, personal support and assistance with an experienced person, will be possible.

Specific areas of knowledge in a usability training plan

While each organization is different, there are general sequences of training that have been used throughout various industries to enable usability within an organization.

In a library setting, knowledge-based training typically is provided by a course that serves as a general introduction to the topic of usability. As such, several areas are usually addressed. Schaffer (2004) has suggested these topics include:

- *why usability is an imperative* – defines when usability methods are used and how they benefit patrons;
- *information architecture* – an introduction to organizing content and functions so users will find them;
- *site and page navigation* – provides guidance on selecting the right site and page navigation model for patron groups;
- *writing for the web* – brief overview of how to write text that people can scan and will enjoy reading;
- *using color effectively* – how depth can be added to design by using good color principles; and
- *standards and consistency* – how locally developed style guides and content creation standards improve the overall functionality of a website or service.

Skills-based training for project team members tends to be very specific training around certain tools or methodologies. In general, however, these skills-based training activities tend to be in three main conceptual areas:

(1) web design;

(2) user-centered analysis and conceptual design; and

(3) usability testing.

Training in the area of web design includes a wide range of topics such as:

- basic HTML coding;
- creating and editing web graphics with programs such as Macromedia Fireworks or Adobe Photoshop;
- overall site design using products such as Microsoft Frontpage or Macromedia Dreamweaver;
- creating animations with Flash;
- validating online forms and using dynamic, database-driven content with programming languages such as PHP, Perl, or ColdFusion;
- search engine optimization; and
- prototype development.

Training in the area of user-centered analysis and conceptual design usually includes modules related to the following areas:

- designing systems for human-computer interaction;
- information architecture, taxonomies, and ontologies;
- writing for the web – developing effective written content;
- accessibility standards and legal requirements;
- developing an effective style guide;
- website localization and internationalization considerations for library websites that serve international audiences or are available in languages other than English;
- analysis techniques which will vary depending on circumstances but could include traditional systems analysis or field-based research methodologies based on ethnographic research; and
- consultancy skills.

Training in the area of usability testing is perhaps the best known of the three areas. The breadth of usability testing technique, however, surprises many people. Topics related to usability testing typically include:

- how to design usability tests tailored for the local environment;
- methodologies for selecting participants that will ensure validity of test results;
- developing test tasks that are relevant to patron needs;
- best practices for setting up a testing environment or lab;
- observation, moderation, and facilitation skills;
- skills related to specific testing methodologies such as heuristic evaluation, cognitive walkthroughs, and peer analysis; and
- development and analysis of usability metrics.

Putting it all together

In developing a local, on-going usability training program, many libraries will choose to develop knowledge-based training activities in-house. Although it may not be possible at the start, after an introductory period there will be enough people on staff

who are familiar with the basics of usability who could offer this training on a regular basis. These recurring offerings of this course would be directed at existing employees who need a refresher as well as providing an introduction for staff new to web projects.

Skills-based training is more complex. Except in the largest organizations, it is unlikely that a library will have the staff and resources to offer training in-house. Moreover, in an age of shrinking budgets, it is unlikely that most libraries will be funded well enough to send all affected staff to every skills-based course. Creativity in this area is required. A popular way of handling this situation is to send one or two people involved in an area to training with the expectation that they will come back and train the other members of their team.

Another viable option is to explore online learning experiences. Several companies offer skills-based training in the online environment and many local library systems or consortia offer special deals for their members. Especially for web design skills, online learning can be a very effective and convenient environment.

Regardless of what method of training delivery is decided upon, the most important aspect is that the usability training program be an on-going endeavor. Adequate funding must be in place to support training experiences for staff throughout the year and project lifecycle. Training budgets should not be completely spent at the beginning of a project or the beginning of the fiscal year. Furthermore, as the training program develops and matures, it will undoubtedly be modified to allow for additional advanced training options for staff members seeking knowledge in new areas of usability or new techniques in their specific area of expertise.

Developing a usability training program is not a simple task, but the benefits gained from a systematic approach to usability can be extensive. Landauer (1995) observed that the average software program has approximately 40 design flaws that impair the ability of people to use it. The resulting cost of lost productivity can be up to 720 percent. Furthermore, according to Pressman (2005) for every dollar invested in usable design, the return in benefits to the organization is anywhere from two-fold to one hundred-fold.

An investment in usability is an investment in the future of the library. Increasingly, the only thing that differentiates one information source from another is how practical, useful, and satisfying it is. The great opportunity for libraries today is in making information more practical, useful, and satisfying. The consequences of not investing in usability are straightforward. We are already seeing the negative impact of ignoring usability as people increasing turn to sources that are solidly rooted in usability principles, such as Google. Pavka (2002) has observed, "People turned away by unusable sites will probably try a competitor's site". If libraries do not take the task of making their resources usable, someone else will.

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Cognitive task analysis

A cognitive approach to evaluate evidence-based nursing websites

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Abstract

Purpose – To introduce a cognitive approach – cognitive task analysis (CTA) – for the usability evaluation of evidence-based nursing (EBN) websites.

Design/methodology/approach – With the justification of the need for new evaluation methodologies for the usability of EBN websites and the provision of the theoretical framework and implications of CTA, the author proposes detailed steps for the usability evaluation of EBN websites.

Findings – CTA is a new approach that can be used for the evaluation of the usability of EBN websites. It has the advantages that conventional evaluation methods lack in characterizing the aspects of websites useful to nurses in carrying out evidence-based practices.

Originality/value – This paper, with the introduction of a new cognitive approach, helps ensure the effective evaluation of the EBN websites, which can then be improved to adequately meet the requirements and information processing needs of the nurses practising evidence-based nursing.

Keywords Evidence-based practice, Nursing, Worldwide web, Function evaluation

Paper type Research paper

Introduction

Evidence-based nursing (EBN) has become an increasingly pervasive term in the nursing profession in the past decade. Many healthcare institutions have started to regard EBN as a priority for professional nursing practice and are revising their mission statements and institutional values to incorporate EBN to fit in with this shift of practice priority. EBN is "the incorporation of evidence from research, clinical expertise, and patient preferences into decisions about the healthcare of individual patients" (Mulhall, 1998, pp. 4-6).

With this new nursing trend, the use of the best available evidence to guide nursing practice has become an integral part of the practice standards of most professional nursing associations and the policy standards of most healthcare organizations. In correspondence with this situation, more and more evidence-based nursing websites have been developed to meet the users' needs. To ensure that the websites adequately meet the requirements and information processing needs of the nurses who are practicing evidence-based nursing, the effective evaluation of these EBN websites is naturally a necessity.

Need for new evaluation methodologies for the usability of EBN websites

Evidence-based nursing (EBN) websites are those that address evidence-based practice, are specific to nursing, and offer resources useful to the practising nurse. The resources they provide include clinical information, suggested protocols, research syntheses, and reviews. The Joanna Briggs Institute for Evidence-Based Nursing and Midwifery (see www.joannabriggs.edu.au), the University of York Centre for Evidence-Based Nursing (see www.york.ac.uk/depts/hstd/centres/evidence/ev-intro.htm) and the Sarah Cole Hirsh

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Institute (see www.hirshinstitute.com) can be regarded as good examples of EBN websites (Morris *et al.*, 2001, pp. 578-87).

A range of approaches can be used for the purpose of assessing the usability of the evidence-based nursing websites. "Usability can be broadly defined as the capacity of a system to allow users to carry out their tasks safely, effectively, efficiently, and enjoyably" (Kushniruk and Patel, 2004, p. 56). Traditional approaches of evaluating websites' usability focus on summative evaluation, aiming at how well-developed evidence-based nursing websites meet a set of pre-defined goals. Yet these approaches often have limitations.

One of the most widely used evaluation methods of the usability of websites is the questionnaire. This technique can either be used as the primary method of data collection in evaluations, or as one of the data collection techniques in multi-method evaluations. A questionnaire is a very useful technique in asking subjects about certain categories of information, for example subject demographics, age, and how often they use the website. It has such advantages as ease of being distributed to a large number of users, automated analysis of results, and quick feedback. The questionnaire, however, may not be able to reveal how the website fits into the context of actual use. The questionnaire contains pre-determined items and it is hard to identify new or emergent issues that the researchers have not previously thought of. Furthermore, by asking subjects to rate a website after the actual use, the results are subject to the difficulty subjects feel in recalling their experience in using the website. When the actual process of using a website is video-recorded and compared to the questionnaire results from the same subject, the questionnaire results often do not reflect what the user actually did in practice, as it was captured on video. In many cases, both experienced and inexperienced users of a website may not be aware of what they actually do, resulting in inadequate or inaccurate information concerning the usability of the website (Kushniruk and Patel 2004, p. 58).

Other commonly used methods for the evaluation of the usability of websites are interviews and focus groups. These methods also ask subjects to reflect on their prior experience with a website, and thus tend to have similar problems as the questionnaire.

Another problem with the use of the questionnaire, interview or focus group for the usability evaluation of a website is that these techniques, if used alone, may be insufficient for revealing how nurses actually search the website for carrying out a complex task and may need to be complemented by using other methods (Kushniruk and Patel 2004, pp. 58-9). Thus new methods need to be developed that can be void of these disadvantages and can satisfy the needs of the researchers.

Theoretical framework and implications of cognitive task analysis

In recent years, cognitive approaches have been developed and adopted for the purpose of website usability evaluation. These approaches are formulated from an interdisciplinary perspective and draw from a number of areas including cognitive psychology, computer science, systems engineering, and the field of usability engineering. They are carried out either to characterize how easily a user can perform a task by using the website, or to assess how users gain the mastery in using the website, or to assess the effects of the website on users' work practices, or to identify problems users have in interacting with the website. This type of evaluation aims at gathering information about the actual process of using a website by representative users performing representative tasks, the results of which can be used either to improve the features of the website before the completion of its

development, or to assess the impact of the fully implemented website (Kushniruk and Patel 2004, p. 57).

A cognitive approach to evaluation emphasizes the fact that users must gain sufficient knowledge, skill, and familiarity with a website in order to use it effectively and safely. It represents a shift from the focus on the component design to the focus on the understanding of the interaction between the end user and the website in performing tasks.

One of these cognitive approaches is cognitive task analysis (CTA), which represents an integration of the ideas from the field of systems engineering and cognitive research in medicine. This approach is concerned with characterizing the subjects' decision making and reasoning skills, as well as information processing needs when they perform activities or tasks relating to the processing of complex information.

Cognitive task analysts try to develop a fairly complete theory or model of how experts in a field perform their tasks, which can then be used to develop system interfaces, intelligent support or decision aids, training programs, and other artifacts. The approach "is similar to, and draws heavily from, knowledge engineering methods that originated in artificial intelligence" (Gordon and Gill, 1997, p. 133).

CTA methodologies vary widely, but they have some features and characteristics in common. First, CTA methodologies usually put an emphasis on understanding the processes involved in complex decision making and reasoning. Second, the methodologies attempt to take into account and characterize the effects of experience and prior knowledge on decision processes. Finally, the methodologies typically identify problems that occur in decision making and reasoning by subjects of varying levels of expertise (Kushniruk, 2001, p. 371).

Proposed evaluation steps of EBN websites via cognitive task analysis

One variation of cognitive task analysis approach to be adopted for the evaluation of website usability relates to what is proposed by Means and Gott (1988). With this variation of the approach, a task hierarchy is first worked out that describes and catalogs the individual work activities or tasks in the institution. For nurses, these tasks might consist of such activities as accessing online guidelines to help in management of a patient. When tasks are identified, subjects with varying levels of expertise can then be observed and video-recorded as they perform selected tasks of interest.

The following are the detailed proposed steps for the evaluation of EBN websites. There may be some variations in these steps, but the listed should be the core steps to be incorporated in the actual evaluation.

Step 1: development of the evaluation plan

The first and also a very important step in conducting EBN website evaluation is to develop a good evaluation plan. At this stage, the overall objectives of the evaluation should be identified. Possible objectives for conducting evaluations can include the assessment of the website functionality, identifying problems in the interaction between users and the website, and evaluating the effects of the website on nurse decision-making processes.

Step 2: selection of representative subjects

This step involves the identification and selection of the target subjects for the website usability evaluation. Subjects should be representative of the end users of this particular website under study, and different levels of subjects should be included for the evaluation

purpose. The subjects to be studied can be different in terms of such aspects as their expertise in using computers and in searching EBN websites, their roles in the workplace, and their expertise in the domain of work the website under study is targeted for.

Step 3: selection of representative tasks
The selection of tasks for the evaluation should be based on the overall study objectives. In addition, tasks should be chosen to be representative of the real uses of the website under study.

Step 4: selection of the background questionnaire
A background questionnaire may be given either before or after actual testing of a subject's interaction with the website being evaluated. This questionnaire can be used to obtain historical information about the subjects, which should be of help to the evaluators in understanding the subjects' behavior and performance during the evaluation (Kushniruk *et al.* 2001, pp. 45-70).

Step 5: setting up the evaluation environment
The evaluation environment can differ a lot. It can be conducted either in a commercial usability laboratory, or, to the other extreme, in the most convenient setting possible or even in actual clinic or hospital settings. In the latter case, a camcorder can be enough for the video-recording of the subjects and a microphone can be used for the recording of subjects' verbalizations.

Step 6: data collection
After the evaluation environment is set up, subjects are asked to perform particular tasks while interacting with the website. They are instructed to "think aloud" during the interaction. The data collected typically include the video-recording of all computer screens along with the corresponding audio recording of subjects' verbalizations as they use the website under study.

Step 7: data analysis
There are a variety of approaches of analyzing video data, ranging from the informal review of the resulting taped data, to the formal and precise analysis of the number and type of errors or user problems. The first stage of the data analysis should be to transcribe the audio recordings in a word processing file, which can then serve as a computer-based log file for entering annotations and codes, and be linked to the corresponding video-recordings.

For the purpose of the data analysis, a coding scheme should be formulated for the purpose of identifying specific occurrences of user problems and aspects of cognitive processes. The coding categories can include information content, comprehensiveness of graphics and text, problems in navigation, and overall web site understandability (Kushniruk and Patel, 2004, p. 65).

Step 8: interpretation of findings
The data analysis results should be summarized, based on the goals of the evaluation. The results may be organized according to such aspects of the website usability as task accuracy, user preference, time to complete the task, frequency and classes of problems encountered by the subjects, and even the types and frequency of problems that occur

when subjects interact with the website. The results should be interpreted for what they mean, within the context of the theoretical framework.

Step 9: iterative input into design

The evaluation of the usability of the website should be an iterative process. The designers should make changes to the website, based on the recommendations made by the evaluators. After the change implementation, evaluation should be repeated to determine how the changes affect the website's usability. In this way, evaluation is integrated in the process of the website development, achieving the continual improvement of the website.

Conclusion

Cognitive task analysis (CTA) is a new approach that can be used for the evaluation of the usability of evidence-based nursing (EBN) websites. It has the advantages that conventional evaluation methods lack in characterizing the aspects of websites useful to nurses in carrying out evidence-based practices.

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