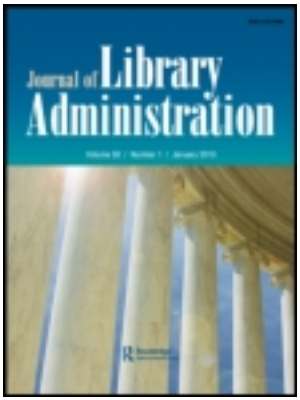

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Usability Testing, Interface Design, and Portals

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Chapter 9

Usability Testing, Interface Design, and Portals

Jennifer L. Ward
Steve Hiller

SUMMARY. During the past decade, usability testing has become an integral component of Web design and development in libraries. Within the past five years, library portals allowing some degree of personal customization have established a presence on a number of library home pages. This chapter reviews some basic concepts of usability testing and then examines how usability testing has been employed to inform the design and use of Web sites and customized library portals at the University of Washington and at other institutions. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com>*

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INTRODUCTION

Usability testing was established in the business world to gain a better understanding of how the (potential) customer uses a specific product. By using a variety of qualitative methods, including observation and focus groups, information would be acquired that could then be used both in the design and marketing processes. We define usability testing as a structured process of getting information on the extent to which a product can be used by the intended users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.

While usability testing is most commonly associated today with human-computer interactions it can be used with almost any product or service. One of the authors took a usability workshop in the early 1990s in which the first task was to set the alarm for a clock radio and, if we were successful, to turn it off. Even though the room was well-lighted, this wasn't easy. Many of us have struggled with clock alarms in dim, unfamiliar hotel rooms and wondered why a relatively simple task could turn out to be such a complex operation. Yet relatively few libraries at that time had employed such testing with their own products and services. Some work had been done with using the library catalog (both card and online) as well as tracking how people actually found books and journals in the library. The majority of these studies showed that users experienced difficulty finding resources through the catalog and locating items on the shelf. The solution offered by many libraries was based on our assumptions on how users should act. We would provide more user education and teach them how to use libraries the "correct way," and perhaps improve signage. The idea of redesigning services based on user preferences was rarely considered or employed.

The concept of the user-centered library that began to emerge in the early 1990s shifted the library focus from how we think or assume things ought to work to understanding how and why our community used libraries, and then designing and implementing library services and programs that could best support their work. As Stoffle and her colleagues at the University of Arizona put it:

> All services and activities must be viewed through the eyes of the customers, letting customers determine quality by whether their needs have been satisfied. Librarians must be sure that their work, activities and tasks add value to the customer. (Stoffle et al., 1996, p. 221)

To understand user behavior we need structured methods to observe, measure, and acquire appropriate information directly from them. Usability testing is one of these methods.

USABILITY TESTING

Usability testing generally involves creating a list of tasks that participants follow when using a product or service and then observing how they accomplish those tasks. Participants are often asked to comment on the process during the test (by thinking aloud) or afterwards and their activity may be captured through a variety of methods: observation, visual and/or audio recording, or through a computer log. The goals of usability testing are to provide data on whether participants can accomplish the task (effectiveness), do it in reasonable time and effort (efficiency), show how it is done (context), and finally their reaction to the product or service (satisfaction). The information acquired from usability testing is then shared with developers and designers and others in direct contact with the user community to better understand user behavior and as part of a user-centered design process. Rubin's influential *Handbook of Usability Testing* (1994) identifies three principles of user-centered design: (1) an early focus on users and tasks; (2) empirical measurement of product usage; and (3) iterative design whereby a product is designed, modified, and tested repeatedly.

For most libraries, usability testing is now associated with Web-based services. Many of the initial library usability studies involved questions of navigability and language on the library's Web site. Participants were often given a task or list of activities to do and their actions were observed. They are often asked to vocalize their thoughts as they go through the process and can indicate when they have difficulty navigating or finding a resource or service on the Web site as well as note any language used that is confusing or they don't understand. More recently, library Web usability studies have also included resource discovery and customizable portals.

Usability testing generally falls into the category of structured qualitative research. Substantial preparation needs to go into the design of the usability test. Campbell notes:

> The most crucial part of doing formal usability testing is creating the list of tasks that participants will complete using the Web site or system. These tasks should be representative of actual things average users would do on the site. . . . When creating tasks it is important to pay special attention to the wording of each question and use words that are not leading or biased in some way. . . . It is also important to limit the number of tasks based upon the amount of time allotted for test sessions. (Campbell, 2001, p. 3)

The number of participants can be relatively small. Generally, four or five participants should be enough to identify about 80% of the problems. When dealing with a more heterogeneous community, it is advisable to make sure there are some representatives from each group. Thus, academic libraries might want to involve several undergraduates as well a few faculty as they tend to use libraries differently. Usability testing can be done at places ranging from a simple computer with a note taker to a sophisticated usability lab with audio and/or video capabilities. However, it is critical that a trained observer record not only their activities but also the comments from the participant as they "think aloud" and other personal reactions such as body language.

Other methods for assessing usability include site statistics, focus groups, pop-up and other Web-based surveys, card sorting and categorization, cognitive walk throughs, and heuristic evaluation by "experts." Effective usability reviews will employ multiple methods to provide a multidimensional evaluation from the user perspective. Conducting the usability test is just one part of the overall process. Equally important is communicating the results to designers, developers and those who work directly with the customer. Usability testing is effective only if the information acquired can be used to make the design process more user-centered. At best this is an iterative process of design, testing, modification, employment, and retesting. More realistically it involves a cyclical process with periodic major design or content changes followed by ongoing small tweaks that enhance use.

Library-related usability testing began to bloom in the mid-1990s through work on digital library initiatives (Van House et al., 1996) and in design and evaluation of library Web sites. Initial publications on usability of library Web sites appear in 1998 based on work at the Uni-

versity of Arizona Sabio system and later at North Carolina State University. Campbell in her 2001 LITA publication, *Usability Assessment of Library-Related Web Sites*: *Methods and Case Studies*, provides an excellent bibliography of previously published or accessible work on library Web sites, as well as a number of case studies from different libraries. Norlin and Winters (2002) produced a short how-to manual published by the American Library Association which is designed for those interested in evaluating their library Web site. Pace's Building and Optimizing Library Web Services in *Library Technology Reports* (2002) had a strong focus on usability and contains usability instruments. Usability presentations are now a common feature at many library conferences and it's safe to say that usability testing is clearly part of a best practices suite for libraries.

Covey (2002) in her study of usage and usability assessment at Digital Library Federation member libraries listed several concerns and issues with usability testing or user protocols. These included librarian assumptions and preferences that impeded testing and use of results, lack of resources and commitment, interpreting and using the data effectively, and recruiting participants who can think aloud. She went on to note that usability testing

> requires skilled facilitators, observers, and analysts and the commitment of human and financial resources. . . . Even if the skills are available, there could be a breakdown in the processes of collecting, analyzing, and interpreting the data, planning how to use the findings, and implementing the plans, which could include conducting follow-up research to gather more information. . . . Limited resources frequently restrict implementation to only the problems that are cheap and easy to fix, which are typically those that appear on the surface of the user interface. Problems that must be addressed in the underlying architecture often are not addressed. (Covey, p. 29)

While these admonitions are important, especially for those planning to initiate usability testing, the predominant experience at libraries that have done usability testing is overwhelmingly positive. Even if a number of the issues and problems identified in usability testing cannot be resolved initially, small changes can improve site usability, and more importantly utilize a design process that recognizes the importance of ongoing user input.

LIBRARY PORTALS AND USABILITY

The basic elements of a library portal are a customizable Web interface, personalized content presentation, and powerful cross searching functionality. The definition, development, and implementation of library portals are described more fully elsewhere in this issue. While there is substantial interest in library portals, Boss (2002) estimated that only a small number of libraries, less than .5%, have implemented them. The first substantial effort to describe portal development at more than one library can be found in a special issue of *Information Technology and Libraries* (*ITAL*) (2000). Each of the libraries involved–North Carolina State University, Virginia Commonwealth University, and the University of Washington–had employed some type of usability testing in a redesign of their Web site which led to a customizable option. However, at the time those articles were written, these portals had been in operation for less than two years. Common threads among these sites are that a relatively low number of active users accounted for most of the activity and that most did not have a robust cross-search function. Ghapery (2002) provided an updated report on My Library at Virginia Commonwealth University which was first described in the *ITAL* 2000 issue. He stated that

> there have not been many follow up studies on the measured use of My Library. A possible reason for this might be the fragmented nature of library personalization. In the case of VCU Libraries, the initial concept for the My Library service was ahead of the technological infrastructure to support it. For example in the fall of 1998 the VCU legacy Integrated Library System (ILS) did not support online borrowing transactions and Interlibrary Loan was mediated through a simple web form. While the spring of 2002 finds these types of web services commonplace, a unified package of services remains to be fielded. (p. 1)

He went on to note that success would come with the "transparency of the My Library service whereby patrons have unfettered access to customized library resources and services depending on their information needs" (p. 5).

Gibbons (2003) discusses using the My Library concept to pre-identify and dynamically push Web pages to students based on the courses they take and course reserves. Librarians and students both participated in usability testing and the results "caused significant changes both to

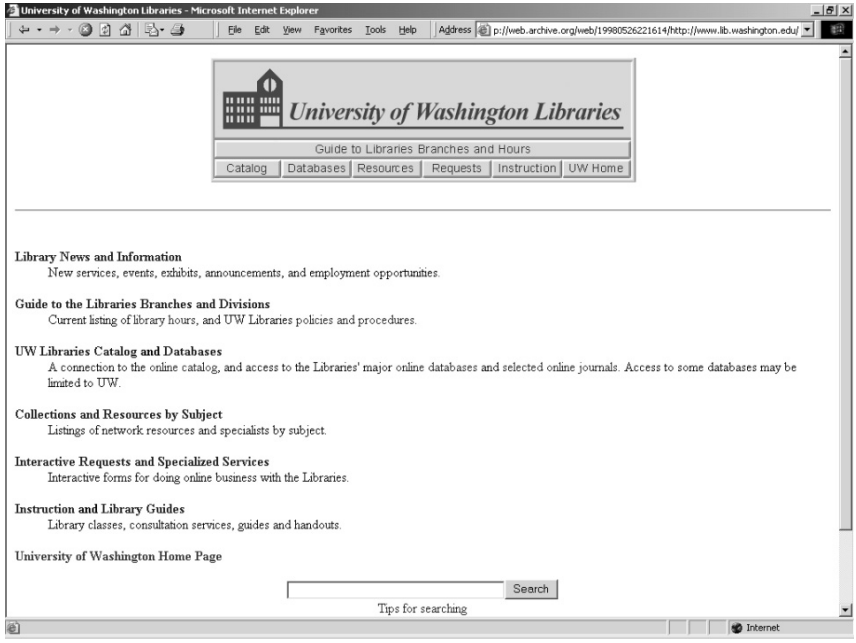
the requirements of the system as well as to its design. . . . Usability testing played a tremendous role in determining the terminology used . . . and the weight and emphasis of elements on the page." Gibbons stressed the integration of the library portal in the user's workspace and maintaining as few barriers as possible to its use. Ketchell noted in 2000 that "customization must expand to personalization to avoid a faceless virtual library; My Library functionality will be only one tier in a user's larger university and Web world" (Ketchell, 2002, p. 178). Morgan and Reade also conceded that "The NCSU Libraries may eventually need to cede the priority of our own portal . . . and develop modules that can function as channels and be plugged into a subscriber's own portal" (Morgan and Reade, 2000, p. 197).

USABILITY TESTING AND INTERFACE DESIGN AT THE UNIVERSITY OF WASHINGTON

Since 1992, the University of Washington Libraries, with strong administrative support and broad-based staff participation, has conducted extensive, ongoing assessment of user needs, focusing on needs assessment, priorities, library and information use patterns, and user satisfaction with the quality of library services and collections. The user-centered approach is in alignment with the UW Libraries' strategic goals and directions. The UW Libraries has employed a variety of methods to obtain information from faculty and students, including large-scale surveys, targeted surveys, focus groups, observation studies, usability testing, guided interviews, meetings, and both traditional and electronic suggestion boxes. Assessment results guide and inform development of services and resources with results used to improve service quality, library performance, and better support user needs.

In 1998, a group was convened to redesign the Libraries' Web site, the underlying goal of which was to move from an administratively organized site (Figure 1) to one that is more task-oriented and focused on information retrieval (Figure 2). During this process, usability testing was conducted on a prototype of the new site as part of a class project by students in the UW Technical Communications department. The tests were held in the department's Laboratory for Usability Testing and Evaluation (LUTE), a lab outfitted with the tools necessary to support a number of evaluation methods. Although familiar with broader service assessment, this was the first experience library staff had with formal usability testing and the reaction was very positive. Based on feedback

FIGURE 1. Screenshot of Libraries' Web Site (May, 1998)



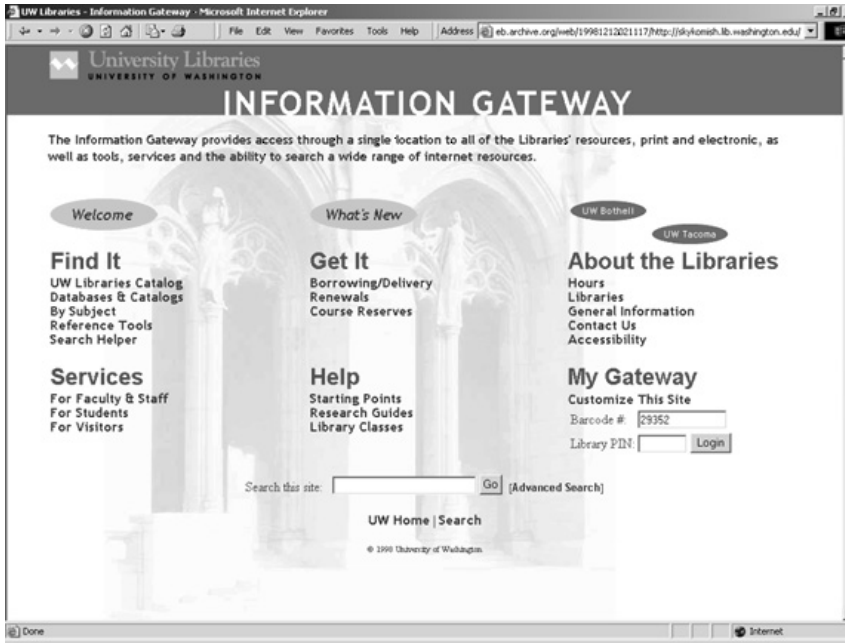
received from the testing, the group made changes to the navigation and terminology of the developing site. Staff were sold on the importance of including usability as part of the systems development life cycle.

After this experience the Libraries sought to programmatically incorporate usability testing in the development life cycle of online services and resources, a goal that was finally realized in 2001. Changes in staffing have brought a usability coordinator and a graduate student dedicated to usability efforts on board. Usability lab space is tight on campus, so equipment was purchased to conduct and monitor tests in-house.

Results from two recent broad-based surveys revealed that users were satisfied with the Libraries' Web site, the Information Gateway. The UW Libraries run large-scale user surveys every three years and the last one in 2001 showed satisfaction with the Information Gateway ranked at or near the top of a group of ten services (Table 1).

The UW Libraries also participates in the LibQUAL+™ survey which was administered at more than 300 institutions in 2003. UW re-

FIGURE 2. Screenshot of UW Libraries' Information Gateway, Showing a More User-Centered Design (December, 1998)



spondent satisfaction with a "library Web site enabling me to locate information on my own" was substantially higher than the mean service adequacy satisfaction for other ARL institutions. LibQUAL+™ also provides a measure for assessing importance by looking at desired levels for a specific service. Among the 25 questions asked on the LibQUAL+™ survey, the mean desired service level for a "library Web site enabling me to locate information on my own" ranked at or near the top for all 25 questions (Table 2).

While the survey results were clearly positive, more detailed information was needed about our site and how it was being used. To achieve that goal, we developed and employed a variety of assessment methods including online surveys, focus groups, interviews, field studies, prototyping, and usability testing.

In 2001, the goal for the usability group was to fix pieces of the gateway that needed improvement and since we had no real data on what ar-

TABLE 1. Satisfaction with Library Services: UW Libraries Triennial Survey 2001, Mean Scores by Group

Scale of 1 (low) to 5 (high)	Faculty (1345)	Grad Student (563)	Undergraduate (497)
Libraries Web site	**4.20**	**4.27**	**4.06**
Staff assistance in library	4.31	4.13	3.90
Article and document delivery	4.11	4.14	3.73
Access to library computers	4.09	4.12	3.90
Reshelving of library items	4.01	3.88	4.04

TABLE 2. Importance of Library Web Site: LibQUAL+™ Survey 2003, Mean Desired Service Level Scores by Group

Desired service level	Faculty		Grad Student		Undergraduate	
Scale of 1 (low) to 9 (high)	**UW**	**ARL**	**UW**	**ARL**	**UW**	**ARL**
Library Web site enabling me to locate information on my own	**8.53 (2)**	**8.49 (1)**	**8.55 (2)***	**8.47 (2)**	**7.85 (6)***	**8.20 (1)**
Information easily accessible for independent use	8.34	8.29	8.27	8.28	7.90	8.08
Electronic resources accessible from my home or office	8.68 (1)	8.49 (1)	8.58 (1)	8.50 (1)	8.02 (1)	8.20 (1)
Easy to use access tools	8.37	8.34	8.38	8.34	7.89	8.15

*Mean score was statistically indistinguishable from score above it.

eas should be targeted, user feedback was needed. Assessment practices have shown that surveys are a useful tool to help identify broad problem areas that need more in-depth investigation. A locally created tool, Catalyst's WebQ, was used to create online surveys that have been posted on the Libraries' home page in summer, 2001 and at the start of autumn quarters in 2001 (University Libraries, 2001) and 2003 (University Libraries, 2003).

The first survey was released in summer of 2001. Response rates were very low and the first valuable lesson was learned–summer is not an ideal time to get user feedback as there are few people on campus. It was, however, a great way to run a pilot test of our survey. Many of the

questions went unanswered, so the survey was slightly modified and reformatted in the hopes of yielding better results when it was run again.

At the beginning of fall quarter in 2001 and 2003, surveys were linked from the Information Gateway and advertised in an electronic newsletter sent via e-mail to all students, faculty, and staff on campus. Announcing our survey in the newsletter did wonders for the response rate. In 2001, the survey was online for a week before the e-mail invitation was sent. The response rate jumped from sixteen to over sixty (of a total one hundred thirty-one) responses overnight after users received the e-mail invitation. The 2003 survey was launched about the same time the newsletter was sent, with a total response rate of two hundred and thirty-eight. Both surveys were online for almost a month, allowing users a chance to become familiar with the site before commenting. A recruiting tool was included in the survey that asked users if they were interested in participating in a future usability study. Over half the respondents from each survey provided their name; this created a built-in pool of potential participants from which we could recruit in the future.

Based on survey design, the WebQ survey tool can do some basic data analysis and that information is presented in an easy to read interface. However, it cannot analyze comments from open-ended questions. To better identify any trends that develop from the open-ended questions, library staff use "clumping" or "clustering" techniques to group comments into various subject areas. Staff read each comment, write a paraphrase of it on a sticky note and place the note on a whiteboard according to what category it falls under (e.g., catalog, navigation, new features, subject pages, etc.). This method is both low-tech and low-cost, but has proven very effective at identifying key problem areas and prioritizing next steps. Marking the respondent number at the bottom of each sticky note allows us to go back and read the comment in full if more information is needed.

The overall sentiment from the two surveys was that the Web site as a whole wasn't "broken," although there were some areas that needed improvement. Not surprisingly, the online catalog generated the most comments in both surveys; users did not discern between it and the Web site as a whole.

Experience has shown that after getting written feedback from users it is critical to follow up with observational methods such as contextual inquiry, unobtrusive studies, or usability testing (including testing on paper prototype designs). Sometimes the meaning of what is being asked is lost in translation or users think they do one thing when in fact they are observed doing something entirely different.

Using methods already cited, the redesign and usability testing of various parts of the site continued through the summer of 2003, improving many of the underlying components. Significant work was completed on the Browse Subjects, Borrowing/Delivery, and Your Library Account pages, the proxy server wizard, and the OpenURL link resolver. A group of subject librarians and technical staff was recently appointed to address ongoing usability issues with the subject guides and other resource lists, both known to be a bit difficult to use.

During the summer of 2003 it became apparent that the site needed a top-down redesign. To gather more current user feedback, we again went to an online survey, the basic design of which was similar to the successful 2001 survey. Data from this survey and follow-up focus groups will be used to inform future design decisions.

UW LIBRARIES' MY GATEWAY

During the initial Web site design in 1998, the prototyping team realized that no single organization scheme would work well for all users. The decision was made to present information in a variety of ways–resources were organized by subject, alphabetically by resource type (databases, catalogs, e-journals, etc.), and with the realization that users might want to create their own lists of useful resources, My Gateway was created.

My Gateway is the personalized component of the Libraries' Web site which allows users to create *ad hoc* lists of frequently used resources or "subscribe" to lists of resources selected by library staff. The service also allows the resource lists to be published as part of a Web page elsewhere on the site. For example, the atmospheric sciences librarian creates a list of useful databases for her subject and makes that list public. A user can subscribe to that list so it shows up on their My Gateway page. That same list can be published in a Web page elsewhere on the site via an include statement. The service will update URLs as needed, which means the resulting Web page will always remain current.

It is interesting to note the access trends to My Gateway over the last three years. In 2000, Jordan reported that "over seven thousand My Gateway accounts have been created, approximately eighteen hundred of which have been accessed at least once during the last academic quarter" (Jordan, p. 180). Yet when the statistics were pulled at almost the same time of year three years hence, the number of total accounts had

doubled to over fourteen thousand, but the number that had been accessed at least once during the last academic quarter had declined by two-thirds to a little over six hundred. As in 2000, few users customize at all. Usable demographics for My Gateway users are unavailable, although anecdotal evidence suggests library staff make up a respectable portion of users entering the site.

One possible reason for the decline in use of My Gateway is the lack of a useful search function. Users prefer to search for information, not click through Web sites hunting for the right link. Nielsen (1997) states that over "half of all users are search-dominant . . . they are task-focused and want to find specific information as fast as possible." Given the popularity of search engines such as Google, that statistic could now be even higher than fifty percent. During a recent usability study of our subject guides, one of the assigned tasks was to find a resource for a Biology 101 paper on a topic of the user's choosing. One user in particular, an undergraduate, "immediately wanted to leave the subject pages. She felt uncomfortable and wanted to search on Yahoo, Looksmart, and HotBox" (University Libraries, 2002).

At a time when users' information needs are diverse and information overload is rampant, more must be done to develop richer search engines of library resources. When asked on the 2003 online survey what new feature users most wanted, over half chose multi-database searching. Focus groups and other usability testing has confirmed that users want a search engine that is capable of cross-format searching (open Web, licensed and unlicensed databases, digital libraries, OPACs, etc.) and displaying an integrated, de-duplicated set of results. Such a service would enable users to feel in control of their information seeking, highlight the breadth and depth of available resources, and get users to the information they need faster and with less frustration. Clearly this is a need that must be met.

Although staff can surmise why the portal is going largely unused, a survey was placed on the My Gateway login page to get user feedback on the service and detailed demographic data. The short survey has been up for over a month and no usable responses have been received to date.

Informal usability testing was done as part of an envisioned 1.2 release of My Gateway. Most of the proposed changes revolved around the management and display of items and categories. The prototypes also included a feature that would allow subject librarians to send short messages to their departments that would highlight a resource or new service. Due to a staffing change and the desire to move the project for-

ward by integrating it with the campus portal, these enhancements were not implemented.

MyUW, THE UNIVERSITY OF WASHINGTON CAMPUS PORTAL

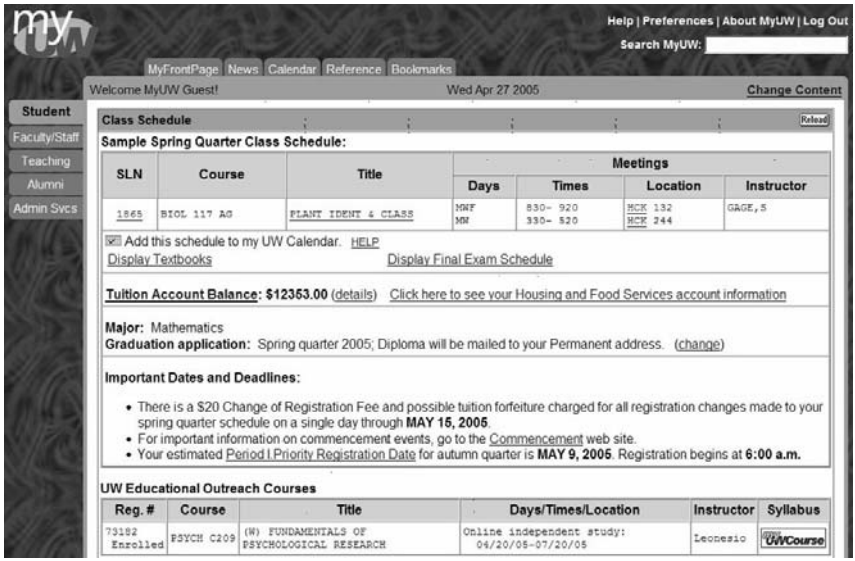
MyUW is the University of Washington's campus portal that customizes the UW Web experience for all types of users (Figure 3). It was first released to students and alumni in 1999, then to faculty and staff a year later. MyUW is the primary access point for many core campus services including registration, transcripts, course schedules, and dining card balances for students; personal benefits information for faculty and staff; and online class schedules and course information for instructors. Through the portal, users can customize content, layout, general look and feel, and add favorite links to their pages.

The delivery of dynamic Libraries' content to the MyUW portal is a goal that will soon be realized. The library currently has a presence under the "Reference" tab, which contains links to the library catalog as well as various databases and other resources. New technologies used by the Libraries will allow us to more easily publish content into MyUW via RSS (RDF Site Summary or Rich Site Summary) channels, which are required by the portal design team. A sample service would allow subject librarians to identify three key resources for a course and publish them into the MyUW student's class schedule and the faculty's class resources page. Links to the class Web site and electronic reserves are currently published within the aforementioned pages and having all course information in one place is helpful to users.

A persistent barrier to providing more library-related content to the campus portal is authentication. The Libraries currently use a 14-digit barcode (found on the back of the campus ID card) and PIN for access to functions such as patron accounts and remote resources via the proxy server. This unwieldy login is difficult for users to remember and most don't understand why they can't access licensed databases even after they have logged in to MyUW with their campus NetID. Numerous requests have been made of the MyUW team to incorporate the patron account in MyUW. Efforts are underway to use the campus authentication scheme for access to library services. Meeting these goals will allow for a more seamless integration of library content into the portal.

Before the site was released, a group in the campus Computing and Communications (IT) department conducted a usability test on MyUW. Users were asked to complete several tasks, then answer questions

FIGURE 3. Screenshot MyUW Student Page (Guest Access Available at http://myuw.washington.edu/)



about the site and their experience. Many of the findings from this early study confirmed the top interface design heuristics as defined by Nielsen including the need for visibility of system status, match between the system and the real world, error prevention, and recognition rather than recall (Nielsen, 1994).

In addition to observing recognized usability principles, the MyUW study showed that portal interface designers should better describe the purpose of customizations and the benefits to users. By default the MyUW interface has many of the frequently used services at the top of the user's (student, faculty/staff, teaching, alumni) page. Since it was released, the MyUW team has discovered that very few users customize the content or layout of their pages. Of the "73,000 individuals who use MyUW weekly, roughly five percent personalize [content] and approximately ten percent change their preferences [look and feel]" (Jensen, 2003).

No studies have been done locally to flesh out this issue–possibly users don't see or understand the "Personalize Content" and "Preferences"

links or they don't want to customize an interface that already has everything they need (even if it means navigating inefficient paths to information they want). Jakob Nielsen suggests that "web personalization is much over-rated and mainly used as a poor excuse for not designing a navigable website" (Nielsen, 1998). Understanding exactly why users choose to customize a portal (or not) is an area for further investigation.

CONCLUSION

Usability testing is now an accepted practice of Web site design in the contemporary academic library, and will increase in importance and use with the continued expansion of the virtual library. Usability testing is also essential in the toolkit of assessment methods and is part of that iterative process of working directly with our users to provide the support and resources they need for their work. It can help designers and others not only to identify what doesn't work well from the user perspective but also to provide input on what would be most useful and important to potential users. Libraries will be faced with many choices on how to make available and customize library portals. Usability testing will help them make informed decisions that address customer needs.

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