Usability and University Library Web Site[*]

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Nowadays, a web site has become a part of most organizations, no matter whether they are public or private and commercial or educational. This is because a web site can be helpful with no restrictions of time and place for many purposes, such as marketing, communication, and publishing.

In higher education, libraries help support their communities by acquiring, organizing, and providing information resources and services. Since high-technology evolves, a web site is also another approach many libraries use as a way to make their information resources and services available anytime anyplace as close as a click of the mouse (Norlin and Winters 2002: 1). However, with the same one click, if a created web site is not usable, will its owner still gain the expectable benefits from it? The answer tends to be, "No!" as "On the Internet, the competition is always just one click away, so if you frustrate users they'll head somewhere else" (Krug 2000: 18).

Clyde (2000: 105-106) said that providing a library web site did not mean only designing, developing, and launching it, since a web site was an ongoing commitment. As a result, what is needed is web site evaluation and reevaluation to discover areas that can be changed and improved to meet the needs of the changing audience (Garlock and Piontek 1996: 65). This is even more necessary when considering that academic library web sites are rather large and complex.

Although there are many aspects to evaluate a library web site, usability is crucial because by themselves, the interface is what users interact with. Therefore, it should be intuitive, effective, and efficient for them to get the suitable information unaided (Agarwal: 2003). Also, as usability can enhance the site's credibility (Fogg et al. 2001: 67), it cannot be neglected. In addition, it can greatly affect the web site usage increasing since studies of user behaviour on the web find a low tolerance for difficult designs or slow sites (Nielsen and Norman 2000), while the web even provides a choice of a click away to move on to another (Head 1999: 126). Guenther (2003: 65) also reinforced this by saying that,

…A Web site that does not effectively serve the needs of its intended audience will result in decreased traffic and has little chance of cultivating repeat visitors. In cases in which a user's experience is especially frustrating, the backlash could extend beyond the virtual visit to the company's brick-and-mortar equivalent…

To prevent this disaster, Beaulieu (2003: 246) suggested that gradual refinement of the interface design and interactions was, therefore, achieved through usability tests. The reason may be because "…usability test methods serve as both catalysts for design changes and as tools for evaluating those changes, especially as library sites strive to meet the increasing information demands of users…" (Battleson, Booth, and Weintrop 2001: 197).

As usability has its own value to every web site, including a university library web site, this article will give an understanding of it, from the general concept to the specific context of the academic libraries. It will cover the definition of usability and its importance followed by usability goals, web usability problems, some evaluation methods, and library web site usability studies. This may be helpful to the university libraries where web technology is now utilized commonly.

Usability: Definition and Importance

Web design can be considered as comprising of four primary facets: content, function (technology), form (visuals), and purpose (economics). A web site is, therefore, possibly designed from one particular point of reference, for instance, content-centered (Powell 2000: 5, 50). However, as user-centered design (UCD), the basis of usability, is also another way to view web design, the word "web site design" mentioned in this article means the design in terms of usability only.

To define what usability is, it may be useful to know its background first. Shackel and Richardson (1991: 6-7) addressed that the rapid growth in the use of computers from 1980 led to the widespread usability problems. Thus, it may be inferred that usability has emerged as an interesting issue since then. Regarding its development, Battleson et al. (2001: 188) stated that usability was a concept which derived its theoretical basis from a major component of usability engineering, Human Computer Interaction (HCI), the study of the interaction between people and computers and the way to make such interactions effective. Usability engineering, a term which has been titled differently for decades, such as user-centered design, human factors engineering, and ergonomics, is the concept representing the techniques, processes, methods, and procedures for designing usable products and systems with the emphasis on the user at the center of the process (Rubin 1994: 10).

Considering the grounding of usability, it is consequently explained briefly as an issue dealing with people and computer technology where users are the major concern. To describe it more clearly, the International Standards Organization defined it as the "effectiveness, efficiency, and satisfaction with which a specified set of users can achieve a specified set of tasks in a particular environment" (Norlin and Winters 2002: 1-2). In the same vein, Preece, Rogers, and Sharp (2002: 14) indicated that "…usability is generally regarded as ensuring that interactive products are easy to learn, effective to use, and enjoyable from the user's perspective…".

Since this article will explore usability in terms of the World Wide Web environment, some definitions regarding web site usability are useful. Spool et al. (1999: 4) determined the meaning of usability with a simple conclusion that "...The more a site helps people find the information they are looking for, the more usable it is". More specifically, Dowling (2003: 48) explained that "...A website is usable if its users comprehend what the site is and what it offers and are able to use the site for its intended purposes". In their web site guide, the Office of Information Technology, New South Wales, Australia (2002) also mentioned the definition of a usable site as "...an effective site. The site architecture, navigation, content, and functionality have been designed to meet the needs of all users, rather than the perceptions of the web designer or the organisation".

In summary, it can be concluded from the definitions that common features of usability, including web site usability, consist of four major components. They are usefulness, effectiveness and efficiency, learnability, and likability.

According to an interview with Nielsen, a usability guru, by Rhodes (1999), he insisted at the end that "**Usability can't be denied, rejected, or ignored**" (emphasis in original). This statement gives a sense of the importance of usability. Also, it can pose a question: why has usability increased in significance, especially in the web environment?

To answer the above question, this can be explained with the fact that a web site may have a good appearance together with the resources that meet the site's objectives but 'humanly unusable' (Gullikson et al. 1999: 294). This can be illustrated with a study of 158 sites by Forrester Research Inc. of Cambridge, Mass., which found failures for basics such as searchability, reliability and navigation consistency (Goldberg, 2003, p.23). These usability-related issues can cause problems, such as return visits and costs. An explanation of this can be seen from the comment of Paynter, Satikit, and Chung (2001) that usability could be advantageous to a web site as it could ensure easy and satisfying interfaces, utility, and functionality, hence, it could increase user support and repeat user support. Besides, it could minimize the cost of service, training, and hot-line calls. An unusable web site will, therefore, produce opposite consequences. To end this section, in brief, Nielsen's opinion can clarify how important usability is:

As a result of this overwhelming choice and the ease of going elsewhere, web users exhibit a remarkable impatience and insistence on instant gratification. If they can't figure out how to use a website in a minute or so, they conclude that it won't be worth their time. And they leave. (Nielsen 2000: 10)

Usability Goals

Generally, to measure an achievement, goals are important as they can be factors indicating the degree of success. Goals should be set at the beginning stage so that they can be formulated as objectives followed by strategies to be used. As a consequence, designing for usability needs an understanding of the usability goals.

According to the standard relevant to requirements on usability or ISO9241 (cited in Dix et al. 2004: 277), these elements were indicated in the given definition of usability as a means of describing explicit measurements for usability.

1) Effectiveness referred to the accuracy and completeness with which specified users could achieve specified goals in particular environments.

2) Efficiency referred to the resources expended for the effectiveness of goals achieved.

3) Satisfaction referred to users' and other people's (affected by its use) comfort and acceptance of the system.

Apart from the standard, many people also set goals concerning usability, user-interface design, and interaction design. These are both similar and different in some aspects. Here, certain works are presented comparatively as shown in the following table.

Comparison of Usability Goals

Shackel (1991)	Rubin (1994)	Shneiderman (1998)	Brinck, Gergle & Wood (2002)	Preece, Rogers & Sharp (2002)	Dix, Finlay, Abowd & Beale (2004)
Flexibility	Usefulness		Functional correctness	Effectiveness	Flexibility
				Utility	Robustness (observability, responsiveness, task conformance)
Effectiveness	Effectiveness (ease of use)	Speed of performance	Efficiency of use	Efficiency	Robustness (recoverability)
		Rate of errors by users	Error tolerance	Safety	
Learnability	Learnability	Time to learn	Ease of learning	Learnability	Learnability
		Retention over time	Ease of remembering	Memorability	
Attitude	Attitude (likability)	Subjective satisfaction	Subjective pleasure		

Considering these usability goals and their definitions, it can be summed up that the usability goals of a system, including a web site can be divided into four categories (Brinck, Gergle, and Wood 2002: 2-3; Dix et al. 2004: 260-270; Preece et al. 2002: 13-17; Rubin 1994: 18-19; Shackel 1991: 25; Shneiderman 1998: 15).

1) Usefulness referred to the way a system can:

   - enable users to achieve their goals.

   - correctly perform the functions that the user needs (allow users to perform their tasks), provide the right kind of functionality so that users can do what they need or want to do, and give the multiplicity of ways in which users and the system exchange information.

   - do what users need it to do, and the degree to which it is good at doing what it is supposed to do.

   - give features that support the successful achievement and assessment of the goals.

2) Effectiveness and Efficiency referred to the way a system can:

   - be used easily to achieve a desired task.

   - help prevent users from making errors when carrying out a task, and detect, identify errors together with the ability to handle/correct/recover them.

   - help users to have speed of performance, give them the minimum number of actions required to complete a task, and not take too much time to carry out a task.

3) Learnability referred to the way a system can:

   - be so easy to learn that new users can learn to perform a task procedure quickly and accurately.

   - be so easy to remember that once it is learned, although users rarely used it, they can relearn it.

4) Likability referred to the way a system can make users like or have good perceptions or feelings as well as satisfy using it.

Web Usability Problems

In regard to designing a usable system, usability goals are not the only issues concerned but the problems related to it should also be taken into account as they can help to avoid undesirable problems that may occur. Badre (2002) indicated that:

Although HCI principles apply equally well to both graphic user interfaces and Web interface design, there are significant differences between GUIs and the Web. There are several unique Web features to which GUI-experienced usability designers should pay particular attention. …

Although there may be a vast array of problems concerning web site usability, both similar to and different from other GUIs, involving in web site usability, these four broad areas are what Brinck et al. (2002: 4-11) highlighted.

1) Human perception   There were two interesting issues that could cause human perception problems. The first one was when pages were designed according to the way in which information was stored, for example in a database. This might be efficient to page delivery and maintenance but didn't meet users' needs and could bring errors. The other one was when designers put an importance on artistic style, such as color and contrast, rather than usability.

2) Navigation   Navigation was a major consideration for web users. Matters that can be helpful to navigation were a logical and standard architecture to the information in a site, sufficient indicators to tell the current location, and the language and the organization of the navigation system that could meet users' expectations and needs for the task.

3) Human memory   Three problems relevant to human memory should be noted when designing for the web. Firstly, the more items to be remembered, the more likely something would be forgotten. Secondly, the longer in terms of time items had to be remembered, the more likely they were to be forgotten. Finally, the greater the similarity among the remembered items, the more likely they were to be confused with one another.

4) Database integration   Problems with database integration in the web context could result in what users saw might not be what the database saved. Some web sites, therefore, required users to reload a page when information was changed. If users forgot to do so, they wouldn't get the new information or even though they did so, this

could cost their time and they might duplicate requests unintentionally in some cases, such as purchasing an air ticket, which could be counted as an error.

On the whole, an understanding of usability goals in general as well as web usability problems can be of assistance to the usability design of all web sites. Both can prevent designers from creating a poor usability web site by helping them to design a web site that meets the goals and responds to the problems.

To help design a usable web site, many authors provide a vast array of guidelines. Indicating all here, in this article, may be too exhaustive. Therefore, this article will present only one example of usability design guideline sets. The set selected to be introduced comes from the library realm which is the main context of this article. It is derived from Raward's work (2002: 54, 67, 73, 74, 83). She divided her guidelines into five categories and described what to be included in each category in brief. Her proposed categories were, finally, summarized into 48 guideline items at the end (Raward 2002: 213-217).

1) Category 1: Finding the information Guidelines included in this category were on contents, indexes, site maps, search tools, and comments pages. Topics such as currency, responsibility, and authority of the information as well as the ability to find answers and complete tasks were also mentioned.

2) Category 2: Understanding the information Guidelines included in this category were on headings, jargon, lists, scannable style, simple and concise as well as clear text, and consistency of terminology, abbreviations, and technical terms.

3) Category 3: Supporting users' tasks Guidelines included in this category were on electronic transactional forms, help screens, and Frequently Asked Questions (FAQ) page.

4) Category 4: Evaluating the technical accuracy Guidelines included in this category were on cross platform compatibility, display and download speeds, graphics, Alternative Text (ALT tag), metadata, HTML code, and specific technologies such as plug-ins or Java script.

5) Category 5: Presenting the information Guidelines included in this category were on the relationship of the web to the parent institution's web site, disability access, navigation tools for usability and accessability, links, consistent look and design, background color, white space, text format, and printing.

According to web usability guidelines, accessability is another closely related topic. It is often included in many design guidelines, as it was also mentioned in Raward's Category 5, for instance. Garlock and Piontek (1999: 61) defined "accessible design" and "universal design" as "…the phrases most often used to describe the creation of web pages that are accessible to the widest audience possible in a variety of technical environments. …" As there are many user groups who use web sites, the services provided should be designed to be accessible to them, no matter whether they are visually, hearing, physically or cognitively impaired people or those with different experience of and attitudes towards technology (King et al. 2004: 125).

Usability Evaluation Methods

A web site is a work without end. It is a continuous commitment which should be reviewed at regular intervals (Clyde 2000: 105-106). In terms of usability evaluation, both under development web sites and current ones need to be evaluated. After studying some literature on web site usability, it is found that there were a lot of available methods. As a result, only those that are often mentioned and commonly used in the library community, which is the focus of this article, will be described.

The usability evaluation methods featured here are cognitive walkthrough, focus group, survey, usability testing, card sort, and heuristic evaluation. The first one was the most frequently used among members of Association of Research Libraries (ARL) surveyed in 1999 (Popp 2001) while the second to the fourth were reported as used most often and the last two ones as successfully used by Digital Library Federation (DLF) libraries surveyed in 2000-2001 (Covey 2002: 6).

Thomsett-Scott (2004) stated that web site usability techniques can be divided into three categories:

1) Inquiry referred to the techniques that involved users' perceptions and opinions.

2) Inspection referred to the techniques that looked at the web sites from the users' perspectives.

3) Formal usability studies referred to the techniques that involved direct observation of users.

These categories frame how the above usability evaluation methods will be depicted in the following.

Inquiry: Focus group, Survey, and Card sort

<u>Focus group</u>

Focus group or "preference testing" (Thomsett-Scott 2004) is the technique in which a small group of representative users have a discussion to identify the acceptability of concepts. A moderator asks the participants a set of open-ended questions that can help focus on the information about usability of the web site. Also, to help participants for the discussion, providing them with some visual displays of the web site can be useful. (Campbell 2001: 6-7; Rubin 1994: 20; Thomsett-Scott 2004).

This method can be used any time with the number of participants ranging from 6-9 (Campbell et al. 2001) to 8-12 (Popp 2001). The strength of conducting a focus group is that it provides more qualitative feedback, that is, users' opinions, attitudes, and beliefs, in an observation of group dynamics where participants can play off one another (Campbell et al. 2001). However, its limitations are that it does not involve actual user behavior, it takes time to find participants and schedule sessions, it may be unduly influenced by only a few outspoken people, and it needs a facilitator who is uninvolved with the research for the reason of non-bias (Campbell et al. 2001; King 2003: 14; Pace 2003: 51).

<u>Survey</u>

Survey is the method used to understand the preferences of a large group of users. It can be used at any time but is most often used early to better understand the potential users (Rubin 1994: 20). Survey can be undertaken by using questionnaires which comprises of a set of questions designed to collect responses and opinions. (Campbell et al. 2001).

Although the strength of this method is the way that it can collect data from larger samples, so that generalization to the population is possible, it cannot collect in-depth responses. (Rubin 1994: 20). In regard to questionnaires, they are easy to conduct and analyze but skill is required to have an effective one (Campbell 2001: 7; Campbell et al. 2001). In addition, low response rates can be a problem.

<u>Card sort</u>

Card sort unfolds users' point of view about terms to be used on labels, and the way to place items or pages by giving participants some index cards to arrange into categories that make sense to them. They are asked to organize and give names to the categories as well as add additional links. During the session, they can also ask questions about anything that confuses them (Campbell 2001: 4; Thomsett-Scott 2004).

The results gained from this method can be analyzed statistically or simply scanned for trends and patterns. (Campbell 2001: 5) However, relying purely on numeric similarity scores is not recommended. On the other hand, users' comments while they sort the cards, which are qualitative, should be valued (Nielsen 2004).

Campbell et al. (2001) said that this technique was used best early in the design for the web site structure but it could also be used any time. The numbers of participants were at least 10 but best with a minimum of 20. However, Gaffney (2000) indicated the less number of at least six while Nielsen (2004) explained this issue in his article with the recommendation of 15.

Card sort is cheap and easy to conduct as well as expands to fit any size of the web site easily. It can show how real users organize and label items. Nevertheless, its drawback is the difficulty to analyze the results with a small number of users (Campbell et al. 2001; Gaffney 2000).

Inspection: Cognitive walkthrough and heuristic evaluation

Cognitive walkthrough

Cognitive walkthrough, which is also called as "design walkthrough" (Campbell 2001: 8) can be compared to role-playing in which designers of the web site pretend to be users, instead of using real users, and try to predict their movements and actions by doing actual tasks themselves, to find problem areas as well as review the ease of learning. This technique is especially useful in the early stages of the design process. (Campbell 2001: 2, 8; King 2003: 14; Popp 2001).

As designers are the ones who design and develop the web site, this is an advantage of cognitive walkthrough as it makes this method quick and cheap to be done. Although another strength of this method is non-requirement of participant recruitment, this can also be the big disadvantage. It is because designers are not average users. They can behave and think differently. Moreover, they are involved in the web site development which can cause bias (Campbell 2001: 9; Campbell et al. 2001).

Heuristic evaluation

Heuristic evaluation is sometimes called as "usability audit" (Popp 2001). In this method, a group of evaluators examine the web site and identify problems by comparing with a set of usability principles, called "heuristics". Heuristics are based on recognized usability principles. Evaluators are asked to evaluate the web site, determine the problem areas, and rate severity. After evaluators inspect the web site individually, for independent and unbiased evaluation, at least twice, they will meet and have their findings aggregated into one list of problems (Campbell 2001: 9; Fichter 2001: 79; Nielsen [n.d.]; Popp 2001).

Despite its application to be done at any time in the iterative process, heuristic evaluation is often done best at the beginning of the process and then repeated at later stages (Popp, 2001). In considering evaluators, either experts, such as usability experts or human factors engineers, or recruited and trained volunteers, or end-users can undertake a heuristic evaluation (Conyer 1995; Fichter 2001: 79; Pace 2003: 52). Since much additional information cannot be gained by only one evaluator, three to five evaluators are advised (Nielsen [n.d.]).

The strength of this evaluation method is speed, inexpensiveness, and ease. Also, it assures the compliance with the recognized principles. Additionally, if experts are evaluators, they can represent expert users. However, this method does have some disadvantages. It does not consider actual user behavior or tasks and it may not involve real users if experts are evaluators (Campbell et al. 2001; Fichter 2001: 79; Paynter et al. 2001).

Formal usability studies: Usability testing

<u>Usability testing</u>

This technique can be called in different names, such as "task-based testing" (Thomsett-Scott 2004) or often called as "formal usability testing" (Campbell 2001: 2). The major idea of this method is to analyze the users' interactions and behavior with the system. Participants are given pre-defined tasks to accomplish and asked to "think out loud" while they use the web site so that the observer can know their thoughts, reactions, and feelings. A moderator is also present during test session to help the participants feel comfortable and prompt them back when they get lost or leave the site that is under evaluation but he/she should not interfere in the test. After testing the site, post-test questionnaires are also used to collect demographics and data about participants' satisfaction with the web site and the test (Campbell 2001: 2-3; Thomsett-Scott 2004).

The testing can be done any time (Campbell et al. 2001) at a laboratory, for instance, or even at the user's site. In the latter regard, one advantage is the ability to see the web site in action in a diverse environment (Fichter 2001: 79). In relation to the number of participants, there is still a debate. However, the cost-effective number often cited is no more than five, proposed

statistically by Nielsen (2000). Also, he recommended in testing multiple groups of disparate users, there should be three to four users from each category if testing two groups of users and three users from each category if testing three or more groups of users.

In conducting a usability testing, creating the tasks is important as they should represent real tasks typical users would like to do when they use the web site. The number of tasks is based on the time allotted for test sessions (Campbell 2001: 3). According to Thomsett-Scott (2004), 8-12 tasks for an hour and a half test time were suggested.

The clear advantage gained from undertaking a usability testing is the opportunity to see real users interacting with the web site while the disadvantages are the difficulty to totally test a complex system and that it is time consuming when organized for the first time (Campbell et al. 2001). Besides, testing is always an artificial situation, not the situation itself (Rubin 1994: 27), no matter how well it is organized. Furthermore, the way users need to think out loud can cause a limitation as people does not get used to it and this can be intrusive and distracting (Conyer 1995).

Apart from these usability evaluation methods, sometimes, there is a need to conduct a usability evaluation remotely, because of a global range of users and participants' personal reasons, for instance. Hartson et al. (1996) also mentioned remote evaluation in their paper. They defined remote evaluation "…to be usability evaluation wherein the evaluator, performing observation and analysis, is separated in space and/or time from the user. …" (Hartson et al.1996: 228). Also, they divided remote evaluation into seven types: portable evaluation, local evaluation at remote site which was subdivided into remote laboratory testing and remote inspection, remote questionnaire/survey, remote-control evaluation, video conferencing as an extension of the usability laboratory, instrumented remote evaluation, and semi-instrumented remote evaluation (Hartson et al.: 229-230).

In more recent literature, Thompson (2003: 24) explained two methods of remote observation. The first one was same-time/different-place testing. In this method, the test administrator observed the user at the same time they performed the test but from a remote location, usually with the user's screen via the network using a specialised software. The test administrator could still communicate with the user over the network. This was what remote testing most commonly referred to. Another method was different-time/different-place. In this regard, the test administrator observed the user in the different time, that is, later, usually from the recorded media. This might rely on the user activating special software on a computer and sending the results to the test administrator. As a result, there was no direct observation and interaction between the test administrator and the user.

As there are many usability evaluation methods, some authors also provided some guidelines to be considered when selecting an evaluation methodology. The following was a list given by Conyer (1995).

- The objectives of the usability evaluation.
- The nature of the criteria for evaluation.
- How open-ended or constrained the evaluation should be; e.g., should the interface be evaluated according to predefined scenario-based end-user tasks, or should it be more open-ended so that the users generate their won goals and paths.
- Which method to use, taking into account the goals of the method, the appropriateness of the method, and how easy the method is to use and learn.
- Which methods to use in combination.
- Usability and learnability of the methods.
- The number of evaluators required to provide a reliable result.
- Evaluator expertise and experience.
- The availability of end-users.
- Benchmarks – what to compare the evaluation results against.
- The development constraints of the project and potential trade-offs.

- How easily and efficiently the results can be communicated to the designers and product owner.
- Available time.
- Available budget.
- Cost benefit of the usability test.

In different way, Brinck et al. (2001: 31-34) provided their method selection in the form of criteria.

1) Required tasks referred to the question if that task, usability method, was required or not. This was due to the fact that certain tasks had to be conducted at some level or should be done to avoid malfunction and unproductiveness.

2) Time to perform the method referred to the length of time to perform a method: short, medium, or long. The time each method took also depended on the variables of the project.

3) Costs referred to a vast variety of expenses related to each method, for example, recruiting and paying participants, mailing, and computing platforms.

4) Learning time referred to the amount of time to learn how to perform a method: short, medium, or long. Generally, most methods did not take too much time to achieve but practice was necessary as well. Therefore, some extra time should be planned when a new method was tried at the first time.

5) Confidence level referred to the reliability of a method: low, medium, or high. Mostly, methods that obtained information from real users had greater confidence and the more users, the greater confidence. Statistical tests might be applied in some methods to give a much better measure. However, this did not mean that methods giving low confidence gave bad information but they should be considered in terms of risks against the costs of other, more reliable ones.

6) Impact on final design referred to the degree to which the method affected the final design: low, medium, or high. Normally, methods would have more impact on the final design when they were applied early.

Library Web Site Usability Studies

In spite of few published assessments of library web sites (McGillis and Toms 2001: 356), some studies conducted to evaluate library web site usability do exist. This confirms that the library community realizes the importance of usability evaluation.

Through the preliminary literature search undertaken by the author as part of her PhD, it was found that formal usability studies, namely, usability testing (nine studies), was mostly used for library web site usability studies. This was followed by inquiry method (three studies) and inspection method (one study) respectively. Furthermore, some studies used multiple methods for the evaluation (two studies). Regarding these studies, the most found problem was terminology, except in the study of Mack et al. (2004). Also, the structure and organization of the web site was another problem frequently mentioned. Each of these 15 studies, especially those of the academic libraries, is presented as the following with the tested web site(s) or specific part(s) if indicated, the focus of the study, and interesting relevant findings. They are depicted here with the intent to give the practical perspective on the real use of usability evaluation methods in the library context.

Inquiry: Focus group, Survey, and Card sort

Faiks and Hyland (2000) had their usability evaluation on the web site of Cornell University Library (CUL), particularly, in the area of Gateway Help, with the technique of card sorting. The test was carried out to redesign and expand Gateway Help, which was the online help system of its web-based collection of resources and services available through the Cornell University Library Gateway, with the intent to determine how users would organize a set of concepts to be included in it. The results of the study gave a more objective insight into how users would organize the help system and provided direction.

Hennig (2001) used card sorting, and survey to redesign the web site of MIT Libraries to find out how users grouped the information on the site into categories. The results could reveal how items should be grouped together meaningfully from the users' point of view, in other words, what they understood and expected to find for each category.

undergraduates, gave up very easily. Another interesting result mentioned was that participants did not scroll down.

Mack et al. (2004) had their usability testing on the web site of University of Tennessee (UT) Libraries. They did it to examine the use of an academic library web site by experienced researchers and active scholars, graduates and faculty, to understand the way they approached online information resources and how fully the web site met their needs. With their research result, terminology was not a problem found, with a few notable exceptions. Their participants had high success rates for most tasks regardless of discipline and status. There was a strong correlation between success in searching and the double-expertise of subject knowledge combined with frequent use of the library's web site as well. They found that searching for information about journals and locating journal articles were the most difficult tasks. Similar to Cockrell and Jayne (2002), it was revealed that participants tended not to scroll down. Besides, the provision of a vast array of paths helped the participants to succeed in locating information and services although they had overlooked a direct link from the main page.

Another study conducted by using usability testing is that of Thompson (2003). However, it is different from the ones mentioned above as it was conducted remotely. The web site tested was the one of California State University San Marcos (CSUSM) with the focus to redesign the CSUSM library web site. The major findings were that students succeeded more in navigating the new site and a serious problem found was terminology.

Multiple methods

Two studies where mixed usability evaluation methods were used are illustrated here. The first one was that of Dickstein and Mills (2000). In their study, they used inquiry method (card sorting), inspection method (cognitive walkthrough as well as heuristic evaluation), and formal usability studies (usability testing). They tested the web site of University of Arizona Library to redesign SABIO, the library's information gateway. The following are interesting relevant findings. From cognitive walkthrough and heuristic evaluation, problems, inconsistencies, violations of guidelines were revealed. From card sorting of "Indexes to Articles" page, it was found that test subjects preferred 13-37 different subject categories

McDonald (2001) tested the web site of Auburn University Libraries to redesign the new site look and structure by conducting focus group, survey, and interview. It was found that most participants had no troubles with the web site or liked it because they already knew how to navigate it. Also, text links were important because images could take time to download. Besides, users had different understanding and expectation for some library terms (e.g., index, and research by subject).

Inspection: Cognitive walkthrough and heuristic evaluation

Raward (2002) identified international best practice design guidelines for the design of academic library web sites from the literature. Then, she developed a simple but effective usability analysis tool (heuristics) to help librarians in the design and redesign process of the library web site. She used the tool to explore some samples of Australian academic library web sites (19 Australian academic library web sites). As a result, the extent to which the samples met international best practice guidelines for web site design was revealed. Recommendations about those samples that failed to meet usability guidelines were also made.

Her findings were presented in two forms: by checklist questions with the mean usability index of each question or Question Usability Index (QUI), and by libraries with the mean usability index of each individual library of Library Usability Index (LUI).

According to her findings by checklist questions, the category which gained the highest mean QUI was Category 5, Presenting the information (99%). The second highest mean QUI were Category 1, Finding the information, and Category 2, Understanding the information, (97%). The third highest mean QUI was Category 4, Evaluating technical accuracy (94%). The least mean QUI was Category 3, Supporting user tasks (32%).

According to her findings by libraries, of 19 web sites, the highest mean LUI was 90%, and the lowest was 73%, with a mean of 82%. The top two web sites with the equal highest score performed differently within the usability categories, one was the only web site to perform well in Category 3, Supporting user tasks, while the other stood out in Category 1, Finding information. Generally, there was no correlation between the results and the institutional level but the

individual staff involved, library and information technology policies, level of training and resources provided by each library. Considering these web sites by categorizing them into five groups within the context of the institutional archetypes by DETYA (Department of Education, Training and Youth Affairs), Australia, it was found that there was no correlation between the institutional archetypes and web site usability.

Formal usability studies: Usability testing

Chisman, Diller, and Walbridge (1999) tested the web site of Washington State University (WSU) Libraries, particularly, in these parts: Online Public Access Catalog (OPAC), Article Indexed, Full Text, More, and Other Library Catalogs sections. The intent of the study was to test how easily users could navigate the web-based catalog and whether they understood what they were seeing. They found that there was no correlation between the categories of novice and expert computer/library users and participants' ability to use the WebPac. Also, users might have a wrong conclusion about resource availability which was due to their incorrect search strategies (e.g., using surname first for an author search). Users did not understand some concepts and consequently were unsuccessful. For example, they did not comprehend the concept of serials, the limiting feature, cross-references, multiple call number schemes, and the difference between what was available in the WebPac, Article Indexes, Full Text, and More Sections. In case of various libraries in a system, users had the problem of what library they were searching and how to search for items on a specific campus. Additionally, problems could stem from library terms, inappropriate labeling, and too much text.

Battleson, Booth, and Weintrop (2001) evaluated the web site of University at Buffalo Libraries, more specifically to determine if users could effectively use the web site to perform specific tasks. It was revealed that students had some confusion with "Web Search", which linked to various aids for identifying information on the site and on the Internet, because they did not know what it actually included. Another link which could also cause confusion was "Need Help", a link to guides for starting research. Although it was rarely selected, when it was chosen, users were dissatisfied with the information provided. Likewise, students faced the problems of terminology, text-heavy presentation, and identification of the most appropriate choice.

Church, Brown, and VanderPol (2001) studied the web site of University of Nevada, Las Vegas (UNLV) Libraries with the focus to redesign the web site to accompany the move of the main library into the new facility with the objective to gather and analyze data to better understand user navigational and organization tendencies. They reported that users usually chose browser navigational tools (Home button, back button) more than those provided on the web site. Inexperienced users more likely turned to search tools than experienced ones but were less successful in answering the questions. Search tools seemed to be used when menu choices did not clearly indicate the right path. Due to this fact, they should be complete and have enough coverage in terms of necessary content or else users used them without gaining success. The site search engine should allow restricting the search to the library web site, to the University web site or to both. As buried content was a problem users found, creating shortcuts or putting it on a main page could be used as solutions. Also, users faced the problem of unclear, confusing terminology. Finally, users were unable to find the answer if the information was not highlighted or findable through a quick page scan.

Collins and Aguiñaga (2001) conducted their usability testing on the web site of Arizona State University West (ASU West) Library to redesign the web site because of its growth. They found that users and librarians had different ways of thinking for the organization of information and wording. Apart from actual content, the site's look and feel such as colors, images, font, and text size and placement could be important. Besides, text amount, sight lines, and scannability of pages were crucial as well as readability for visual disabilities.

McGillis and Toms (2001) tested the web site of Memorial University of Newfoundland (MUN) Libraries. They aimed to evaluate the usability of an academic library web site to have a better understanding of the way faculty and students completed typical library tasks. They revealed that university experience and the amount of library experience did not affect user performance. This resembled the result of Chisman et al. (1999) that there was no correlation between the categories of novice and expert computer/library users and participants' ability to use the WebPac. Quantitatively, they found that their participants could complete 75 percent of the tasks by using around 2 minutes per task. Generally, participants were satisfied with the site's clarity and organization as well as their ability to do the tasks. A problem they encountered was that they did not

know where to start. This might due to the way library web sites were structured. They started as a list of things based on the premise that people came to look for a particular tool instead of responding to information tasks. Besides, participants experienced difficulties with categories and their labels. They had problems with the menu both to understand the terminology and to choose from the list of menu options. It was revealed that participants' ability to use a series of menus, access tools, and navigational aids could affect their performance. In addition, the search engine and navigation bar were used very little. Some participants did not notice while others did not think that they could click items on the bar.

Augustine and Greene (2002) evaluated the web site of library at the University of Illinois at Chicago (UIC) to test the clarity and ease of navigation of the lately redesigned site and to observe how users searched for information to customize services to customers. After the test, the problems students found were library terms and knowledge of library resources. They also faced problems with the online catalog interface. It was also found that they used the library web site's internal search engine more than navigating through pages although the results retrieved contained misleading or irrelevant links. When students had problems, particularly when trying to find technical assistance, they desired human contact, either by e-mailing or telephoning, to receive personalized help.

Cockrell and Jayne (2002) explored the web site of Western Michigan University's (WMU) Library to examine if success with looking for periodical articles was related to educational status, to study whether there were common patterns in the search behaviours of users who had difficulties or who did not achieve in location the online periodical indexes, and to explore if successful users were differentiating about their choice of index and citation. They discovered that the type of article and the educational group related to the success in finding articles. Participants encountered problems realizing the role and content of the online catalog, the need to use an index to identify an article, not the online catalog, the meaning of terms, and the difference between a popular magazine and a scholarly journal and between a magazine title or journal title and an article title. Few participants took the time to read explanations, descriptions, search hints, or help screens. Moreover, participants applied their web search habits to searching library databases with the same lack of attention to search rules. They were also likely to reach hasty conclusions for record thought unavailable, for instance. Many participants were not selective and some, especially

and there was little agreement in terminology. Thus, many specific subjects and synonyms could be possible. Users encountered problems with organization and standard library terminology (e.g., catalog, resources, and index).

The other one was the study investigated by Bobay et al. (2001). The techniques they used were inquiry method (survey), and formal usability studies (usability testing as well as field study). They evaluated the web site of Indiana University Bloomington (IUB) Libraries with the focus to conduct usability testing and provide advice on how to evolve the site. From the two surveys, one conducted by the consultants and the other conducted by the Working Group, among "top ten" tasks found, these six ones were found in both surveys: Use IUCAT – the IU Libraries online catalog, Use a library database for information on a topic (e.g., ERIC, Academic Search Elite), Locate information describing the IUB Libraries' collections and services, Complete a transaction with the library (e.g., renew a book, request an interlibrary loan), Read an electronic journal online, and Ask a question, Find "when and where" information about the libraries (e.g., hours, locations, workshops). Regarding problems found, they were the complex information structure and organization, user difficulties with selecting appropriate resources, difficult/confusing terminology, and problems with navigation strategy.

In summary, these library web site usability studies can give some guidelines of how to conduct a usability evaluation of a university library web site. Also, the instrument used, for instance, questions, heuristics, and tasks, can also pave the way for others to apply. Concerning the findings of the studies, especially the problems found, they can be helpful to the focus and preparation for the librarians who are interested in conducting their usability studies so that they will not neglect these critical issues. In addition, what is revealed can be invaluable for the design or redesign process of any academic library web sites. Moreover, although the studies cannot give the clear answer which usability methods are the quickest, cheapest, or easiest, at least, they can illustrate the fact that many usability evaluation methods are feasible to be used successfully for the usability evaluation of university library web sites with remarkable advantages in return.

Conclusion

After reading this article from the beginning to this line, it may be clear now how crucial web site usability is and university library web sites are no exceptions. As a result, in the academic library environment, usability has become such an interesting issue that many libraries carry out their usability tests, with an array of methods as mentioned above. However, since today's academic libraries have to do much more than "stock shelves" or make information accessible (Abbott and Peach 2001: 303), the usability of the library web sites may not be an only issue that the university libraries should pay attention. On the contrary, they should prove their existence by considering other essential issues in the field too. They may look at various dimensions of an issue or link some issues together so that some more insight and understanding can be revealed, integrated, and usefully applied.

At present, no one can deny that information literacy is among hot topics in the library context. This can be seen, for instance, through the advice of Kuh and Gonyea (2003: 256) that, "…librarians should redouble their collaborative efforts to promote the value of information literacy and help create opportunities for students to evaluate the quality of the information they obtain".

Realizing the move towards student-centered learning, information seeking may be a major activity that can serve students' needs and help nurturing their information literacy as is confirmed with the opinion of UNESCO's Aoyagi that,

> …information literacy skills are "formed" through active rather than passive learning, based on the learner's motivation to improve his or her quality of life. Information literacy cannot be taught by "the osmosis technique" but must be "indoctrinated into good information seeking behavior." (Thompson 2004)

Currently, in an academic library environment, most students use libraries via their web sites to search for information needed. Since Cottrell and Eisenberg (1997: 54, 56) suggested useful design features by applying the Big Six Skills for Information Problem-Solving, which can correlate to information literacy, this, in turn, suggests that web design and information literacy may be related. Also, Church (1999: 7) mentioned that most of the information on computer was presented visually and most learning

occurred visually. As a result, it can be assumed that students are likely to learn information literacy when they use a university library web site. In particular, a university library web site design may be considered as a potential means to help develop their information literacy in an academic learning context. This approach of information seeking can also accord to the definition of academic learning, by Nunes and Fowell (1996), which is "…the process of constructing knowledge and the development of reflexive awareness, where the individual is an active processor of information…" Additionally, when usable design, which is an important issue for academic library web sites, is taken into account, it will possibly be very cost-effective if the web site design can also help function to encourage students' information literacy. This way of learning will be a form of experiential learning in everyday life which "…is synonymous with conscious living when we treat experience as a life-long phenomenon. This is the how people learn naturally..." (Jarvis, Holford, and Griffin 2003: 66).

To add more information about this and to have a better understanding of this assumption, a study investigating the relationship between university library web site design, in terms of usability, and information literacy development through students' experience of using a web site, which is being done by the author, is appropriate. This is because it can make a valuable contribution to the library discipline both theoretically and practically. It responds to the research need into the experience of information literacy in digital environments (Thompson 2004) and people's experience of learning information literacy (Bruce 1997: 80). Also, it reveals an alternative way to teach information literacy, which can be useful to determine which approaches are the most effective in teaching information literacy (Kuh and Gonyea 2003: 269). Moreover, because in the higher education domain, at the time of this writing, there are no studies linking these two essential issues--web site usability and information literacy--together, specifically, on the topic about the conceptions of information literacy development when using a university library web site, this can then be regarded as an example to combine significant issues in the discipline. It may, finally, uncover something useful which looking at each issue separately has never done before.

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