A Qualitative Usability Study: The University of Maryland Libraries Website on Mobile Devices

Xiaoyu Tai (xtai@umd.edu)

May 9, 2016

Abstract This paper evaluates the usability of the new mobile site for the University of Maryland Libraries and the students' experience of using the new website on their mobile devices. This study is based on multiple qualitative research methods, including usability studies and interviews. The study identified multiple usability issues with different severity through observation, 'think-a-loud' activities, and interview. Findings reveal mixed feelings about the mobile site, including dislike, helpful, confused, and lack of necessity. This study also discusses the roles of the responsive library website and ways to improve the usability of the website.

Keywords Mobile website, mobile library, usability studies.

Contents

1 Introduction

University libraries are one of the most important knowledge portals on college campuses for students, faculty members, and many others to access information. University libraries play an important role as the information access point in academic life(Kuh and Gonyea, 2003), and these libraries are not only useful for researchers to find books, but also for students to focus on their assignments. University libraries also provide professional help to their users, such as research consultations, workshops, copy, print and scan services, equipment loans, and more.

The University of Maryland Library system has more than 4 million books and 300 databases, and it servers more than 37,000 students and faculty of the flagship College Park campus. There is no doubt that the University Libraries are trying to do its best to facilitate academic lives of both students and faculty members. One factor the library cannot ignore is technological progress. The procedure of accessing information, such as borrowing and returning books, has been simplified by the library website. A new UMD library website has been published since January, 2016, and the new website features a responsive web design. This design allows both mobile and desktop users access the same website.

1.1 Responsive Web Design

Responsive web design is a hot trend in web development community, and this design approach has been adjusted for an increasing number of websites. A responsive website can be accepted on both desktop computers and mobile device with the same content, and this design helps mobile users to obtain information equally. Adopting responsive web design seems to be a must for libraries since more and more library users have their own mobile devices, and a skillful and inventive adaptation is important for providing information to all users (Kim, 2013a, 2013b).

1.2 Related Work

Library websites have become the information access point for many researchers and students. Many studies have focused on university library websites by evaluating website usability (Battleson et al., 2001; Dickstein and Mills, 2000; McMullen, 2001), improving the information communication between the library website and users (Manzari and Trinidad-Christensen, 2006; Petch et al., 2016), and developing novel technologies (Kim, 2013a; Lown et al., 2013). There are also proposals of why librarians should make university library websites accessible on mobile devices (Dresselhaus and Shrode, 2012; Kim, 2013b). All of these approaches aim to improve the library website and assist its audience.

In this study, I address the usability issues of using the library website on mobile devices, and I also reveal feelings from using the library website on mobile devices to increase user experiences. Although there are some existing works on evaluating mobile library websites, all of these studies have focused on a specific mobile version of the library website. A responsive version library website has many distinctions to a mobile-specific library website, and a usability testing can reveal usability issues and enhance the design for mobile devices.

The University of Maryland Libraries just released a new version of its website, and the new version was created applying responsive web design guidelines. A usability testing on the performance of mobile devices can evaluate the new designs and improve the user experience on the new site. Therefore, this study could be valuable for an example of evaluating responsive library websites on mobile devices and for developers and designers to improve the website and to benefit mobile users of the website.

2 Research Questions

To support more users and to make information consistent, a new responsive web design version of the University of Maryland Libraries website was recently developed. The new website has the same information and functions across different clients (i.e., mobile, tablet, and desktop users). Although the same information is presented to different users, users have various using situations. Perhaps the biggest difference is the situational impatient when a mobile user using his or her mobile device on-the-way, and study shows "common contextual variations can lead to dramatic changes in behavior" (Barnard et al., 2007).

The new version of library website was published in January 2016, and this paper evaluates its mobile user performance. Doing so will help the designer and developer team to address usability issues and further improve the website designs. The old version of the library website was separated by platform, and the old mobile site had less content than primary desktop site. However, currently, the new responsive version has the same content in both mobile view and desktop view.

The focus of this research is user' performance and response of this newer version of library website on their mobile devices. This study identifies potential enhancements for mobile users, such as information architecture, site navigation, layout, and color design. Therefore, this paper addresses the following research questions:

RQ1. How well do UMD students think the library's new mobile site meet usability requirements?
RQ2. How do UMD students feel about using the library's new mobile site?

3 Methodology

This paper uses multiple qualitative research methods such as observations of task performance and semi-structured interviews. Hour-long user studies that include a questionnaire, task performance, and a semi-structured interview were conducted with six UMD graduate students. The user study protocol can be found in Appendix A.

All subjects are graduate students at the University of Maryland. A total number of six graduate students accepted to participant in this study.

3.1 Procedure

Before task performance, a simple questionnaire was provided to participants. The goal of the questionnaire was to learn the demographic information (occupation, age, and gender) and history of using the University of Maryland library website on either the desktop or mobile devices.

Following completion of the questionnaire, participants were asked to perform four tasks. These tasks were selected base on their importance to the daily users with both computer and mobile devices and included finding books, articles, journal papers, and requesting a unique selection from special collections of the university. These tasks commonly occur on the website of the library. Another three tasks were selected to test the usability of finding events and services provided by the library. These tasks represented the support of library for services and events, and may be used by students with a mobile device.

Five different scenarios were created for participants to better understand tasks and their backgrounds. Each scenario included a basic background description. As suggested in the literature (Barnard et al., 2007), participants were asked to stand up and walk around to simulate the real-life usage scenario in three out of seven tasks. The participant was given 10 minutes for each task. If the time exceeded 10 minutes, the participant would be asked to stop. The 'think-aloud' method was used in the task performance, and the researcher assisted the participant if necessary. A comprehensive task list with the five different scenarios is included in Appendix B.

Open-ended questions were included in the semi-structured interviews after task completion. These open-ended questions asked participants about their evaluation of performance on the tasks they just perform, general feelings of using mobile library website while walking and sitting, their experience with library website and mobile library website, and suggestions for improvements for the mobile website. All interview questions are included in Appendix C.

Task performance took each participant approximately 20 to 25 minutes. The researcher recorded the audio and generated transcripts. The researcher also kept observation notes when the participant is performing tasks. Each interview took approximately 20 to 30 minutes. Interviews were recorded and transcribed.

4 Analysis

Notes from the performance observations, think-aloud recordings, and interview recordings are combined into a master note and examined in an iterative coding process. The researcher was focused on emerging themes that can reveal both usability issues and experience from the participant. A total of five usability issues and five feelings are identified from the coded master note. Names are omitted in order to keep the anonymity of this study.

4.1 Task Performance

All six participants were asked to perform a set of seven tasks, and each task should be completed within 10 minutes. Most of the participants were able to complete all seven tasks on their mobile devices except

one participant that failed to complete task 4 under ten minutes. All participants were asked to evaluate their task performance by selecting the most difficult and the easiest task during the interview. The results are included in table 1. A completed tasks description can be found in Appendix B.

Table 1: Task completion table

Tasks	Completion Rate	People think this is the easiest task	People think this is the most difficult task
Task 1: Find resources from an author	100%	3	2
Task 2: Find information about a specific book	100%	1	2
Task 3: Find a physical location of special collections	100%		
Task 4: Request a paper from special collection	83.3%		1
Task 5: Find information about a library event	100%		1
Task 6: Find out information of a library service	100%		
Task 7: Find out information of a library service	100%	2	

The task 1 and 2 showed some differences in our participant group; some participants believed the searching box on the homepage had helped them completing this task while others suggested two different search boxes on the home page confused them. A participant run out of time on task 4 because he could not find the request button on the special collection page. He almost landed on the right page, but the request button is too small for his smartphone. He scrolled up and down on the right page for some time but was unable to find the request button; therefore, he failed the task.

All participants seemed comfortable using their mobile devices. Two mainstream mobile systems are used in this study: four participants used iOS devices, and two participants used Android devices. No significant difference between two platforms was revealed during the task performance session.

Task completion rates showed participants can complete these tasks on mobile devices, which indicate the website has basic functionality for mobile users, and users are able to complete primary library website tasks on their mobile devices.

4.2 Usability Issues

The first research question focused on the usability of the University of Maryland Library website. Total of five emerging usability issues were identified from the task performance observation, 'think-a-loud' transcript, and the post-task interview transcript.

4.2.1 Confusing Search Boxes

The foremost issue is two confusing search boxes on the home page. All participants use searching as their main method to find information on a mobile device. Many participants suggested the search boxes are confusing and hard to understand. A participant revealed his opinion when answering interview question 8: "I think... those two search boxes require user to learn... how to distinguish them." Another participant suggested the same: "the box is hard to understand, I don't know which one to use..." Another participant answered the first interview question: "I think... my performance is going to be better if I change the search box."

Although two search boxes are presented on the home page (figure 1), some participants only entered keywords of all tasks in the first search box (Google Site Custom Search). Nevertheless, these two search boxes have different functions: the first search box is expected to be used for website information, and the second search box is expected to be used for academic searches. This confusing design is a catastrophic experience for library users since searching is one of the most important features and services of the library website.

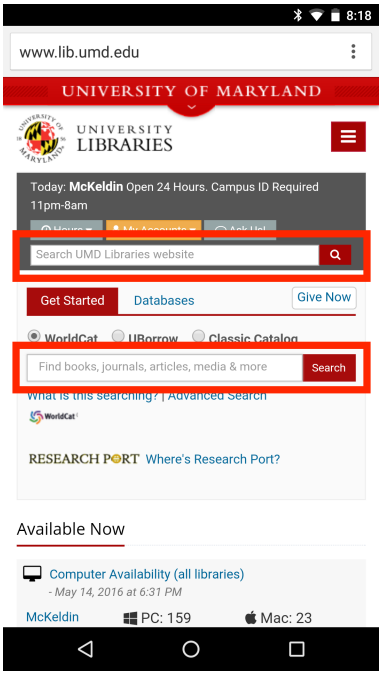

Figure 1: Two different search boxes are identified with red blocks.

4.2.2 Overwhelm Content

A lot of participants complained about reading too much content on one page. This issue occurred repeatedly on task 3 where the participant was asked to find physical location of a special collection. A participant said: "I don't want to look at these paragraphs; I want to look at pictures and large texts." Two participants also complained about the footer designer during their interviews: "This block (footer) is way too long compare to the header menu," "I won't go through these items; it just too many of them."

The special collection websites are part of the new responsive-web-design revision; however, these websites did not change any content to match the mobile version. This makes mobile users difficult to locate useful information on a single page. Long paragraphs are also hard for users to read when they are on the way. Footer design is also problematic since a long footer is displayed on every page. This design not only overwhelmed users' experience but also increased the amount of data interchange between mobile devices.

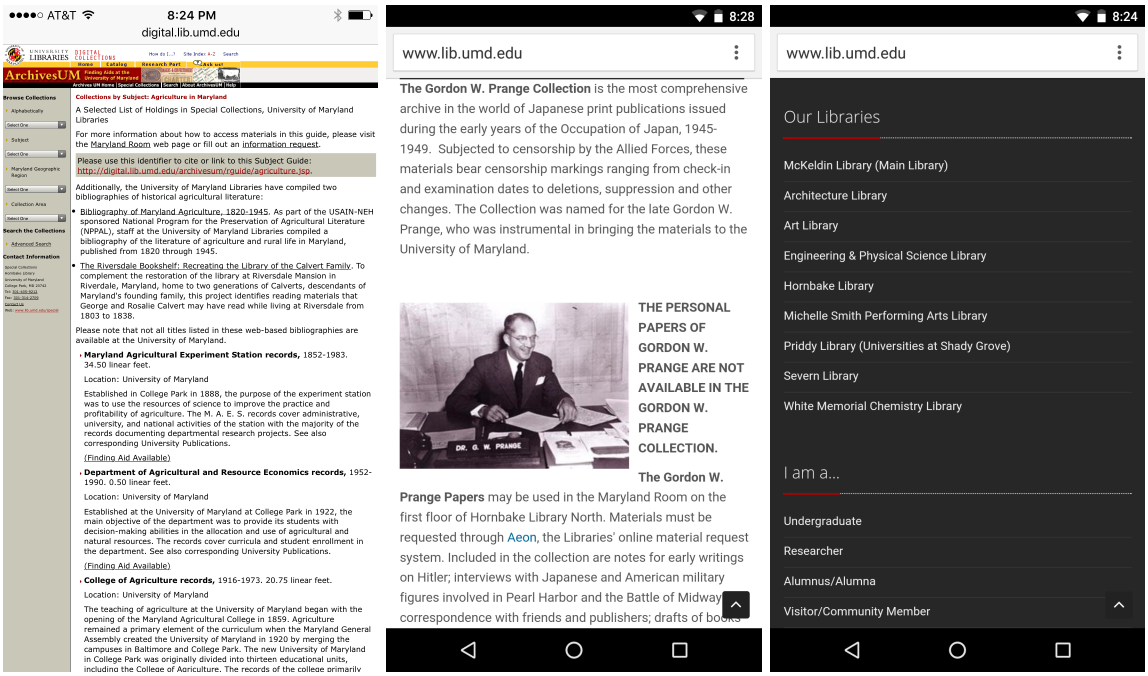

Figure 2: Small font size, long paragraphs, and long footer on mobile devices.

4.2.3 Small Font Size

Many participants have mentioned small font size (figure 2) during the task performance and interviews. One participant said this while finding the location information of the special collection in the task 3: "Text size is so smallllll... (long voice)." Almost all participants mentioned font size during the interview question 8.1, which asks the participant if any difficulty in using the library website on your mobile device. Another participant suggested: "I think I have to put a lot of efforts to read;" another mentioned: "I think the mobile site should increase the font size. I zoomed in multiple times looking for information," and

many participants did zoom in while performing tasks. This usability issue can be solved easily by increasing the minimal font size in mobile device; however, this issue is related to the content issue (4.2.2), and content changes are also needed.

4.2.4 Small Buttons

Multiple tasks revealed button size issue. One participant clicked at wrong buttons multiple times on his device during task 1, and he said this in his 'think-a-loud' method transcript: "Why are they (buttons on figure 3) so close to each other?" Unlike the desktop website, the mobile website needs larger buttons for users to use their fingers as input method. Many design guidelines[1] suggest creating a larger clickable area for mobile buttons. Small buttons issue can be a frustrating experience when mobile users view desktop buttons.

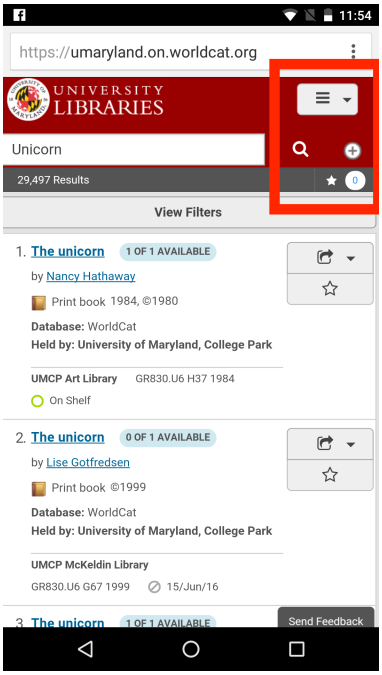

Figure 3: Five small buttons are located within the red block.

4.2.5 Non-responsive Pages

All participant encountered this problem when they were performing task 4. Many participants are surprised when they found the button on the figure 4. One participant mentioned: "It is like a spot-the-difference puzzle, where you can spot difference and find the right button to click... in these old fashion websites." Another participant said this in his interview: "The overall feeling is like browsing old websites and new websites at the same time, and it just feels old already."

[1]Google Developers. Size Tap Targets Appropriately. https://developers.google.com/.

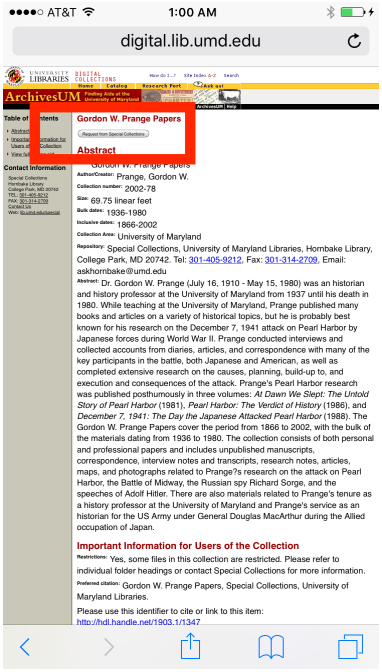

Figure 4: The ArchivesUM website is not designed for mobile users but is linked from a responsive page.

Participants often feel inconsistency when they were using the library website on mobile devices. Some external links do not provide responsive or mobile-specific design, which creates an unpleasant experience for mobile users, and these non-responsive web pages, like figure 4, reduce the usability on mobile devices.

4.3 Feelings

Our second research question focused on the feelings of the library website mobile users. Although some pages do not have usability issues, these pages might not make sense to users. This study identified four major feelings from six participants using the library website, and both positive feelings (helpful) and negative feelings (tired, dislike, lack of necessity, and inconsistency) were revealed during interviews and 'think-a-loud' activities.

4.3.1 Tiredness and Dislike: everything is small, fulfill by content

Small font size and small buttons are identified in the pervious section; moreover, these usability issues make our participants feel bad as well. One participant said this during the post-task interview: "I feel tired of looking at the small screen and small text." Many participants also mentioned they feel tired. One participant said: "I can read these small texts, but I don't want to." Mobile applications and websites should have simple and large text, and responsive web design is not only presenting desktop content to mobile users but also optimizing mobile user experiences.

4.3.2 Helpfulness: I get what I want with my mobile

Some participants believed the mobile library website is useful and helpful in some cases. One participant recalled she used the mobile library website once or twice in the past month, and she said: "I remember I used this new version the week before las week. I think I found what I was looking for. " Another participant mentioned the usefulness in his interview answer: "If I don't have a computer with me, this website seems fine. It's good to have a website like this." Although there are many usability issues, four out of six participants think a mobile library website is useful in some circumstances, and they prefer to have access to the library on their mobile devices.

4.3.3 Lack of Necessity: I don't need my phone for library website

Some participants questioned the necessity of having a mobile library website: "I will always use my laptop to access library website, if I don't have my laptop with me, I will wait until I get home or get a laptop." Another participant said: "I will go over to the library, and ask them the availability of a book rather than look up on my mobile." These scenarios and feedback indicate that users are not comfortable using the mobile library website, even though they are comfortable using their mobile devices for their daily lives.

4.3.4 Inconsistency: some websites are not responsive

The UMD Libraries website has many sub-sites, such as digital collections, special collections, and WorldCat. These databases are all linked from the main site. One participant mentioned: "...these are old fashion websites." As another participant mentioned: "It's good to have these non-responsive websites, but the feeling of using them on mobile is not good, at least for me," some sub-site have not been updated for many years, and these websites create an inconsistent feel for mobile users.

5 Discussion

The study exams the usability of the new University of Maryland Libraries website on mobile devices and reveals how students feel about using this mobile website. The results show the website is functional on mobile devices; however, some usability issues and bad user experiences are identified. From these highlighted issues, this study discusses serval improvements for the UMD libraries website.

5.1 User Interface Improvement

Many user interface issues are identified from this study, such as button size, font size, and item locations. These issues can be easily changed from a design renovation.

First, developers and designers should focus on clickable areas like buttons and links. Desktop users navigate with mouse or trackpad, and they can focus on small links and buttons with no problems. However, the natural of mobile input method is human fingers; therefore, small clickable areas are no longer suitable for mobile. Buttons and links should be large for clicking in mobile devices, and developers should also avoid multiple buttons and links in a small area.

Second, site navigation needs to be clearer. Currently, the library website uses a navigation menu and a footer for basic site navigation and quick links. Although this structure works in desktop mode, a long menu and footer might confuse mobile users. One participant mentioned this in his 'think-a-loud' activity: "this menu is really long; I have to scroll up and down to... oh there it is... I will just use search the next time." This suggests the developers should simplify the main menu and provide easy access to search feature for mobile users.

5.2 Content Optimization for Mobile

In addition to user interfaces, content optimization is also critical for mobile users. Most participants mentioned that they have to deal with long paragraphs and awkward site structures.

Important information should be provided on the top of the page and in a form except paragraphs of text. From our usability testings, participants repeatedly mentioned they cannot find certain information from paragraphs. One participant said: "I just want to look at pictures and large titles, perhaps charts? I don't know... definitely not the text." For instance, the printing price should be included in a chart, and locations should be highlighted rather than place in the bottom. However, this process of content refinements is not easy and requires collaborations from librarians across different departments.

5.3 Better User Experience

All changes in user interfaces and content lead to a better user experience, but a good mobile user experience is more than these improvements. This study also uncovers different behavior between mobile users and desktop users. This study learns that mobile users tend to use search box because long navigation menu is not practical for mobile users. However, two search boxes are presented on the home page, and users are confused with this design. Developers can create better terminology for both search boxes, but this still requires users to learn when to use certain search box. An integrated search box is another solution, where results from different sources are presented together.

Better user experience will let the user feel comfortable while using the library website on their mobile devices. As one participant said: "I will go over to the library, and ask them the availability of a book rather than look up on my mobile." If an equally good website experience is provided to mobile users, they might learn to use mobile library website and save a trip to the library.

5.4 Latest Developments and Future

As part of the UMD library website developer team, the researcher has shared findings with the team. Rapid development work has been made to enhance the experience for mobile users.

A redesigned info bar with enlarged buttons and search bar is going to deploy to the production site soon (figure 5). This new design optimized the mobile user experience by extending clickable area for three buttons and the search bar on every mobile page.

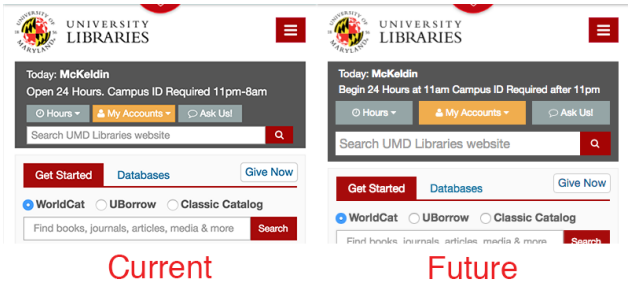

Figure 5: Based on this study, a new info-bar with large buttons design will be in production soon.

As literature (Lown et al., 2013) suggests, a new 'bento-box' searching mechanism was proposed to and will be considered by the Web Advisory Committee for the UMD Libraries website. This new mechanism lets users search from a single box, and the site will search multiple sources and assemble different results to a single page. The result page (figure 6) looks like a Japanese lunch bento box; therefore, it is named after 'bento-box quick search.' This new design provides both desktop and mobile users a better-integrated searching experience.

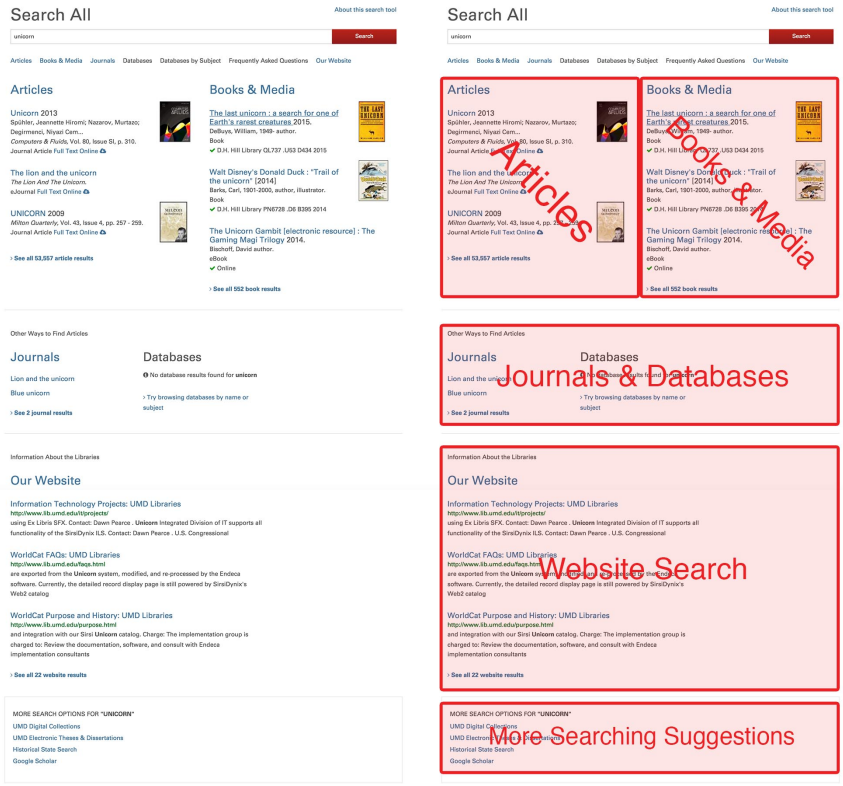

Figure 6: 'Bento-box' searching mechanism: an integrated searching experience.

6 Conclusion

This qualitative usability study focused on the new UMD library website on mobile devices, and this study identified multiple usability issues from task performance and interviews. From this study, we learned mobile users need larger font size and clickable areas, and mobile users are not in favor of long text. More work is needed to improve mobile user experience, such as enlarge clickable items, highlight important content, optimize all linked websites for mobile devices, and provide a clearer searching experience.

References

Leon Barnard, Ji Soo Yi, Julie A Jacko, and Andrew Sears. Capturing the effects of context on human performance in mobile computing systems. Personal and Ubiquitous Computing, 11(2):81–96, 2007.

Brenda Battleson, Austin Booth, and Jane Weintrop. Usability testing of an academic library web site: a case study. The Journal of Academic Librarianship, 27(3):188–198, 2001.

Ruth Dickstein and Vicki Mills. Usability testing at the university of arizona library: how to let the users in on the design. Information technology and libraries, 19(3):144, 2000.

Angela Dresselhaus and Flora Shrode. Mobile technologies & academics: do students use mobile technologies in their academic lives and are librarians ready to meet this challenge? Information Technology and Libraries (Online), 31(2):82, 2012.

Bohyun Kim. The library mobile experience: Practices and user expectations. American Library Association, 2013a.

Bohyun Kim. Responsive web design, discoverability, and mobile challenge. Library technology reports, 49 (6):29–39, 2013b.

George D Kuh and Robert M Gonyea. The role of the academic library in promoting student engagement in learning. College & Research Libraries, 64(4):256–282, 2003.

Cory Lown, Tito Sierra, and Josh Boyer. How users search the library from a single search box. College & Research Libraries, 74(3):227–241, 2013.

Laura Manzari and Jeremiah Trinidad-Christensen. User-centered design of a web site for library and information science students: Heuristic evaluation and usability testing. Information technology and libraries, 25(3):163, 2006.

Susan McMullen. Usability testing in a library web site redesign project. Reference services review, 29(1): 7–22, 2001.

Melanie Petch, Katie Fraser, Nathan Rush, Alan Cope, and Julie Lowe. Improving communication between postgraduate researchers and the university library: A case study at de montfort university library and learning services. New Review of Academic Librarianship, (just-accepted):00–00, 2016.

A Testing Protocol

```
<Date/Time>
<Subject #>
<Pre-test Questionnaire Ref#>
<Recording File Name __.m4a>
<Observation File Name __.md>
<Language>

------------------------------
## A. Introduction
This research project is trying to study the usability of library website
   on mobile devices, and the feelings of users using mobile library
   website. This project is part of my course study. I appreciate you
   taking the time participating in this study. Everything will be
   anonymous, and you do not need to answer every question and can quit at
    any time. You will first be asked to complete a basic pre-test
   questionnaire, then perform seven tasks on your mobile device, and I
   will ask some follow-up questions about your experience. This whole
   process will be recorded and should take less than an hour.

------------------------------
## B. Consent (Oral)

------------------------------
## C. Pre-Test Questionnaire
Opened up Google Forms for the participant (record time & clarify any
   question)

------------------------------
## D. Task Performance
(Give the task (please see Appendix B) to the participant)
Here are seven related tasks that I would like you to perform on your
   mobile device.

*explain think-a-loud method:* Please talk out loud what are you thinking
   while you doing your tasks. Just say what you think while doing the
   task
*explain each test, with scenario descriptions, and clarify the task with
   the participant if necessary*
however, I will not assist you while you are performing your tasks. You
   have 10 minutes for each task, if the time runs out, you will be
   notified and asked to move to the next task.

------------------------------
## E. Post-Test Interviews
Post-Test Interview Protocol: please see Appendix C

------------------------------
Thanks again for participating in this study. If you have any additional
   questions and suggestion, please contact <email>.
```

B Tasks and Scenarios

```
------------------------------
## Scenario 1: Task 1 & 2
(Scenario: your professor suggests you an author / a book to read in a
   class, now the class is over, and you are on you way back to home. You
   pull out your mobile phone and would like to check out if the book is
   available in the library. If the book is available, then you could drop
    by one of the libraries on the way back and pick up the book.)
**Please stand up and walk around to pretend you are on-the-way**
1. Try to find out the location of Ben Shneiderman's books in the Library
   that I can borrow. (Physical location: On which shelf of UMD libraries)
2. Find the availability of the book: Interaction design: beyond human-
   computer interaction by J Preece.

------------------------------
## Scenario 2: Task 3 & 4
(Scenario: you have just been told there is a Special Collection at UMD
   that is the topic of your interest, and you pull out your mobile device
    and try to find out where it is.)
**You can sit down to perform this task**
3. Find the physical location(in which library/floor?) of Gordon W. Prange
    Collection (also known as Post-War Japan collection).
4. Find out how to request the "Aaron S. Oberly Papers (1863-1865)" from
   Special Collections, University of Maryland Libraries.

------------------------------
## Scenario 3: Task 5
(Scenario: you see this poster on the way back to your home, and the
   poster is about consultation of Graduate School Writing Center, and you
    would like to find out more detail about it using your mobile phone.)
**Please stand up and walk around to pretend you are on-the-way for this
   tasks as well**
5. Find out how to request a consultation in Graduate School Writing
   Center via libraries' website.

------------------------------
## Scenario 4: Task 6
(Scenario: you have your use flash drive and your cell phone with you, and
    you would like to find out how much to print a color page in the
   McKeldin Library.)
6. Find out how much to print a color page in the library.

------------------------------
## Scenario 5: Task 7
(Scenario: you are studying in the library; however, your laptop just died
   . You heard that there are laptop chargers available for borrow in the
   library, and you want to find out where are they with your mobile phone
   .)
7. Find out where to borrow a MacBook Charger in McKeldin.
```

C Post-Test Interview Protocol

```
You just finished seven tasks that are relevant to using library website
   on mobile devices. Now, I would like to ask several questions about
   your experience and feelings.

-------------------------------------------------------------------------
## 1. Brief Transition forms tasks
-------------------------------------------------------------------------
1. What do you think of your performance on these tasks?


(if the participant have not shared his or her experience of **the most
   difficult task**)
2. Which task do you think is the most difficult one, why?


(if the participant have not shared his or her experience of **the easiest
    task**)
3. Which task do you think is the easiest one, why?


4. Have you used these feature before?

-- If yes, ask:
4.1 Have you completed task before on your desktop device or mobile device
   , which one?
4.2 Do you feel different while using the mobile compare to the desktop?
   What's the different while using mobile device to complete the task?
(Developing through participant's response, ask about their feelings,
   differences between desktop and mobile, difference if both mobile(*old
   version* vs. *new version*))


5. Do you feel any difference while using your mobile device when you
   stand up and walking around verse sit down?


-------------------------------------------------------------------------
## 2. Get an overview feelings of the mobile library website
-------------------------------------------------------------------------
(This part might include the detailed feelings as well as the usability
   issues.)

6. What do you usually do when you are trying to use the library website?

(if participant does not use library website for books, papers, or etc. )
6.1 Then, what websites do you use for <...>?


7. In what cases would you use the mobile library websites?
```

8. What do you think of the mobile site overall? Tell us what is your feeling of using mobile device browsing library website.
(See how the participant's response to this question, then cue them to talk more: why is that?)

8.1 Is there any difficulty while using on your mobile device accessing the library website, why?

8.2 What part do you think the system has helped you with, why?

---
3. Find more usability issues in addition to the tasks performance
---
9. Can you think of some positive and negative aspects of this mobile website?
(Such as user interface designs, buttons, menus, inputs...)
(+reflect what the user did during the task performance)

10. If you can design this website for the mobile user, what do you think you will change? How to change it?