

2016

Mobile Web Site Ease of Use: An Analysis of Orbis Cascade Alliance Member Web Sites

Zebulin Evelhoch

Central Washington University, zeb.evelhoch@cwu.edu

Follow this and additional works at: <http://digitalcommons.cwu.edu/libraryfac>



Part of the [Library and Information Science Commons](#)

Recommended Citation

Evelhoch, Z. (2016). Mobile web site ease of use: An analysis of Orbis Cascade Alliance member web sites. *Journal of Web Librarianship* 10(2), 101-123. DOI: 10.1080/19322909.2016.1167649

This Article is brought to you for free and open access by the Library at ScholarWorks@CWU. It has been accepted for inclusion in Faculty Scholarship from the Library by an authorized administrator of ScholarWorks@CWU.

This is an electronic version of an article published in

Evelhoch, Zebulin. 2016. "Mobile Web Site Ease of Use: An Analysis of Orbis Cascade Alliance Member Web Sites" *Journal of Web Librarianship* 10(2): 101-123.

This article is available online at: <http://dx.doi.org/10.1080/19322909.2016.1167649>

The Journal of Web Librarianship is available online at:
<http://www.tandfonline.com/toc/wjwl20/current>

Mobile Website Ease of Use: An Analysis of Orbis Cascade Alliance Member Websites

Zebulin Evelhoch
zeb.evelhoch@cwu.edu
James E. Brooks Library
Central Washington University
Ellensburg, Washington, USA

Abstract

This paper analyzes 37 Orbis Cascade Alliance members' websites to determine ease of use across mobile devices. Based on that analysis and a literature review, guidance is provided on how libraries' mobile websites may be improved. Websites were examined to determine ease of locating frequently accessed resources on mobile devices that were identified in the literature: contact information, hours, databases, library accounts, and search boxes. Scalability of websites on mobile devices was also evaluated and was found to be non-existent in nearly a quarter of examined libraries. Areas for consideration and improvement are presented across Orbis Cascade Alliance libraries that can easily be applied globally.

Keywords: mobile website, academic library, ease of use, accessibility

Introduction

The ability to access information and services from an academic library website on a variety of mobile devices is increasingly important. However, the question remains: are all libraries equal in this respect? This paper analyzes the library websites of the members of the Orbis Cascade Alliance (OCA) from a variety of mobile devices to determine ease of access to information and resources most needed by users of academic libraries as identified in the literature. This analysis will help to advance the usability of mobile websites not only in the OCA but also throughout academic libraries by identifying areas in which mobile academic library websites need to improve as well as providing a foundation for where those improvements should be made.

To determine ease of access to resources across a wide variety of academic library websites, the websites of the members of the OCA were examined to determine the availability of the most requested resources and information through mobile devices in academic libraries as identified in the literature. These libraries provided some consistency of web experiences as over a year and a half period from June 2013 to December 2014, all 37 member libraries migrated from their legacy integrated library systems (ILS) to an OCA-wide shared hosted library services platform, Ex Libris Alma (Orbis Cascade Alliance 2015a). Member libraries also generally instituted Ex Libris Primo as their discovery layer at the time of migration. While each OCA library uses a shared hosted library services platform and the same discovery layer, there are noticeable differences in how each academic library has instituted and presented Primo and other content on their webpages. Primo may be located at various places, in various sizes, or may not be present at all. Additionally, institutional branding may or may not have been applied to the discovery layer.

The OCA is a consortium of 39 institutions in Idaho, Oregon, and Washington (Orbis Cascade Alliance 2015b). These intuitions represent the entire spectrum of higher education institutions from small private schools, community colleges, and regional universities to large comprehensive research institutions. The combined student population across OCA is 358,232 with 15 schools granting associates degrees, 33 bachelors, 31 masters, and 17 doctoral (Carnegie Foundation for the Advancement of Teaching n.d.; Northwest Commission on Colleges and Universities n.d.). There is a mix of both public and private institutions, with 17 private (non-profit), and 22 public institutions (Northwest Commission on Colleges and Universities n.d.). This broad membership of higher education institutions contained within the OCA provides a diverse cross

section of institutions to examine and from which to provide insight into any issues, or positive trends, which are prominent in mobile access across academic libraries.

Literature Review

Considering that library websites are often the primary place academic users go to for information related to coursework or research, it is essential that these sites quickly guide users to the information they need from a variety of devices, especially as college students spend a large majority of their time on mobile devices (Chow, Bridges, and Commander 2014; Roberts, Yaya, and Manolis 2014). As mobile devices continue to infiltrate all aspects of life, it is important for universities to provide necessary student services, including library services, on mobile websites (Aldrich 2010).

An initial decision academic libraries may need to make is deciding what content should be included on their websites and how that content can be displayed clearly on a small screen (Kim 2013). A survey at Oregon State University Libraries found that overwhelmingly the main reason users accessed the library's mobile website was to check hours, though users also accessed the mobile site to search for a book and to perform research, both basic and complex (Gascho Rempel and Bridges 2013). Other research supports the finding that the library website is predominantly used to check hours, search for books, or use a database (Condit Fagan et al. 2012; Persson, Langh, and Nilsson 2010). The accessibility of these tasks and resources should be made a priority in academic library website design. In addition to performing research, users noted the ability to access their online library account as a priority on mobile devices (Seeholzer and Salem 2011). It is worth noting that a study of academic and public libraries discovered 16.2 percent did not provide contact information on the homepage, even though the ability to contact a library has been identified as of utmost importance by mobile users of academic library websites (Chow, Bridges, and Commander 2014; Seeholzer and Salem 2011). Additionally, libraries could provide tutorials on how to use library resources or perform research so that students could view the tutorials on their mobile device while performing the tasks on their computer (Aldrich 2010). Whatever approach academic libraries take to selecting the design of their websites "the restricted space on a small screen requires us to rethink what the most important items are on a page and how the rest of the content can be presented in a streamlined and uncluttered way" (Kim 2013, 33).

Online catalogs or discovery layers are successful when they are able to engage an end user in a meaningful way and successfully support the end user in achieving their goals (Johnson and Craven 2010). If libraries want to continue to be a place faculty and students turn to for information, it is vital that academic library catalog design adapts to reflect systems end users are most comfortable with (Kniewel, Wakimoto, and Holladay 2009). Johnson and Craven (2010) found that end users not only like, but expect a single-search box that leads to a results screen with summaries and basic information with the ability to see more detailed information about a resource. This finding was supported by a study at the University of Colorado Boulder Library that determined catalog designs must reflect systems users are comfortable using, and must change over time to ensure they continue to meet users' needs (Kniewel, Wakimoto, and Holladay 2009). Having a search box on the homepage, with the ability to search the catalog from that search box is of paramount importance to many students (Barba et al. 2013; Persson, Langh, and Nilsson 2010).

However, there are valid concerns with both a central search box and a discovery layer that returns a variety of results. When a central search box is present on a homepage, users may disregard other links and information on the homepage, even if those links may be more helpful, and it can also be difficult for users to differentiate between the types of materials available from the wide variety returned (Swanson and Green 2011). This could lead to students searching for hours or contact information in the discovery layer, instead of browsing the homepage.

Considering the usage behavior of academic library website users discussed above, the overall layout of the website must be designed thoughtfully in a way that provides for efficient use, whether that is for informational or educational purposes (Chen, Germain, and Yang 2009). In the past, when users accessed websites from desktop computers, it was found that users were unlikely to scroll to find information (Mack et al. 2004). With the advent of mobile devices, this behavior has changed to a degree. On mobile devices the ability to scroll is available only by manipulating the screen with a finger. A study of ecommerce sites reported in *Smashing Magazine* viewed this action as a constraint to user scrolling as was the difficulty in controlling scroll speed on mobile devices (Holst 2016). A study by the Nielsen Norman Group found that across device types users will scroll, but only if the information at the top of the page encourages them to do so. The author of this study stated, "What is visible on the page without requiring any action is what encourages us to scroll" (Schade 2015). Web design can thus further either encourage or

discourage scrolling. Certain items can discourage scrolling, such as the presence of a horizontal line, which users see as a barrier, while content barely showing at the bottom of a page encourages scrolling (Yazdi and Leech 2009). While users clearly do scroll on mobile devices, having needed and important information easily discoverable without scrolling should still be a priority as user attention drops when scrolling, with the most intense viewing taking place at the top of a page (Nielsen 2010).

Another mobile website design concern is clicking—the need to click on secondary links to get to more information. Clicking, like scrolling can either lead to the discovery of more information, or it can cause information to be ignored or overlooked. Clicking can be a navigational hindrance as a mobile user must locate a link, determine if the link is useful, manually touch the link, and then wait for the new page to load (Anthony 2012). Further difficulty with clicking comes with the “fat finger problem” or the inability to select the correct link on a mobile device, which can potentially lead to users leaving a website (Appleseed 2012). Each additional click leads to wait time as a page loads, as well as increased data usage (Cerejo 2012). All of these factors can add additional frustration and inconvenience for the end user, not to mention data costs, to find needed information.

Research shows the majority of academic users turn to commercial web resources to complete academic tasks, which is disturbing considering the amount libraries spend to design user-friendly websites and provide online resources (Kim 2011). Perhaps libraries can recapture some users with more intuitive layouts, including increasing ease of use, which has been defined as “the degree of effort required on the part of the user in order to complete an activity” (Hyman, Moser, and Segala 2014, 41). A study by Heinrichs et al. (2007) found that ease of use directly affected users’ perception of a website. Like commercial entities, academic libraries must create websites that are intuitive and create a positive user experience as these experiences could lead to repeat visits (Chiang and Nunez 2007). Considering where to place key content such as the discovery tool, and other research tools, in a way that makes sense to end users is extremely important (Condit Fagan et al. 2012). Kim (2011) emphasized increased use as a positive outcome of improved design by noting that when “a website helps users complete their tasks, they are likely to use the website” (Kim 2011, 99). Through creating these positive experiences, usage will hopefully increase, both from repeat visits, and through growth from positive community

referrals. Essentially, the more students benefit from, and are able to easily use mobile library resources, the more they will use them (Aharony 2014).

One last consideration for library website design is using terminology that users are comfortable and familiar with. In an extensive survey of 51 library usability tests, Kupersmith (2012) found that the terminology used has a large impact on the ability of users to locate information and that most library users prefer natural language for descriptors. This seems in contrast to the branding many academic libraries do with their discovery layers or OPACs and shows that libraries may be better off with simple terminology such as “Find a Book” or Library Catalog.

While all websites are designed with end users in mind, and many web designers feel their sites are ideal, user ratings often show the opposite (Kim 2011). This disconnect can be complicated by survey results and actual observed data that have diverging results and is made more complex by the need of many academic libraries to adhere to the general style guidelines of the university’s website (Barba et al. 2013; Persson, Langh, and Nilsson 2010). This need to adhere to university website guidelines greatly reduces the ability to tailor the library’s website to the specific needs of its users, especially those using mobile devices. Overall, the literature demonstrates that web design and discoverability of frequently used resources, such as open hours and the library catalog, across a variety of devices should be considered in designing an academic library website.

Methodology

Each of the 39 websites of the current OCA member libraries, including the two recently added members, Clackamas Community College and Whitworth College, were included in this study, for a total of 39 academic library websites initially evaluated (Orbis Cascade Alliance 2015b; Orbis Cascade Alliance 2016a; Orbis Cascade Alliance 2016b). As Clackamas Community College and Whitworth College were approved pending members at the time of analysis, and have since been accepted as members, it was important to include them in an analysis of the OCA member library websites (Orbis Cascade Alliance 2016a; Orbis Cascade Alliance 2016b). Whitworth University is already operating Primo as its discovery layer in conjunction with Ex Libris Voyager as their ILS, and will migrate to OCA’s shared instance of Ex Libris Alma in June 2016 (Nancy Bunker, e-mail message to author, December 14, 2015; Orbis Cascade Alli-

ance 2016b). Clackamas Community College currently uses Innovate Interfaces Inc.'s Millennium for its ILS and Encore for discovery (Terry Mackey, e-mail message to author, December 14, 2015). It is unclear when, or if, a migration to the OCA's shared instance of Alma will occur for Clackamas Community College. After the entire analysis was completed, two OCA libraries were excluded from the study. Saint Martin's University and Pacific University were not included, as their library homepages would not load in the iPhone 6 Plus emulator, Screenfly. These two institutions were excluded from all analyses to maintain a consistent sample size of n=37 across all devices.

The analysis of member websites occurred in multiple stages as each section was completed on a number of devices, which are described below. An initial analysis was completed of each website using a standard desktop computer to gain basic information from each site such as institutional branding of Primo, the terms used to describe account access, and to establish a baseline comparison of functionality between a desktop computer and mobile devices.

Next, two mobile devices and one mobile device emulator were used to view each website in order to provide a comprehensive view of how mobile friendly each website was. Ease of access on a mobile device was based on how easy it was to locate the most popular information needed by academic library users as discovered and discussed in the literature review. The following information needs were identified from the literature review as the reason users most frequently visit an academic library's mobile website, and were used to determine ease of use for each library's website:

- Determine library open hours
- Identify library contact information or get help
- Search for an item or resource
- Perform more advanced research via databases
- Access their library account to renew items, place holds, verify due dates, etc.

Ease of Use

As ease of use of each member's website on mobile devices was the focus of this study, and as noted by Heinrichs et al. (2007) ease of use has been shown to have a "strong significant positive relationship with [user] satisfaction," therefore determining how to evaluate if a website

was easy to use on a mobile device was paramount (2331). Throughout this paper, ease of use is used interchangeably with user friendly as in this study both represent the ability for the end user to easily and quickly locate the information they are seeking. As mentioned above, a number of user needs were identified in the literature, which are essential content elements to include on a library's mobile website. These elements include, but are not limited to the ability to search for an item or resource, access a library account, and determine library open hours. From these categories identified in the literature, a number of factors, listed below, were established to evaluate each library's website. Examining each website for accessibility of these factors allowed for an analysis of how user-friendly each library's website was on each mobile device tested. The following factors can be taken individually, or examined holistically, to determine ease of use on a specific mobile device or across a variety of devices:

- Mobile Scalability (resizes to display all content without horizontal scrolling)
- Location of information
 - Hours
 - Contact information
 - Database or other research tools
 - Ability to access account
 - Discovery layer search box
- Presence of information (no linking needed)
 - Hours
 - Contact information
 - Database or other research tools
 - Ability to access account
 - Discovery layer search box
- Wording
 - Contact information
 - Database or other research tools
- Scalability
 - Discovery layer results

Each website was examined to determine how easy it was to locate this information across various devices and thus to determine overall ease of use. Sites which displayed the most commonly sought information or resources directly on the website with no scrolling, both vertical and horizontal, or clicking of links to view secondary pages were deemed to be most user friendly, and thus offer the most ease of use. Wording was also evaluated to determine the presence or lack of library jargon when evaluating ease of use for locating contact information and databases. The presence or absence of jargon was also evaluated for account access and search

boxes, though for these two categories it was considered outside of ease of use and viewed solely as an additional consideration. Search box branding did not directly affect the ability to discover a search box on the screen and was thus also considered supplementary. Account access terminology was additionally considered supplementary to ease of use and was simply used to determine commonalities across OCA libraries.

The following tasks were performed to evaluate how accessible it was to locate the most sought after information or resources on each website using mobile devices. First, a web search was done to locate the institution’s library homepage for each OCA member on each device. As each item was evaluated, it was recorded based on the ease of use matrix shown in Table 1.

Table 1: Ease of Use Matrix

| | Non-User Friendly | Semi-User Friendly | User Friendly |
|----------------|--|---|--|
| Scalability | No scaling (phones only) | Mobile version | Scaled (phones) /desktop view (iPad) |
| Hours | Linking required | Scrolling required. No linking required | No linking required, no scrolling required. |
| Contact | Linking required/difficult to locate. Uses unclear language which may include library jargon | Scrolling required, no linking required. Uses clear language lacking library jargon | No linking required, no scrolling required. Uses clear language lacking library jargon |
| Account Access | Not discoverable on homepage and/or linking to full site required | Scrolling required, no linking required | No linking required, no scrolling required |
| Databases | Linking required, may require expansion of a menu, “Database” not included in wording OR not discoverable on homepage and/or linking to full site required | Scrolling required. No linking required. Wording included “Database” | No scrolling required. Wording included “Database” |

| | | | |
|----------------|--|---|---|
| Search Box | Not discoverable on homepage. Must follow a link to access search box. | Scrolling required. No linking required. | No scrolling required, no linking required. |
| Search Results | Full version (phones only). Results do not scale and horizontal scrolling required | Mobile friendly. Requires horizontal scrolling to view full display | Mobile friendly on phones/full version on iPad. No horizontal scrolling required. |

After reaching the library’s homepage, the author first noted if the website scaled to the device. This functionality, known as scalability, is “the ability for something designed to operate at one measure of size to operate successfully at other sizes” (Butterfield and Ngondi, eds. 2016). More simply put, scalability is when a website that is designed to display correctly on one screen is able to successfully readjust to the display size of other screens. The author did not evaluate if the website used scalable design, fluid design, or responsive design, as the coding of the website was not being examined, simply if the website scaled to a user-friendly size on a variety of mobile devices. Additionally, researchers have found that responsive design websites that are poorly designed can be just as difficult to navigate as traditional websites (Kim 2013).

Next, the author located hours and contact information and noted if scrolling was required to view either, and if the information was displayed directly or if a link was required to view the information. When viewing contact information, wording was evaluated. Contact information lacking library jargon and containing “contact” was deemed more user-friendly than wording such as “Ask a Librarian.”

Access to databases, including wording used, was also examined. Wording used to describe access to databases was considered user friendly if the term “database” was present. The need to scroll, follow a link, or expand a menu was evaluated in conjunction with wording, to determine overall database ease of use on mobile devices.

This exploration was followed by a search to locate library account access. Wording was considered supplementary; the focus for ease of use was on whether or not scrolling was required to access an account, or if a user was required to link to a desktop view of the website in order to access their account.

The discovery layer was examined to determine if it could be found on the library homepage without scrolling or linking. Those search boxes that required neither were deemed most user friendly, while a search box that was not present on the homepage and required linking to access was considered non-user friendly.

Last, a basic search was done using the discovery layer to see how consistent the results screen was across devices, and how well it displayed on mobile devices. The same search for “Pacific Northwest” was used on all member websites across all devices. This search was performed as it would return a variety of results and item types, thus providing a view of how various resources displayed in the results screen. The search was also selected as the OCA members are mostly located in the Pacific Northwest. Results were evaluated based on if they displayed in a mobile-friendly or full-desktop view and if horizontal scrolling was required to view all needed information. The purpose of this study was only to determine if the results were mobile friendly and fairly consistent across devices, not what those results contained or how they were displayed across institutions.

As websites were evaluated on a variety of devices, rankings were recorded in the ease of use matrix shown in Table 1 to determine the overall ease of use on each mobile device.

Website Review

The review of websites took place in December 2015 and January 2016 and used the hardware and software configurations listed below. The devices selected were chosen to provide a comprehensive view of mobile devices and included two sizes of mobile phones and one tablet, providing a broad picture of mobile adaptability. These devices were selected as they provided the ability to view all OCA websites using various combinations of operating systems and web browsers, and were expressive of the spectrum of device sizes currently in general use, thereby representing the myriad combinations of operating systems and web browsers that patrons may use.

To simulate accessibility on a large mobile phone, an iPhone 6 Plus emulator, using Screenfly by Quirktools (QuirkTools n.d.b), was used which allows users “to view your website on a variety of screens and resolutions” (QuirkTools n.d.a). To view a website using Screenfly,

first, a web search was done was to obtain the Library's URL, which was then copied and pasted into Screenfly. After the page loaded in Screenfly, iPhone 6 Plus was selected from the phone icon dropdown menu; this was repeated for all OCA libraries. The devices used and their configurations are listed below:

- Desktop Computer: Apple iMac; 21.5 Inch Monitor with OS X 'El Capitan' version 10.11.2 using Mozilla Firefox version 42.0
- Tablet: Apple iPad MD328LL/A, 3rd Generation; Version 7.1 using Safari Web Browser
 - Resolution: 2048 x 1536; used in landscape mode
- Small/Medium Mobile Phone: Samsung Galaxy Reverb SPH-M950, Android Version 4.1.2 using Mozilla Firefox version 42.0.2
 - Resolution: 480 x 800; used in portrait mode
- Large Mobile Phone: iPhone 6 Plus
 - Resolution: 414 x 736; used in portrait mode
 - Accessed via Screenfly (QuirkTools n.d.b) using Apple iMac; 21.5 Inch Monitor with OS X 'El Capitan' version 10.11.2 using Mozilla Firefox version 42.0

It is important to note that this study was undertaken to create an overall view of ease of use of all OCA Member Library websites, creating a general portrait of mobile adaptability of websites in the OCA as a whole. This study is not meant to point out specific imperfections on member websites, but rather to present them holistically so that member libraries may evaluate individually where improvements can be made. It will be at the sole discretion of each member library to determine the needs of their users, though this general information should help guide them in evaluation and improvement of their websites, especially when viewed from mobile devices.

Results

Scalability

When viewing library websites from the largest mobile device for this analysis, the iPad, all websites displayed as the full site with no scaling to the screen. This did not create any difficulty in reading or navigating the sites. When accessing OCA member websites from the Samsung Galaxy Reverb, eight websites (22 percent) did not scale, and instead presented the normal version of the website in desktop view. These websites were extremely challenging to navigate and required zooming and a confusing combination of horizontal and vertical scrolling to locate

information. As shown in Table 2, and outlined in the ease of use matrix, a website without scaling capabilities was considered non-user friendly on the two phones, while it was considered user friendly on the iPad.

Table 2: Scalability of OCA Mobile Websites (n=37)

| | Non-User Friendly: No scaling (phones only) | | Semi-User Friendly: Mobile version | | User Friendly: Scaled (phones) /desktop view (iPad) | |
|------------------------|--|---------|---------------------------------------|---------|--|---------|
| | Libraries | Percent | Libraries | Percent | Libraries | Percent |
| Samsung Galaxy Reverb | 8 | 22% | 3 | 8% | 26 | 70% |
| iPhone 6 Plus Emulator | 13 | 35% | 0 | 0% | 24 | 65% |
| iPad | 0 | 0% | 0 | 0% | 37 | 100% |

This inability to scale may be due to website design and style guidelines instituted at the institution level and may be beyond the libraries' control, though the number of websites that did not scale increased on the iPhone 6 Plus emulator to thirteen (35 percent) libraries. Some of this increase may be due to three websites loading as extremely scaled down "mobile versions" on the Samsung Galaxy Reverb while they did not do so on the iPhone 6 Plus emulator. The larger screen size may have had an effect on other websites not scaling as well. The three mobile versions viewed on the Samsung Galaxy Reverb were easy to navigate, but did not contain access to all library resources, which could lead to an end user needing to access the full, non-mobile friendly, version of the site anyway.

On the Samsung Galaxy Reverb and iPhone 6 Plus emulator, 26 (70 percent) and 24 (65 percent) websites respectively, scaled out of the OCA sample size of 37. Overall, the iPad was the most user-friendly in this category, followed by the Samsung Galaxy Reverb and last by the iPhone 6 Plus emulator.

Hours

Library open hours are fairly easily to locate across OCA member libraries. Some libraries had only hours for the current day, which while helpful, may not help with quick planning for future library visits. Many of those libraries often had links to a more comprehensive schedule of hours located nearby. One institution had hours located at the very top of the page, which is a logical place; however, given its small size it was easy to overlook on a mobile device. Table 3 outlines the ease of locating hours on each device.

Table 3: Number of OCA Websites with Easily Located Hours (n=37)

| | Non-User Friendly: Linking required | | Semi-User Friendly: Scrolling required. No linking required | | User Friendly: No linking required, no scrolling required. | |
|------------------------|--|---------|---|---------|--|---------|
| | Libraries | Percent | Libraries | Percent | Libraries | Percent |
| Samsung Galaxy Reverb | 3 | 8% | 5 | 14% | 29 | 78% |
| iPhone 6 Plus Emulator | 3 | 8% | 6 | 16% | 28 | 76% |
| iPad | 11 | 30% | 10 | 27% | 16 | 43% |

Three libraries (eight percent) required multiple links to view library hours, e.g., first clicking an hours link, then selecting a specific branch's links in order to view a table of hours. This problem was encountered while using both the iPhone 6 Plus emulator, the Samsung Galaxy Reverb, and the iPad (for two of the websites). These libraries, in addition to a few others, had very complex charts and tables for determining when a branch was open based on academic time periods. This process could be very difficult and confusing for new students unfamiliar with the campus. Overall, when using the Samsung Galaxy Reverb 29 libraries' (78 percent) hours were easy to locate, while 28 (76 percent) were easy to locate on the iPhone 6 Plus emulator.

Five websites (14 percent) on the Samsung Galaxy Reverb and six (16 percent) on the iPhone 6 Plus emulator required horizontal scrolling to locate hours, all on websites which did not scale. These websites were very difficult to locate hours on as one could easily "get lost" between horizontal and vertical scrolling. Locating hours for 16 libraries, or just under half of libraries at 43 percent, on the iPad required no scrolling at all, while ten (27 percent) required some vertical scrolling and eleven websites (30 percent) required linking. Two of these instances

contained the multiple links discussed above, and one website required both scrolling and linking. Unlike with scalability, locating hours using the iPad was the least user friendly task, with the Samsung Galaxy Reverb just ahead of the iPhone 6 Plus emulator for ease of access. For this category, locating hours was easiest on the smallest device, and most difficult on the largest device. Of greatest concern is that between 22 percent and 57 percent of libraries did not have hours easily discoverable on their homepage when viewed from mobile devices.

Contact

Wording to describe contact information varied across OCA libraries and could either increase, or decrease, the discoverability of that information. Thus, wording was considered in overall ease of use and was deemed less user friendly when library jargon was used. Contact information across OCA websites ranged from simple chat icons, chat windows to links to department staff, “Contact the Library Staff,” sometimes prominent “Answer Services” but harder to find general contact info, phone numbers for circulation, a general library phone number, or “Ask a Librarian,” which could direct to a general phone number, or a staff listing of all librarians. Many libraries had various combinations of contact information located in numerous places across their homepages.

The ability to locate contact information, without the need to scroll or follow a link, was evaluated based on finding basic contact information, including a phone number. On the iPad 18 libraries, or nearly half the sample size at 49 percent, had contact information on the homepage that did not require scrolling or links to view, with twelve sites (32 percent) requiring linking and seven (19 percent), requiring scrolling to view contact information (see Table 4).

Table 4: Number of OCA Websites with Easily Located Contact Information (n=37)

| Non-User Friendly: Linking required/difficult to locate. Uses unclear language which may include library jargon | | Semi-User Friendly: Scrolling required, no linking required. Uses clear language lacking library jargon | | User Friendly: No linking required, no scrolling required. Uses clear language lacking library jargon | |
|--|---------|--|---------|--|---------|
| Libraries | Percent | Libraries | Percent | Libraries | Percent |
| | | | | | |

| | | | | | | |
|------------------------|----|-----|---|-----|----|-----|
| Samsung Galaxy Reverb | 3 | 8% | 5 | 14% | 29 | 78% |
| iPhone 6 Plus emulator | 2 | 5% | 8 | 22% | 27 | 73% |
| iPad | 12 | 32% | 7 | 19% | 18 | 49% |

When viewing contact information on the phones, five websites (14 percent) required horizontal or a combination of horizontal and vertical scrolling on the Samsung Galaxy Reverb with eight (nearly 22 percent) requiring the same on the iPhone 6 Plus. Three libraries on the Samsung Galaxy Reverb and two on the iPhone 6 Plus had contact information that was difficult to locate. These websites often had an easily discoverable chat or feedback form, but did not have more traditional contact methods. Overall, contact information was very easy to locate on the OCA member websites: 27 sites (73 percent) with the iPhone 6 Plus emulator and 29 sites (78 percent), on the Samsung Galaxy Reverb. The ability to locate contact information across devices was similar in ease of use to determining library open hours with contact information for eight sites (22 percent) on the Samsung Galaxy Reverb, ten sites (27 percent) on the iPhone 6 Plus, and a high of nineteen sites (51 percent) on the iPad fall in the non-user friendly or semi-user friendly category. Once again, the Samsung Galaxy Reverb, the smallest device, was the easiest to locate contact information with 29 libraries (78 percent) having contact information easily located. The Samsung Galaxy Reverb was followed by the iPhone 6 Plus emulator with 27 libraries (73 percent), and the iPad was the least user friendly in this category having only eighteen academic libraries (49 percent) falling within the most user-friendly category of “easily located.”

Account Access

Wording used to describe account access, while not considered a direct factor in ease of use for this category, was examined anecdotally for presence or absence of library jargon. The most concerning finding about account access was that one library actually has their link misspelled as “My library accoun.” Seventeen libraries, nearly half at 46 percent, used a variation of

“(My) Library Account(s) / (Renew Books)” with eleven, just under 30 percent, removing library and having just “My Account(s)”. “(View) Your Library Account(s)” was favored by five libraries with the remainder using other terminology such as “Sign In” or simply “My Library.” Additional research is needed to determine preferred terminology, though in this study any combination involving “library” and “account” was easiest for the author to identify.

The need to scroll to find account access was considered semi-user friendly, while account access that could be found without scrolling was user friendly. As shown in Table 5, account access could be found with no scrolling using the iPad on 26 OCA member websites (70 percent), with the remaining eleven libraries’ (30 percent) requiring scrolling. Some links went directly to Ex-Libris login screens, some directed users to a landing page to select a specific library account, while others went to the university single sign-on service page, then presumably on to the library account page.

Table 5: Number of OCA Websites with Easily Located Account Access (n=37)

| | Non-User Friendly: Not discoverable on homepage and/or linking to full site re- quired | | Semi-User Friendly: Scrolling required, no linking required | | User Friendly: No linking required, no scrolling required | |
|------------------------|--|---------|---|---------|---|---------|
| | Libraries | Percent | Libraries | Percent | Libraries | Percent |
| Samsung Galaxy Reverb | 3 | 8% | 5 | 14% | 29 | 78% |
| iPhone 6 Plus emulator | 2 | 5% | 7 | 19% | 28 | 76% |
| iPad | 0 | 0% | 11 | 30% | 26 | 70% |

Unfortunately, account access could not be discovered for two libraries on both the iPhone 6 Plus emulator and the Samsung Galaxy Reverb, accounting for five percent of the total libraries surveyed, with one additional site requiring the user to link to the full site to access their account while using the Samsung Galaxy Reverb. Otherwise, account access was easily located on 29 sites (78 percent) on the Samsung Galaxy Reverb and 28 (76 percent) on the iPhone 6 Plus emulator with five (14 percent) and seven (19 percent) respectively requiring horizontal or a combination of horizontal and vertical scrolling to locate login links, all on websites that did not scale. Account access was most easily discovered on the Samsung Galaxy Reverb with 29 libraries (78 percent) having it in the most user friendly category of easily located, though this left

eight libraries (22 percent) outside the top category. This fell slightly to 28 libraries (76 percent) on the iPhone 6 Plus emulator, with again the iPad coming in third with 26 sites (70 percent) having account access easily located and eleven sites (30 percent) in the two less user-friendly categories. Outside of these overall high rankings it is concerning that three libraries (eight percent) do not have account access available on the Samsung Galaxy Reverb and two libraries (five percent) do not have access on the iPhone 6 Plus emulator.

Databases

Databases are the second category in which wording was considered a factor in discoverability. Those websites with “database” in the name, in conjunction with no scrolling required to view, were considered the most user friendly. Libraries used a variety of terminology to identify databases ranging from Databases, Research Databases, Articles or Databases, Databases A-Z to terms which may be more difficult for novice users to identify such as Electronic Resources and Journal Articles. Others had databases nested under other links or menus, such as Search & Find, Articles & More, or Electronic Resources, creating additional difficulty in locating these resources. The majority of websites had links to databases easily discoverable and contained ‘databases’ somewhere in the link name. These were a high of 30 sites (81 percent) on the iPhone 6 Plus emulator, 26 sites (70 percent) on the Samsung Galaxy Reverb and 26 sites (70 percent) on the iPad. Six websites, making up just over 16 percent of library sites, on both mobile phones, had language that did not include “database” or required a user to expand a menu to locate databases; this was the case for four libraries’ (11 percent) websites on the iPad.

Using both mobile phones, it was not possible to locate or access databases from one library website; additionally two sites (5 percent) required linking from the mobile site to the full site on the Samsung Galaxy Reverb, creating additional scrolling - and confusion (see Table 6).

Table 6: Number of OCA Websites with Easily Located Databases (n=37)

| | | | | |
|--|---|---|---|--|
| | Non-User Friendly: not discoverable on homepage and/or linking to full site required | Non-User Friendly: Linking required, may require expansion of a menu, “Database” not included in wording | Semi-User Friendly: Scrolling required. No linking required. Wording included “Database” | User Friendly: No scrolling required. Wording included “Database” |
|--|---|---|---|--|

| | Libraries | Percent | Libraries | Percent | Libraries | Percent | Libraries | Percent |
|------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
| Samsung Galaxy Reverb | 3 | 8% | 6 | 16% | 2 | 5% | 26 | 70% |
| iPhone 6 Plus emulator | 1 | 3% | 6 | 16% | 0 | 0% | 30 | 81% |
| iPad | 0 | 0% | 4 | 11% | 7 | 19% | 26 | 70% |

On the iPad seven libraries' (19 percent) sites required scrolling to view the databases link, while two websites (five percent) on the Samsung Galaxy Reverb required horizontal or a combination of horizontal and vertical scrolling to access databases, while no websites on the iPhone 6 Plus emulator required this. Links to databases on the iPad also did not require scrolling to see.

Ease of access to databases was the first category the iPhone 6 Plus emulator had the highest number of library websites in the most user-friendly category, with 30 libraries (81 percent) falling into the easily located category, though 7 Orbis Cascade Alliance websites (19 percent) were still in the lower ease-of-use categories. The iPad and Samsung Galaxy Reverb both had 26 libraries (70 percent) fall into the same most user-friendly category, but the iPad had better access overall as all libraries provided database access somewhere on their site, while three libraries (8 percent) on the Samsung Galaxy Reverb did not have any access to databases or required linking to the library's full site.

Search Box

The location and prominence of search boxes on the OCA mobile websites was the most difficult to evaluate and is discussed in further detail in the discussion section. Wording, while not considered as a factor in ease of use for this category, is worth reporting given its variance across OCA libraries and its general lack of library jargon (catalog) and presence of institutional branding. Fourteen libraries selected a library specific brand such as Sherlock, Discover @ Clark, or EWU Library Search, to describe their search box. The use of branding may be of concern given users' potential unfamiliarity with institutional branding and library jargon, and is

worth additional discussion as these branded search boxes account for fourteen libraries (38 percent of the total sites evaluated). This holds true for the six libraries (16 percent) that use Primo in some way to describe their search box, and the three (8 percent) that use OneSearch, as neither is a common term outside of the library world. Only four libraries (11 percent) in OCA have catalog somewhere in the name of their discovery layer with the remaining ten using some variation of library search, search for books, etc. This great variation with naming, in addition to location of the search box discussed below, can cause confusion when searchers move to a new library with which they are unfamiliar.

The lack of a search box on a library’s homepage was considered non-user friendly, while search boxes that were immediately seen with no scrolling or linking required were considered user friendly. When viewing library homepages on the iPad, three OCA libraries (8 percent) did not have a search box directly on the homepage. This number increased to ten (27 percent) with the Samsung Galaxy Reverb, then dropped to six sites (16 percent) on the iPhone 6 Plus emulator, as shown in Table 7. Thirty-two search boxes (86 percent) were immediately visible on the iPad while two sites (five percent) required scrolling to view. The search boxes ranged from small, basic search bars to large, colorful boxes with multiple tabs that spanned the entire website. On the Samsung Galaxy Reverb, the remaining 27 search boxes (73 percent) were easy to discover, with only six sites (16 percent) requiring scrolling to view the search box, which is surprising given the small screen size of the Reverb. On the iPhone 6 Plus emulator, 31 search boxes (84 percent) were easy to discover, with six (16 percent) of those requiring some scrolling to discover.

Table 7: Number of OCA Websites with an Easily Located Search Box (n=37)

| | Non-User Friendly: Not discoverable on homepage. Must follow a link to access search box | | Semi-User Friendly: Scrolling required. No linking required. | | User Friendly: No scrolling required, no linking required. | |
|------------------------|---|---------|---|---------|---|---------|
| | Libraries | Percent | Libraries | Percent | Libraries | Percent |
| Samsung Galaxy Reverb | 10 | 27% | 6 | 16% | 21 | 57% |
| iPhone 6 Plus emulator | 6 | 16% | 6 | 16% | 25 | 68% |
| iPad | 3 | 8% | 2 | 5% | 32 | 86% |

Thirty-two sites had (86 percent) search boxes that were immediately discoverable on the iPad, followed by 25 sites (68 percent) on the iPhone 6 Plus emulator. This category saw the smallest device, the Samsung Galaxy Reverb, providing the most non-user friendly search boxes with only 21 websites (57 percent) having the search box easily found. This difficulty was also shown on the other end of the spectrum where ten (27 percent) OCA libraries did not have a search box available on the homepage when accessed from the Samsung Galaxy Reverb. This decreased to six sites (16 percent) on the iPhone 6 Plus emulator.

One other item of note is that on the iPad, and to a lesser extent on the mobile phones, it was necessary to tap the “search” or “go” button on the website to initiate the search instead of having the onscreen keyboard “go” button perform that task.

Search Results

Search results were fairly consistent across all platforms, as shown in Table 8, with all results displaying similarly to the desktop experience on the iPad, with the only exception being three libraries (eight percent) that have a click-through screen requiring the user to either log in or continue as a guest. Results in Primo were generally displayed in a mobile-friendly format on the mobile phones requiring no horizontal scrolling. Walla Walla University provides a great example of this experience. Twenty-nine libraries (78 percent), had the results display in this mobile view on both the Samsung Galaxy Reverb and the iPhone 6 Plus emulator, though eight libraries (22 percent), have a click-through screen on the iPhone Six Plus emulator and seven libraries (19 percent) on the Samsung Galaxy Reverb. The click-through screen is only mentioned as it did create an additional action users have to take, which can be cumbersome on mobile devices, and is considered only in addition to search results, not as part of that analysis. For this reason, the presence of a click-through screen was not considered in the ease of use matrix, but was deemed important enough to mention in the general findings and is shown in Table 8.

Table 8: Number of OCA Websites with Easily Viewable Search Results (n=37)

| | Click-Through Screen | Non-User Friendly: Full version (Phones Only). Results do not | Semi-User Friendly: Mobile friendly; requires horizontal | User-Friendly: Mobile friendly on phones/full version on iPad. No |
|--|----------------------|---|--|---|
| | | | | |

| | | | scale and horizontal scrolling required | | scrolling to view full display | | horizontal scrolling required. | |
|------------------------|-----------|---------|---|---------|--------------------------------|---------|--------------------------------|---------|
| | Libraries | Percent | Libraries | Percent | Libraries | Percent | Libraries | Percent |
| Samsung Galaxy Reverb | 7 | 19% | 4 | 11% | 4 | 11% | 29 | 78% |
| iPhone 6 Plus emulator | 8 | 22% | 5 | 14% | 3 | 8% | 29 | 78% |
| iPad | 3 | 8% | N/A | | N/A | | 37 | 100% |

Looking at ease of use for search results consisted of evaluating the presence or absence of a mobile results display, and the need to horizontally scroll to view all results information. Four libraries’ websites (11 percent) on the Samsung Galaxy Reverb and three (8 percent) on the iPhone 6 Plus emulator displayed in a mobile friendly view, though due to customizations made to call number displays, the results were more difficult to read than the “out of the box” configuration. Western Oregon University was able to implement a custom call number display while maintaining a user-friendly view on mobile devices. Despite the availability of a Primo mobile view, four of the libraries (11 percent) on the Samsung Galaxy Reverb and five libraries (14 percent) on the iPhone 6 Plus emulator displayed in full desktop view, requiring horizontal and vertical scrolling in addition to zooming. As shown in Table 8, full-version display of results is considered negative on the two phones, though was acceptable on the iPad due to its much larger screen size and was considered consistent with a mobile view on the phones.

Similar to results in scalability ease of use, the iPad proved to be the most user-friendly mobile device in this category with all 37 OCA libraries displaying in a consistent user-friendly view. Both the phones had twenty nine libraries (78 percent) with results displayed in a mobile-friendly view, though one more library website did display results in the full version on the iPhone 6 Plus emulator than on the Samsung Galaxy Reverb, making the Samsung Galaxy Reverb slightly more user friendly in this category.

Overall Ease of Use

For a number of content elements-- hours, contact, and account access-- the Samsung Galaxy Reverb, the smallest device used in this study, was found to be the most user friendly.

However, the Samsung Galaxy Reverb was not found to be the most user-friendly device overall. When using the ease of use matrix discussed in the methodology section (see Table 1), results across all content elements are combined to determine which devices were most user friendly for viewing OCA libraries' websites on mobile devices. The iPad was the most user-friendly device with 74 percent of content elements across all libraries falling into the user-friendly category (see Table 9). This ranking indicated that it was generally easy to locate items on OCA library websites using the iPad. However, the iPhone 6 Plus emulator was only slightly lower with 74 percent of library websites, one less library website, falling into the most user-friendly category, and the Samsung Galaxy Reverb was at 73 percent.

Table 9: Overall Ease of Use by Device Type (n=37)

| | Non-User Friendly | | Semi-User Friendly | | User Friendly | |
|------------------------|-------------------|---------|--------------------|---------|---------------|---------|
| | Libraries | Percent | Libraries | Percent | Libraries | Percent |
| Samsung Galaxy Reverb | 34 | 13% | 36 | 14% | 189 | 73% |
| iPhone 6 Plus emulator | 32 | 12% | 36 | 14% | 191 | 74% |
| iPad | 26 | 10% | 41 | 16% | 192 | 74% |

Ease of use on the iPad was further reinforced on the non-user friendly end of the scale with only 10 percent of libraries having content elements fall into the non-user friendly category, where items were difficult to access. Both of the phones had slightly higher non-user friendly rankings with 12 percent on the iPhone 6 Plus emulator and 13 percent with the Samsung Galaxy Reverb. Although there were some differences in individual content elements, overall most OCA libraries have websites that provide reasonable ease of use across the mobile devices tested in this study. However, between 26 percent and 27 percent of content elements fell below the most user-friendly rating, which shows the need for a reexamination of most OCA libraries' websites ease of use on mobile devices.

Discussion

Navigating OCA websites using mobile devices showed that overall, content identified in the literature as frequently accessed by academic library users was easily discoverable and deemed generally user-friendly across devices and categories. There is still room for improvement across OCA libraries with library websites with regards to scaling on mobile devices and making needed content easily discoverable and accessible. Throughout this process, it consistently took much longer to navigate sites on mobile phones than on the tablet, even when exploring websites I was familiar with from previous visits on other devices. While this is somewhat to be expected given the smaller screens, because college students increasingly spend time on mobile devices, and presumably access library websites from those mobile devices, developing academic library websites that are scalable and adaptable across a range of devices should be of the utmost importance (Roberts, Yaya, and Manolis 2014). Furthermore, as Aharony (2014) noted, “students appreciate the usefulness and ease of use of mobile services and are ready to experience and work with them in library settings,” further demonstrating the need for academic libraries to have websites that students can easily use from a mobile device (210).

Some academic library websites incorporated a menu option near the top of their mobile websites. When present, these menus had helpful information in them, but often the menus were easily overlooked because other links were more prevalent. Given the valuable information contained in these menus, they should be made more prominent across all devices. Additionally, sometimes it was difficult to discern between a menu that was specifically for the library’s webpage and one that was for the institution’s website as a whole. Some intuitions also had database pages, discovery layers, and other resources such as chat, open in a new window. The ease of use of this feature may vary by user and requires additional research and usability testing.

A consideration for contact information is that library users, especially students, may be hesitant to “contact a librarian” with routine questions. Therefore, general contact information should be easily discoverable with contact a librarian being used in addition to, not in place of, general contact details.

The barrier of scrolling to ease of use could greatly benefit from additional research and usability testing. Scrolling was considered to be a negative factor as often the only way to manip-

ulate a mobile device is using a finger, which can prove difficult for both scrolling and controlling the speed of scrolling (Holst 2016). Given that users often have short attention spans, scrolling can prove problematic as users may miss needed information if it requires additional reading and work (Nielsen 2010). Thus, when a user is required to scroll to locate valuable information, he/she may overlook that information. Additionally, clicking was viewed as a negative design feature given that with each click, additional data and time are used while pages load. Also, the possibility of clicking a wrong link increases when using the small screen of mobile devices (Appleseed 2012; Cerejo 2012). Clicking the wrong link exponentially increases wait time and data usage as users must return to the previous page then attempt to follow the correct link again. With more pages viewed from mobile devices, the ability to quickly locate needed information on mobile devices is ever more important. Based on the results of this analysis, the location and availability of frequently sought after information should be considered as a significant factor in web design, particularly when a website is viewed on a mobile device.

Another consideration is that if an academic library website user arrives at the library homepage from a search engine, often contact information and hours are displayed on the search results screens, or direct links are provided in the search results to databases, hours, or other commonly sought information, allowing users to directly locate the information they need without having to navigate the library website. However, if the student arrives at the library homepage from elsewhere, e.g., a course management system or a direct URL, the usability of a mobile website is an extremely important consideration, especially as a user-friendly website has the potential to lead to repeat visits (Chiang and Nunez 2007).

The location and prominence of the search box on academic libraries' websites is also of great access importance via mobile devices. Academic library users indicate they want the ability to search from the homepage, but a search box can also prevent users from discovering other relevant information (Barba et al. 2013; Persson, Langh, and Nilsson 2010; Swanson and Green 2011). This shows that academic libraries need to strike a balance between the easy availability of a search box and the simplicity of the search box causing users to overlook other helpful information on the homepage. Comprehension of the function of search boxes may also be affected by naming. This will mainly occur when a search box is not present on the library homepage and instead a link is provided to the catalog, making it difficult for those unfamiliar with library jargon to determine what link to follow to search for library materials. Additional research into user

preferences for the naming or branding that most easily identifies a library catalog would be required; these are important considerations for libraries to keep in mind when designing websites that will be highly accessed from mobile devices.

Last, overall ease of use and scalability of a website to mobile devices will be the factor driving the location and accessibility of all other content elements. If an academic library website is useful, users will be more likely to use it, which would lead to even more increased use (Heinrichs et al. 2007). Libraries need to carefully evaluate the needs of their users and design the best website for them, which may include scalability, responsive design, or a separate mobile site. Responsive design, like all web design options has many benefits, but as Kim (2013) notes, it also has some drawbacks and means that “each library needs to carefully consider if responsive web design is the right solution for its patrons and their use cases” (33).

Examples of websites that are user friendly across mobile devices include Portland State University, Chemeketa Community College, and Whitman College, among many other excellent examples in the Orbis Cascade Alliance. While access was robust in many OCA libraries, a quarter of combined categories fell into the lowest ease of use rankings across mobile devices, which leaves ample room for improvement and rethinking of website layout to ensure users can quickly access desired information on mobile devices. Building on the methodology used in this analysis, usability testing could be completed with end users on each factor evaluated here to determine ease of use of a library’s website on mobile devices. Research and testing based on the factors identified in the literature and researched throughout the Orbis Cascade Alliance would be a great first step in understanding the needs of library users and designing a website that is user friendly on a variety of mobile devices.

Conclusions and Recommendations

Orbis Cascade Alliance member websites are generally user-friendly and scalable to a variety of mobile devices. However, there are some concerning results from this analysis that should be addressed soon. The most important change that needs to be made is to ensure that library webpages scale to a user-friendly view on mobile devices. The need to both horizontally and vertically scroll to locate information from a small screen creates an atmosphere in which an end user can easily “get lost” on a page, and as a result not find the information they are seeking, and thus not return to the site in the future. Academic libraries may be restricted in their ability to

make necessary adjustments to enhance scalability due to institution-wide web design and style guidelines. Where this is the case, libraries should push for a revision of the parent institution's website to ensure user-friendly access from mobile devices.

Other areas of concern include the lack of displaying Primo results in a mobile-friendly fashion, even though Primo is purported to provide a mobile-ready interface. The deployment of Primo 5 may address these issues, as well as some of the mobile display issues seen with the customized display of call numbers, but additional research will be needed to determine this. Additionally, libraries that do not provide easy access to library accounts, basic contact information, or easily discernible hours should ensure this information is available and easily discoverable via language that is understandable directly on their homepage. For example, the terminology "Ask a Librarian" may deter some users from using that contact information if they are only seeking basic information and do not wish to "disturb" a librarian; the "Ask a Librarian" link may be best used in conjunction with readily discoverable "Contact Us" details.

This analysis provided a survey of the current status of the ease of use of OCA member websites on mobile devices. Future, more comprehensive user surveys of OCA end users would provide the answers to questions regarding preferred search box, contact, and account access terminology. In conclusion, OCA libraries provide easy to use access to many resources from mobile devices, but reevaluation of how websites can best serve mobile users' needs should be an ongoing process.

REFERENCES

- Aharony, Noa. 2014. "Mobile Libraries: Librarians' and Students' Perspectives." *College & Research Libraries* 75 (2): 202–17.
- Aldrich, Alan. 2010. "Universities and Libraries Move to the Mobile Web." *Educause Review Online*, June 24. Accessed December 3, 2015. <http://er.educause.edu/articles/2010/6/universities-and-libraries-move-to-the-mobile-web>.
- Anthony. 2012. "Why Scrolling Is The New Click." *UX Movement*, January 10. Accessed March 3, 2016. <http://uxmovement.com/navigation/why-scrolling-is-the-new-click/>.
- Appleseed, Jamie. 2012. "8 Limitations When Designing For Mobile." *Baymard Institute: UX Research Articles*, March 21. Accessed March 3, 2016. <http://baymard.com/blog/mobile-design-limitations>.

- Barba, Ian, Ryan Cassidy, Esther De Leon, and B. Justin Williams. 2013. "Web Analytics Reveal User Behavior: TTU Libraries' Experience with Google Analytics." *Journal of Web Librarianship* 7 (4): 389–400.
- Butterfield, Andrew, and Gerard Ekembe Ngondi, eds. 2016. "Scalability." *A Dictionary of Computer Science*. Oxford University Press. Accessed February 12, 2016. <http://www.oxfordreference.com/view/10.1093/acref/9780199688975.001.0001/acref-9780199688975-e-4606>.
- Carnegie Foundation for the Advancement of Teaching. n.d. "Carnegie Classification: Institution Lookup." Accessed December 4, 2015. http://carnegieclassifications.iu.edu/lookup_listings/institution.php.
- Cerejo, Lyndon. 2012. "The Elements of The Mobile User Experience." *Smashing Magazine*, July 12. Accessed March 3, 2016. <https://www.smashingmagazine.com/2012/07/elements-mobile-user-experience/>.
- Chen, Yu-Hui, Carol Anne Germain, and Huahai Yang. 2009. "An Exploration into the Practices of Library Web Usability in ARL Academic Libraries." *Journal of the American Society for Information Science and Technology* 60 (5): 953–68. doi:10.1002/asi.21032.
- Chiang, I. Robert, and Manuel A. Nunez. 2007. "Improving Web-Catalog Design for Easy Product Search." *INFORMS Journal on Computing* 19 (4): 510–19. Accessed October 22, 2015. doi:10.1287/ijoc.1060.0184.
- Chow, Anthony S., Michelle Bridges, and Patricia Commander. 2014. "The Website Design and Usability of US Academic and Public Libraries." *Reference & User Services Quarterly* 53 (3): 253–65.
- Condit Fagan, Jody, Meris Mandernach, Carl S. Nelson, Jonathan R. Paulo, and Grover Saunders. 2012. "Usability Test Results for a Discovery Tool in an Academic Library." *Information Technology & Libraries* 31 (1): 83–112.
- Gascho Rempel, Hannah, and Laurie Bridges. 2013. "That Was Then, This Is Now: Replacing the Mobile-Optimized Site with Responsive Design." *Information Technology & Libraries* 32 (4): 8–24.
- Heinrichs, John, Kee-Sook Lim, Jeen-Su Lim, and Melissa Allen Spangenberg. 2007. "Determining Factors of Academic Library Web Site Usage." *Journal of the American Society for Information Science & Technology* 58 (14): 2325–34. doi:10.1002/asi.20710.
- Holst, Christian. 2016. "Infinite Scrolling, Pagination Or 'Load More' Buttons? Usability Findings In eCommerce." *Smashing Magazine*, March 1. Accessed March 3, 2016. <https://www.smashingmagazine.com/2016/03/pagination-infinite-scrolling-load-more-buttons/>.
- Hyman, Jack, Mary Moser, and Laura Segala. 2014. "Electronic Reading and Digital Library Technologies: Understanding Learner Expectation and Usage Intent for Mobile Learning." *Educational Technology Research & Development* 62 (1): 35–52. doi:10.1007/s11423-013-9330-5.
- Johnson, Frances C., and Jenny Craven. 2010. "Beyond Usability: The Study of Functionality of the 2.0 Online Catalogue (OPAC)." *New Review of Academic Librarianship* 16 (2): 228–50. doi:10.1080/13614533.2010.511845.

- Kim, Bohyun. 2013. "Responsive Web Design, Discoverability, and Mobile Challenge." *Library Technology Reports* 49 (6): 29–39. doi:10.5860/ltr.49n6.
- Kim, Yong-Mi. 2011. "Factors Affecting University Library Website Design." *Information Technology & Libraries* 30 (3): 99–107.
- Knieval, Jennifer E., Jina Choi Wakimoto, and Sara Holladay. 2009. "Does Interface Design Influence Catalog Use? A Case Study." *College & Research Libraries* 70 (5): 446–58
- Kupersmith, John. 2012. "Library Terms That Users Understand". *eScholarship: UC Berkeley Library*. Accessed March 11, 2016. <http://escholarship.org/uc/item/3qq499w7>.
- Mack, Thura, Maribeth Manoff, Tamara J. Miller, and Anthony D. Smith. 2004. "Designing for Experts: How Scholars Approach an Academic Library Web Site." *Information Technology & Libraries* 23 (1): 16–22.
- Nielsen, Jakob. 2010. "Scrolling and Attention." *Nielsen Norman Group: Evidence-Based User Experience Research, Training, and Consulting*, March 22. Accessed March 3, 2016. <https://www.nngroup.com/articles/scrolling-and-attention/>.
- Northwest Commission on Colleges and Universities. n.d. "NWCCU Directory of Institutions." Accessed October 15, 2015. <http://www.nwccu.org/Directory%20of%20Inst/Direc-tory%20of%20Institutions.htm>.
- Orbis Cascade Alliance. 2015a. "Cohort Plan for the Shared ILS Implementation." Accessed December 3, 2015. <https://www.orbiscascade.org/cohort-plan-for-shared-ils>.
- . 2015b. "Members." Accessed December 3, 2015. <https://www.orbiscascade.org/member/>.
- . 2016a. "Whitworth University Joins the Orbis Cascade Alliance." *Alliance News & Announcements*, February 9. Accessed March 7, 2016. <https://www.orbiscascade.org/blog/1/?bid=79>.
- . 2016b. "Clackamas Community College Joins the Orbis Cascade Alliance." *Alliance News & Announcements*, March 7. Accessed March 7, 2016. <https://www.orbiscascade.org/blog/1/?bid=93>.
- Persson, Ann-Christin, Maria Langh, and Jessica Nilsson. 2010. "Usability Testing and Redesign of Library Web Pages at Lund University, Faculty of Engineering: A Case Study Applying a Two-Phase, Systematic Quality Approach." *Information Research: An International Electronic Journal* 15 (2).
- QuirkTools. n.d.a. "Help / Screenfly." Accessed December 9, 2015. <http://quirktools.com/help/screenfly/>.
- . n.d.b. "Screenfly / Test Your Website at Different Screen Resolutions." Accessed December 2, 2015. <http://quirktools.com/screenfly/>.
- Roberts, James A., Luc Yaya, and Chris Manolis. 2014. "The Invisible Addiction: Cell-Phone Activities and Addiction among Male and Female College Students." *Journal of Behavioral Addictions* 3 (4): 254–65. doi:10.1556/JBA.3.2014.015.

- Schade, Amy. 2015. "The Fold Manifesto: Why the Page Fold Still Matters." *Nielsen Norman Group: Evidence-Based User Experience Research, Training, and Consulting*, February 1. Accessed March 3, 2016. <https://www.nngroup.com/articles/page-fold-manifesto/>.
- Seeholzer, Jamie, and Joseph A. Salem. 2011. "Library on the Go: A Focus Group Study of the Mobile Web and the Academic Library." *College & Research Libraries* 72 (1): 9–20.
- Swanson, Troy A., and Jeremy Green. 2011. "Why We Are Not Google: Lessons From a Library Website Usability Study." *Journal of Academic Librarianship* 37 (3): 222–29.
- Yazdi, Fiz, and Joe Leech. 2009. "The Myth of the Page Fold: Evidence from User Testing." *Cxpartners*, September 18. Accessed March 3, 2016. https://www.cxpartners.co.uk/our-thinking/the_myth_of_the_page_fold_evidence_from_user_testing/.