Usability and the Mobile Web
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Mobile technology has changed the way we interact with one another and our communities. For libraries, it’s important to create a positive experience for patrons so they can make repeated returns to our institutions and make use of our services. This is true for both virtual and physical representations of the library. Now, with the recent proliferation of mobile devices and constant availability of information access, it is more important than ever for libraries to meet users on their phones and tablets. This book explores usability within the context of mobile web and applications for libraries.

I found it necessary to write this book as more libraries adopt and develop mobile technologies. From my personal observations, I have seen students in my academic library write term papers on their smartphones and conduct research on their touch-optimized computer tablets. Havelka and Verbovetskaya have stated the importance of its “beginning to look like the days of the desktop and laptop as the preferred ways to search, access, and read information are numbered.” This is especially fascinating, since this generation of students does not know a time when the Internet wasn’t easily accessible, especially with a handheld mobile device.

Now, instead of possessing a laptop or desktop machine to access the Web, more and more students are using a device that fits in their pocket that has immediate access to information resources, anywhere and at any time. Today’s mobile devices have the appropriate power to accomplish many of the common web tasks accomplished on a desktop machine. Using these devices may be more favorable for college students, since they have a lower economic and technical barrier for access. The compact physical characteristics of the device and its inherent portability may also be appealing.

I believe it’s necessary for libraries to be in the forefront of mobile web use, so that reliable and accurate resources can get into the hands of students. Librarians
and developers must recognize the importance of displaying these resources in a meaningful way that patrons can utilize. Once a technology has value for a user, it’s logical to assume that it will have repeated use. However, not all mobile library websites are created equal. Creating a desktop library website can be a huge undertaking with a number of challenges that librarians specifically face when developing mobile websites and apps for patrons.

This book aims to help librarians and library developers create mobile websites and applications from a user-centered perspective. That is, to include the user’s outlook and mindset in every aspect of the design process. This ensures that the library’s mobile project has value for patrons, based on the data and input gathered from its websites. This book is also intended for librarians who have not conducted mobile web usability tests. Librarians and readers who work in libraries who are new to the concept of user-centered design, user experience, and even initializing their first mobile website may also find this text useful.

The difficult part about this mobile usability guide is that technology can outpace the currency of this text. It has been quite a challenge to keep track of mobile usability, since the technology changes so much. Even within a span of a few months, a new device or app has been released, completely changing the way we interact with our devices. This can change how users interact with technology, and greatly impact how testing can take place. This is one of the reasons why mobile usability testing differs from desktop testing. It’s commonplace that libraries and librarians have conducted web usability testing on desktop machines, but mobile usability differs significantly from these practices. Mobile users have a myriad of context, screen sizes, input devices, and network connectivity, which separates them from desktop users. Recognizing these differences in the early stages of the design process of a mobile site can greatly enhance the usability of a website, and may require a different method to evaluate their input in comparison to desktop sites.

As much as there are differences between testing a desktop and a mobile device, such as interactions and entering user input, there could be even greater differences in future, emerging technologies. We are on the forefront of wearable technology, such as Google Glass, smart watches, and fitness trackers. In the future, these devices may also be used to access library resources. It may be possible to apply the foundations of mobile usability testing to future generations of users.

NOTE

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Libraries have embraced mobile devices. Smartphones and tablet computers are frequently used to access library websites and resources. Some of these mobile devices can even be borrowed from libraries, where mobile-friendly electronic readers (e-readers) and electronic books (e-books) are widely available at academic and public libraries. According to the Pew Internet and American Life project, these devices are increasing in popularity. Numerous library databases now have mobile counterparts, such as mobile websites and apps, which provide access to their services. Catalogs and discovery tools are becoming mobile-enabled and optimized. With this popular technology, librarians and library web developers must make their own services accessible to mobile users.

It’s apparent that the proliferation of smartphone use and ownership has driven mobile web development. A survey conducted by the Pew Internet Research Center in June 2013 found that 56 percent of 252 sampled Americans identify their cell phone as a smartphone. This is increasing among adolescents, with 1 out of every 5 young Americans accessing library websites, specifically library websites, with mobile devices. Libraries must meet the needs of these mobile users, providing them with a satisfying user experience.

The purpose of this book is to help library administrators, web developers, and other staff involved in the library website integrate a mobile perspective in their thinking about websites’ usability. It advocates for and describes the task-testing process. This will help identify users’ needs and how to meet them through mobile web and application usability testing through the development process. Mobile web usability can provide insight into numerous questions, such as: How can librarians...
target users in the context of the mobile Web? What differences are there between a traditional, desktop web experience and that of a mobile one? More importantly, how can we better understand how and why mobile users interact with a library website?

MOBILE CONTEXT

An obvious commonality of mobile devices, including smartphones and tablet computers, is that users are “on the go.” The small size of mobile devices allows for easy access and use. Information access not only fits in your pocket, but quite literally, in the palm of your hand. They can be used anywhere and at any time.

The “mobile context” refers to the circumstances and environment in which the mobile device is used. The portability of these devices also changes the context, since the circumstances and environments are always in flux. The mobile context can change rapidly. For example, imagine the mobile context change seamlessly from waiting in line for a movie ticket, with mobile device in hand using a movie app to gather film critic reviews, to checking e-mail in your seat before the film starts. The user is placed in two different contexts, interacting with different sets of people and environmental elements. This can distract the user when using the device. This variable context is a fundamental difference between a mobile user and a desktop user.

CONNECTIVITY

Connectivity and broadband speed can play a significant role in the usability of mobile devices. The lack of a network connection at times dictates the usefulness of a phone. How can a phone access your library website if there is a poor-quality connection? A slow connection creates a poor user experience on desktop machines, but it can completely undermine a mobile device. This can limit mobile applications and make mobile websites inaccessible.

HARDWARE

Zhang and Adipat have listed different aspects of mobile usability that can be summarized as hardware issues. The hardware of handheld devices varies widely. Smartphones, tablet computers, e-readers, MP3 players, and even portable gaming
consoles can be used to access the mobile Web. Hardware is not limited to just Apple products, Android/Google products, or Windows devices. Ideally, a mobile website should meet the needs of different hardware configurations and be capable of cross-platform compatibility. There are a variety of small screen sizes, screen resolutions, and processing speed that all contribute to the user experience.

**Small Screen Size**

Probably one of the most apparent hardware differences between a mobile device and desktop machines is the screen size. Adipat and Zhang note how small screen sizes can create usability problems. Websites may not only become unpleasing to the eye but cannot be navigated or legible. Screen size and resolution have made more progress since Adipat and Zhang’s 2005 article. Raptis et al. have found that larger mobile screen sizes support certain information-seeking behaviors.

**Low Screen Resolution**

Screen resolution refers to the number of pixels that are on a screen. A pixel is a measurement of light on a screen. The lower number of pixels there are, the lower the screen resolution of the screen. The screen resolution of a mobile device is much lower than that of a desktop machine. This can affect not only how graphics are displayed, but can make text hyperlinks difficult to tap. Graphic images that use text may also lose fidelity when displayed at a lower resolution.

**Processing Power**

The processing power of mobile and tablet devices is vastly different from a desktop workstation. Web programming such as JavaScript or Flash may not be necessarily compatible with all mobile devices’ web browsers and platforms. However, this may have changed because mobile devices have much more processing power today than they did in 2005. One approach is to design and develop mobile applications that do not utilize too much processing power, since this can crash mobile devices.

**Data Entry**

Data entry on mobile devices is more commonly used with on-screen touch-interfaces, and this can be a challenge for users’ finger dexterity. Links can be tapped and images can be swiped. Gestures such as pinching may be used to zoom in and
zoom out of images. These interactions should also be taken into account when developing mobile websites.

A recent mobile framework called PACMAD, or People At the Center of Mobile Application Development, combines the International Organization for Standardization, Nielsen's framework model, and the limitations that Zhang and Adipat have outlined. This model is geared specifically for mobile applications. PACMAD consists of three factors related to the usability of mobile applications: user, task, and context of use.

The user is a self-explanatory factor of PACMAD. It takes into account the end-users, and their previous experience in using a mobile system. During the design of a mobile application, different types of users should be expected. One comparison that can be made is that of an experienced power user, who prefers shortcuts and advanced features, and that of a first-time user who would rather interact with an intuitive and easy-to-utilize interface. The design of the application should support these two extremes.

Task is a factor that refers to what the user is attempting to accomplish. There may be extra features that can be incorporated into the task, at the cost of usability. The more complex the mobile system is, the less usable it becomes. This may be problematic for the common third-party systems that libraries use, such as integrated library systems, electronic databases, and catalogs. Many of these systems utilize numerous processes and steps that burden the end-user.

Context of use refers to the circumstances in which the user will use the application. This is closely related to Adipat and Zhang's mobile context, which defines the user's physical location, other tasks the user may also be performing, and environmental elements that the user is engaged with.

There are several characteristics that PACMAD attributes to usability. These are closely related to Nielsen's own usability framework and include effectiveness, efficiency, satisfaction, learnability, memorability, errors, and cognitive load. One attribute, cognitive load, is directly applicable to mobile application use. It refers to the amount of cognitive processing that the user undertakes as they engage a mobile application. One example of cognitive load is using a mobile application while walking, which can slow the user's pace. This can be simulated in a field-testing environment, which will be further explored in chapter 5.

Zhang and Adipat's mobile context and the PACMAD framework can be useful tools that can differentiate between desktop and mobile environments. When creating questions for data-collecting instruments such as surveys, focus groups, or usability tests, it can be useful to refer to these frameworks. For instance, a
survey question may ask if users use mobile devices while watching television. A usability test can take into account the difficulty of typing into a virtual keyboard while testing out a task scenario.

**THE MOBILE EXPERIENCE IS NOT THE DESKTOP EXPERIENCE**

To better understand mobile web usability, we must examine the differences between viewing and using mobile websites between mobile devices and using desktop workstations. As Zhang and Adipat have mentioned in their framework, hardware and network speed can be a dividing line between using mobile devices and computers. Screen size, resolution, orientation, processing power, connectivity, and touch interfaces can factor into how well a website can be used.

**Screen Size**

There is an obvious difference between the screen size of mobile devices and desktop monitors. The screen size of current mobile devices range anywhere between 4.5” to 7”, while the dimensions of the average desktop monitor are between 20” and 24”. Laptops range between 11” to as large as 19”. Web page real estate, which refers to the placement of elements on a web page, is greatly constrained on a mobile device. This changes how content is viewed on a site. A large desktop screen allows for a wide swath of real estate. There is ample room for elements such as multi-column layouts, ads, banners, pictures, navigation, sub-navigation, and footers and headers. On a smaller device’s screen, elements that are not mobile-optimized may be obscured, incorrectly rendered, or may not even load. The smaller screen may also restrict other typical web page elements within web pages, such as tables or frames.

**Resolution**

Today, according to the web information site W3Schools, most computer workstation monitors utilize a resolution of 1024 × 768 pixels or higher to view web pages. This allows website developers to have a point of reference to create the correct canvas size for a web page. Mobile devices have a much greater variety of resolutions since there is a greater variation of device types. Typically, developers
design for a resolution of 320 × 480 pixels for mobile devices. Since mobile screens are smaller, fonts and images will not look as sharp as they do on larger monitors.

**Device Orientation**

Planning the design of mobile applications can be further complicated because some smartphones and tablet computers rotate web pages depending on the viewing orientation of the device. This reorientation can swap the width and height of the screen’s resolution, which may be adverse to the developer’s original design. When viewed on a mobile device in landscape (see figure 1.1) or horizontal orientation, the page may load into the whole width of the screen. Even further, when a website is viewed in portrait or vertical orientation, the device may zoom out of the visible area of the page (see figure 1.2), which can leave text unreadable or change the layout of the site. These are important aspects to be considered since they can radically affect how web page navigation and content are displayed.

![Figure 1.1](image-url)

*Website rendered in a tablet’s landscape view*
Processing Power

Some mobile devices may run on slower processor power than desktop machines. For instance, mobile devices do not have the same multitasking capabilities as does a desktop machine. Multiple windows and tabs can create significant slowdown on tablets and smartphones. Although these types of processors could be seen as a weakness, mobile devices do have some hardware strengths over those of desktop machines.

Today’s mobile devices combine and package different technologies together. Smartphones obviously provide voice and data capabilities, but they are also bundled with geo-location capabilities, digital camera, and audio recording. Libraries can potentially harness these features. For instance, the geo-location technology within a smartphone or tablet can potentially be used to display nearby library...
branches, based on a mobile user's location. Many libraries have also utilized the social media networks that take advantage of these mobile capabilities, such as the popular Instagram app.

**Connectivity**

Mobile connectivity can be unreliable in comparison to desktop machines. Cellular data networks are at the mercy of environmental factors, and Wi-Fi can be burdened with too many users, resulting in slower network speeds. This is a specific characteristic that separates desktop and mobile devices and which developers should be aware of.

**Touch Interface**

Another hardware difference includes the touch interface. This is much different than the keyboard and mouse interface of desktop computers, and tactile-based device interactions have moved from “point and click” to “touch and tap.” User input can be limited, especially for office or creative applications. Many mobile devices do have voice recognition as another source of input, but it may not always be available or usable, depending on the situation or context. As such, developers must keep in mind these limitations when creating mobile websites. Navigation can be problematic, since fingers are less accurate than using a mouse, and tapping may not always register.

**DEBATE OVER THE MOBILE CONTEXT**

Despite the differences between mobile and desktop connectivity, there are also those who believe that the idea of the mobile context may not necessarily apply anymore. Hall argues that the “vague” concept of the mobile context is no longer valid due to the assumption that distractions differ between mobile and desktop experiences, the blurring of handheld devices and desktop technology, and that in some parts of the world, the only network connection is a mobile one. Design and technology have also evolved since Zhang and Adipat's 2005 study. Wroblewski, known for his approach in “mobile first” design philosophy, has noted that the mobile context should be determined by the set of services and content that are provided, not by whether a particular device (mobile or desktop) can meet a user's
end goals. Regardless of the debate over the existence of the mobile context, usability testing can help identify and improve what mobile web services libraries have to offer. Perhaps one approach is to use the different attributes of the mobile context and apply modern mobile design and development to augment a library website.

WRAPPING UP

Mobile web usability is no easy task. It requires libraries to develop gradual and incremental improvements to cater to the needs of visitors, based on user research. One piece of the puzzle is examining the hardware, the context of its use, and network connectivity. Librarians can make some changes that will make their mobile websites more accessible and easier to use. The other piece that librarians must solve is how users are going to use the site. The following chapters of this guide provide insight on how this can be done.

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