

DESIGNING LIBRARY WEB SERVICES FOR MOBILE DEVICES

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Abstract: The growth of Internet-capable cell phones and mobile devices has changed the global communications landscape in recent years. In parts of the world with limited fixed telecommunications infrastructure, mobile devices are often the single, most reliable means available to library users for access to Internet resources. The time has come for libraries to meet their users where the users increasingly are: on their mobile devices. This presentation will discuss strategies for re-designing web-based library services for delivery to mobile devices, including user-driven design criteria, selection of appropriate and feasible services, and examples of successful implementations.

Keywords: mobile devices, smartphones web design; library websites.

The Evolution Of Mobile Web

Early implementations of basic library websites designed for access from cell phone browsers and simple mobile devices appeared about four years ago. At the time, a special markup language called WML (wireless markup language) was necessary to create web pages and navigation for the crude capabilities of the WAP (wireless access protocol) browsers that were included on many cell phones. These protocols made it relatively easy to present certain types of text-based content to those browsers, such as a list of library hours, contact information, driving directions, etc. At that time, the author was able to adapt the Z39.50 software that underlies the IANSLIC Z39.50 Distributed Library to provide a simple search interface to his library's online catalog, including the ability to retrieve and display real-time circulation status.

In several short years, mobile networks have vastly increased their bandwidth, and mobile devices and browsers have quickly become much more capable of handling more advanced web pages, as popularized by the introduction of Apple's iPhone. Browsers began to support HTML more fully, albeit with some modifications to facilitate navigation menus. Appropriately scaled graphical content and multimedia content were directly supported, enabling much more engaging user interfaces. However, given the small screen sizes of most mobile displays, it is still necessary to design an alternate set of web pages that are optimized to be readable and usable on small screens.

In addition to these enhancements to mobile technologies, the geography of access to the Internet and global cellular service have evolved dramatically. According to an analysis by Miniwatts Marketing Group, there were nearly 2 billion estimated Internet users as of June 30, 2010, with by far the largest number of users in Asia (825.1 million), followed by Europe (475.1 million), North America (266.2 million), Latin America/Caribbean (204.7 million), Africa (110.9 million), Middle East (63.2 million), and Oceania/Australia (21.3 million). They also looked at the penetration in each region, expressed as a percentage of the total population: North America (77.4%), Oceania/Australia (61.3%), Europe (58.4%), Latin America/Caribbean (34.5%), Middle East (29.8%), Asia (21.5%), and Africa (10.9%). Clearly, the proportion of people with Internet access is not evenly distributed globally, even though an estimated 28.7% of the world's population now has access.

The International Telecommunication Union (ITU) reported that there were an estimated 4.7 billion subscribers to cellular services worldwide in 2009, up from 1.4 billion in 2003. Furthermore, while only about 1/3 of cellular subscribers were from developing countries in 2003, nearly 70% of such subscribers were from developing countries in 2009. Of more direct relevance to website access via mobile devices, the same ITU report noted that "mobile broadband subscriptions overtook fixed broadband subscribers in 2008, highlighting the huge potential for the mobile Internet." That means that more people have the potential to connect to and use Internet and web content via cell phones and cellular networks than those who have hardwired, broadband network connections. This is particularly significant in areas of the world that do not have widespread physical network infrastructures in place, as it means that broad Internet and web access can be available without the considerable expense of creating such an infrastructure. Unfortunately, the cost of individual cellular subscription services is not consistently affordable across the globe, especially when compared to per-capita income. The ITU report also states that "the relative price for ICT services is highest in Africa, the region with the lowest income levels." Therefore, while there is great potential for widespread access via mobile devices, a digital divide continues to exist.

The Moving Target

One year ago, in 2009, best practice said:

- Design for a stripped-down interface.
- Concentrate on simple tasks, quickly accomplished.
- Minimize graphics.
- Support both simple cell phone browsers and more robust smart phone platforms.

Now, only one year later, the current wisdom says:

- Most users with full data plans will have smart phones with full-featured browsers.
- Smaller mobile devices will increasingly replace laptops.
- You still need to detect and support some simpler browsers.
- It is possible to offer a more complete range of library services via a mobile interface.

Know Your Users

As with any user interface design project, it is important to learn about the habits and preferences of your own users in order to design with their needs in mind. While the author's library did not conduct formal user studies as part of the initial design, several less formal approaches were used. We observed a variety of students who were using their mobile devices in the library, asked them informally whether they would be likely to access library resources via their devices, and if so, what kinds of resources and services would they find most useful. The reference librarians also contributed anecdotal evidence of patterns of use and demand. The author analyzed usage statistics from the logs of the library's web servers to identify heavily-used pages whose content might lend itself to mobile users. We learned that:

- How to look up titles on Course Reserves is probably our most frequently asked question.
- The self reservation system for group study rooms is very popular.
- Students like to text call numbers/locations from our catalog to their cell phones.
- They want to be able to conduct transactions, not just look things up.

Based on these user preferences, priority was given to the development of mobile interfaces to library web pages and services that would meet those expressed needs. The placement of various options on the main navigation menu of the library's mobile home page was also driven by user demand and usage history. As a result, the mobile home page now includes:



Optimizing Mobile Display

A combination of cascading style sheets (CSS) and metadata stanzas in the <head> section of the HTML code are used to size the display to fit the small screens of mobile devices and to enhance the readability of the content for various mobile browsers. It is usually possible to retrieve the CSS from an existing mobile-optimized website by simply

viewing the page source via a web browser and clicking on the link to the stylesheet. That CSS code can then be modified to meet local needs. In addition, several lines of metadata should be included:

```
<head>
<meta http-equiv="Content-Type" content="application/xhtml+xml; charset=utf-8" />
<meta name="viewport" content="width = device-width" />
<meta name="apple-mobile-web-app-capable" content="yes" />
<meta name="apple-mobile-web-app-status-bar-style" content="black" />
[add links to mobile CSS stylesheets here as well]
</head>
```

Design Strategies

When it comes to the content of a mobile website, one must naturally approach it differently from the design of a regular website. Not everything will lend itself to inclusion on the mobile site and the content will need to be deliberately reworked to function in the context of the mobile interface.

- You need to “chunk” out content differently.
- Keeping in mind that text will actually need to be enlarged to be readily viewable on a small screen, the amount of text, the size of images, and the number of navigation links on any given page need to be limited. For instance, it is not likely that more than 10 navigation links will be able to fit onto the screen and all be visible. Users are not likely to read a lot of verbiage on the small screen, so the designer must aim for very concise, clear language and options. This is actually a good exercise for the designer to apply to a regular website as well, looking for opportunities for brevity and clarity of language. The ability to use gestures and swipe motions to scroll the screen display on many smartphones is making it easier for users to deal with longer web pages, but minimizing the need to scroll is still a design objective.
- Reduce number of clicks where possible.
- Users want to find their way to the content or function they are seeking with a minimum number of steps, which is true of regular website navigation as well. This goal can be in conflict with the previous one and the designer will need to find a good balance between smaller, manageable chunks of content and efficient site navigation.
- Examine all existing web pages for potential conversion to a mobile-compatible format.
- While some library services and resources are obvious candidates for inclusion in a mobile-friendly website, it is a useful exercise to look at each and every page on the library’s main website to think critically about whether the information it conveys or the service it provides could be adapted. As mentioned above, it is helpful to get some input from library users regarding which services and functions they would be likely to use via their mobile devices.
- Explore the possibility of implementing a fully functional mobile interface to the library’s online catalog.

- The vendors of integrated library systems are not ignorant of the emergence of mobile devices as a primary means of access to web content, yet few of them have implemented mobile-friendly user interfaces at this point in time. However, at the author's library it was possible to move from an early, stripped-down Z39.50 search interface to a fully-featured mobile catalog interface by building on the work done by Tom Pasley at the Universal College of Learning, New Zealand that is freely shared with other libraries who use the Ex Libris Voyager system. Library web designers should investigate whether similar efforts have been undertaken for their integrated library systems.
- Look for non-Flash based chat widgets.
- Many libraries have been offering chat-based reference services for some years now, usually offered to users via a chat widget that is embedded in web pages on the library's website. Most of those widgets use Adobe's Flash technology to implement the interactivity of chat sessions between the librarian and the user. Because Flash is not supported on some mobile devices, most notably the iPhone, if the library wishes to make chat reference available to users on their mobile devices, the designer should look for widgets that use JavaScript or other non-Flash technologies so that they will be operational on most devices.
- Some content management systems offer a site-wide mobile interface option.
- The use of a content management system can make the creation of a website much simpler and enables multiple people to have authoring capabilities with straightforward editing tools. Some of the most widely used open-source content management systems have optional modules or themes that are designed to render the content of all pages on the website for mobile devices. The extent to which this will succeed is limited by some of the design considerations outlined above, such as the amount of text, size of images, and number of navigation links on a given page. However, with the proliferation of Internet access via mobile devices, it is worth investigating the implementation of such mobile-friendly tools if they are available.
- If possible, automatically redirect users of mobile browsers to the library's mobile site.
- Many mobile websites will have their own web address, something like <http://mobile.some.library.edu> or <http://some.library.edu/mobile>; however, it is highly desirable to not force the user to type in such a URL on their mobile device. Fortunately, there are several freely available resources that will detect that an incoming connection is from a mobile browser and will automatically redirect the session to whatever address the library is using for their mobile site. The author has used a PHP utility developed by Andy Moore at <http://detectmobilebrowsers.mobi> to automatically redirect mobile sessions over the past several years. When users navigate to the main library website address at <http://library.csumb.edu> they have been redirected to the mobile site at <http://library2.csumb.edu/m>. Unfortunately, the author's campus recently moved to a new web infrastructure that filters all user sessions through a proxy system to manage the load, therefore information on the type of browser is no longer passed through to the library's home page and it is no longer possible to automatically redirect users based on the browser they are using. In all cases, it

is also good practice to provide a link back to the library's full website, at least on the mobile site home page.

What About Mobile Apps For Libraries?

The introduction of the Apple iPhone and iPod Touch, with their associated iTunes App Store, ushered in an era of rapid development of mobile applications, or apps, that can be used in place of a mobile web browser to implement a wide range of services, including access to library resources. The question naturally arises, then, whether libraries should choose to develop mobile apps rather than designing mobile-aware websites. Apps have the advantage of working closely with the operating system and interface capabilities of the mobile device for which they are designed, therefore it may be possible to add functionality to a mobile app that is beyond what is possible with a mobile website. However, a mobile library app requires marketing to increase awareness of its availability among library users and then requires them to locate, download and install the app on their mobile device. While those are not serious barriers, and while marketing may also be important to raise awareness of a library's mobile website, creating a fully functional mobile app is also a much more complex process than adapting a website to be mobile-aware, and the app will need to be kept up-to-date as new versions of the mobile operating system appear. Furthermore, since library users are likely to have smartphones from various vendors with different operating systems, a library would need to develop and maintain separate apps for the iOS, Android, BlackBerry, and Symbian operating systems, depending on the platforms that are common among the local library user population. Due to these considerations, the author's institution chose to focus on a mobile-aware website as the primary means of delivering library services to users via their mobile devices, however other libraries have chosen to focus on mobile apps, some of which incorporate impressive features.

Trends for the future

As mentioned above, mobile technologies are evolving at a rapid pace and their increasing adoption by a significant portion of the world's population means that libraries need to be developing strategies for delivering resources and services for this medium. 2010 might well be considered the year in which tablet computing devices finally emerged as mainstream options. Both Apple's iOS and Google's Android operating systems have been implemented to great effect on tablet devices whose screens are large enough and sharp enough to display the full version of most websites, negating the need to develop mobile versions for those devices. However, the number of tablets sold to date is dwarfed by the number of smartphones that are in use, so the need to support smaller displays will remain for the foreseeable future.

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