

# **Access to library resources in multiple devices through Responsive Web Design: Single Design for multiple devices - A case with UNISWA Library website**

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## **Abstract**

Mobile communication technology has greatly enhanced the academic and learning environments in the institutions of higher learning. The internet explosion, proliferation of online resources and the advent of free and open access resources provided the much needed impetus for libraries to inject new energy into providing quality service delivery of its services. The continuous advancements in the mobile communication paradigm, the shifting focus of users towards accepting mobile internet as the primary source of access to information has once again shifted the attention of libraries to provide mobile-related services to their users. More and more applications and databases are being provided to the libraries as mobile products. This paper focuses on the overall impact of mobile-related services and applications in libraries and looks specifically on the mobile library websites. Library websites are considered to be the face of any library. Most of the library services are offered through the library websites. For any Library which wants to provide a better interface for their mobile users are forced to rethink about their websites to see whether it is compatible with the multitude of mobile gadgets. This paper looks at the best practices in creating such mobile library websites. The important ingredient of this paper is the overall experience of creating such a website for a university library, from the inception of the concept to the end. The paper begins with the planning of such a website and the techniques adopted in successfully implementing such a website along with best practice guidelines on creating a mobile ready website.

## **Keywords**

Library websites, smartphones, mobile devices, Wi-Fi, access, mobile websites, mobile applications

## **1. Introduction**

The unprecedented growth and development in the field of Information and Communication Technologies (ICT), the convergence of major technology fields especially having internet as the focal point has brought enormous change in all walks of life around the globe. Mobile communication paradigm seems to be the driving force behind the ICT advancements. This major paradigm shift is mainly because of the desire for people to use mobile communication gadgets as the primary medium to access internet. Desktop computers are rapidly replaced by mobile communication devices such as tablets, phablets, smartphones and wearable technologies. The advent of 3G and the subsequent shift to 4G connections along with Wi-Fi

hotspots and community Wi-Fi has triggered a massive change in the access mode of internet services and products. Yoo-Seong Song (2011, 574) observes that the users have “widely adopted mobile devices, such as smart phones, tablet PCs, and e-readers as their primary tools to access information”. This swiftly changing environment has made people “more dependent on wireless communication systems” (Olatokun, 2006). The growth of mobile telecommunication system, especially the ever expanding growth in Africa and Asia in the use of cellular telephony, has triggered a number of innovations both in the technology and service delivery of mobile communication technology.

This has greatly enhanced the academic landscape where academic institutions have harnessed the power and innovations of these technologies to provide better services to their users. Libraries which act as the central point of the academic community especially in facilitating access to quality information resources have adapted these changing technologies in their service delivery. With the cosmic change of mobile revolution around the globe, there is no surprise that the libraries stand in the forefront in providing information to their users using the new mode of mobile technology.

## **2. Mobile Technology and Academic Institutions**

As the mobile communication system evolved there is no doubt that the academic institutions also showed enormous growth using those systems. While Olatokun (2006) observes that “Mobile phones have become an inseparable part of everyday life” which includes the whole of humanity, Shannon, Smith et al. in their study of undergraduate students and information Technology (EDUCAUSE, 2009) provide particular insight into the mindset of undergraduate students and their habit of mobile usage. According to their study, close to 77% of undergraduate students have used smartphones for accessing information especially while using the phones for other communication purposes. The mobile device ownership statistics of Yoo-Seong Song and Lee’s (2012) is particularly fascinating as they point out close to 82% students owned smartphones and use them to access information. The word smartphones have started emerging as the major component of each of these studies. The advent of smartphones in the last decade has revolutionized the mobile internet concept which is designed to allow users to browse the web with much ease irrespective of the website designs.

## **3. Mobile Communication System and Libraries**

As more and more library related applications are trickling to emerge to satisfy library users it is imperative to analyse the connection between Libraries and Mobile Communication system. Firstly, it is important to acknowledge that all the other service oriented facilities have started embracing mobile technology as one of their main bandwagon to extend their service delivery the libraries are left with very little choice other than to accept this as the future. With a number of e-commerce and entertainment activities make use of this mobile revolution; it is imperative that libraries also turn towards mobile services as one of their main avenues of providing quality information service delivery. It is equally important to notice that the libraries are still trying to understand the extent of their service delivery in this new realm compared to that of the profit oriented e-commerce and entertainment sectors. Walsh, (2009) observes that, in this dynamic situation, libraries are slowly but strongly beginning to make inroads into the world of mobile learning especially information dissemination through mobile phones Most of the initiatives are aimed at starting the basic services for mobile users and unfortunately in the mobile app market place the libraries have

not started making any significant inroads. LaCounte (2012) observes that during the advent of microprocessors and internet technologies, libraries had the upper hand and provided state of art services to their clients as the services were straight forward, but in the case of mobile applications, libraries are still lagging behind. He points out of the hundreds of thousands of mobile applications available for phones; the number of apps that librarians have built for libraries can be counted on one hand!

But leaving the mobile applications aside, there were certainly initiatives to have mobile related services in libraries. Griffey (2010) observes that “libraries over the past five years, focused heavily on providing digital services, especially reference services, via mobile channels”. Most of these services focused on providing reference queries using mobile technology. This concept is slowly changing with the advent of smartphones. Smartphones have redefined the mobile communication landscape and have reinvented the mobile computing phenomenon. The convergence of three important components, web-enabled smartphones, mobile applications and cloud computing are rapidly revolutionizing the attitude of people towards how they interact, access and disseminate information. It is predicted that the coming years will be an explosion of fully featured smartphones. This is good news for libraries as the developments will allow the libraries to realign their services to match the rest of other service providers in the mobile communication world. For all these to take place the starting point is to begin with mobile library websites as they are the face of the libraries in the desktop computing world.

#### **4. Literature Review**

The literature review of mobile related applications and initiatives for libraries draws on a wealth of literature. There is an increasing interest amongst academic institutions in the use of mobile devices especially in institutions of higher learning. Wisniewski (2011) from the University of Pittsburgh predicted that “by 2014 mobile internet usage will surpass desktop web usage” which seems to be true. In his paper he observes the proliferation of mobile devices and concludes by saying “the future is mobile and the future is now”. In general the important factors in deciding on mobile library applications for any specific library will depend on the library environment, the budget, the objectives of the library and the desired competency and skills of library professions to handle the technology. Canuel and Crichton (2010) in their impact factor analysis of mobile web show that Canadian Association of Research Libraries (CARL) boasts a 34% penetration rate amongst their users. Cummings, Merrill and Borrelli’s (2010) study indicates close to 55% of the users use mobile based internet services and close to 45.2% of respondents indicated that their desired search medium is mobile catalogues.

Since library websites are considered to be the face of many libraries, the obvious choice for any library to initiate its mobile presence is through its library website. Laurie Bridges et al. (2010, 310) confess that if there is a question asked whether the library should develop a fully mobile website, the answer is an unequivocal yes. They base their decision on the ECAR (Educause Center for Applied Research, (2009) study, which alludes to the fact that traditional college- going students use web-enabled mobile devices regularly which strongly advocates for building mobile catalogues. Yun-hong Lv’s (2012) investigation on China’s mobile library development and the analysis of global mobile library development presents a rather interesting mobile library service process which advocates for mobile synthesized library process. He provides a domestic mobile library model as opposed to a global approach. His argument is mainly for incorporating video streaming, personalized service, video reference advisory to name a few. Griffey, (2010) notes that the mobile browsing,

especially for library websites has become better mainly because of technology. With a little bit of tweaking of the existing library website coding or by using a conditional mobile CSS with a simple “command of max-device-width” an effective mobile based website can be created for libraries. This seems to have influenced lot of library website developers to combine their desktop as well as their mobile websites using a single web design with conditional style sheets. The newer generation of designers is influenced by the Responsive Web Design techniques which provide the single design for multitude of devices. Baturary et. al. (2013) gives a peep into responsive web design for instructional content in their paper “Responsive Web Design: a new type of design for web based instructional content”. The responsive web design aims to provide a “suite of techniques for building fluid, standards-based websites that adapt to user devices” Reidsma (2013). Responsive web design provides the developers with an option of using fluid grids and CSS media queries to change style according to different devices. With the advent of responsive web design it is possible to provide a single web design for multiple devices. Chad Marin (2013, 93) concludes by saying the development of different websites for different gadgets will be the concept of the past as newer technologies and techniques are aimed at strengthening the mobile website presence as the prime source.

## **5. Mobile Library Websites – Where to Start:**

As the library website is meant for library users the obvious place to start is to receive inputs from the users. Lilla Murray (2011, 235) in her experience recalls the questionnaire in which she asked her users to identify the various services which they thought will be useful to her library users. She concludes by saying it is imperative for “each library to learn which mobile web resources library patrons consider most useful”. For existing websites there will always be page statistics which can be effectively used to determine which pages are often visited by the users. Still this may not be the right approach as the existing statistics point to the desktop usage. Another way of getting to know the needs of the users is to find out through questionnaires about the services the users would like to have in their mobile website as a priority.

Another important aspect of planning for the mobile website is to determine the mobile using habits of the users. This is very important because it determines the design of the mobile website as the design should suit the nature of browsing by the users. This is a tricky situation as each user will have a different using habit, but an analysis of the majority of the habits will help in determining the browsing nature of the users. Mostly the habit of the users will vary depending on the mobile devices which are being used. A survey of the devices used by the users will also be useful while designing the mobile websites. While designing mobile websites, the density of smartphone usage amongst the users, the types of display screen will make a huge difference in designing websites. Along with this the demography of the user base, the internet access point of the users especially the more specific places from where they access the website will help determine the exact design of the website.

Once these data are at hand the designing becomes much simpler. Sometimes it might transpire that the need is not a mobile library website instead a separate application for the mobile users. This is an important decision for the library administrators because a separate application for the library will help the users in many areas especially with faster loading of information and easy searching of its catalogues. Developing separate application for the library will also enable the developers to include a number of mobile specific built in advantages and applications such as device orientation, GPS enabled location finding maps, QR and barcode scanning, making phone numbers clickable and making use of the inbuilt

camera or other utilities such as push notification services etc. But the downside is that with a number of mobile platforms the developers needs to develop applications for each platform and keep developing as and new platforms appear. Testing and releasing applications through app stores are cumbersome processes.

## 6. The Starting point: A case study with UNISWA Library

As indicated the best starting point for mobile website creation is the users. In this study in order to ascertain the need of the library, three specific user studies were conducted. From the page visits of the desktop website a statistics was randomly drawn on the pages most visited and the least visited pages were marked. A questionnaire was circulated on a random sampling method to get the user feedback. Separate one to one interviews were conducted with a number of faculty members who are actively involved in library activities. The questionnaire had a total of 12 different questions, but for this paper 5 questions pertaining to the mobile library website are taken into discussion.

### 6.1 Survey Population

A questionnaire in Google Drive was created and circulated through the library Facebook page and by email. A total of 221 respondents replied to the questions sent to them. The breakdown of the survey population is as below:

Category	No of response	Percentage
Teaching Faculty	<b>22</b>	<b>10%</b>
Non-Teaching Staff	<b>4</b>	2%
Students	<b>195</b>	88%
	221	100%

### 6.2 Types of mobile phone ownership:

Mobile phone types are important to develop a good website because this will form the basis for the design and development of the library website for the mobile phones. A specific question was asked on the type of mobile phone used.

Type of Mobile phones	No of response	Percentage
iPhones	<b>19</b>	<b>(7%)</b>
Android Phone	<b>148</b>	<b>(65%)</b>
Windows mobile phones	<b>20</b>	<b>(9%)</b>
Other Smart phones	<b>31</b>	<b>(14%)</b>
Phone without internet	<b>11</b>	<b>(5%)</b>
	221	100%

This is a revelation for the administration as close to 95% of the users use mobile enabled smart phones and the android phones have topped with 65% followed by apple iPhones and

other internet enabled phones. This has given us confidence that the library should be moving towards creating a library website for the mobile users. This has also given an idea for the future when we want to develop apps for the libraries, our target operating system and the users.

While we had all these background information, we also wanted to check the pattern of using internet by our users in order to plan for information literacy provision and marketing of the mobile library services. First we wanted see how frequently the users access internet through their mobile phones. A specific question related to this was asked:

### 6.3 Frequency of Internet Access through mobile phones

Frequency of Access	No of response	Percentage
Rarely	31	14%
Frequently	<b>183</b>	83%
Never	7	<b>3%</b>
	221	100%

The response was very positive as 97% of our users were using internet through their mobile phones and among them 83% were using it frequently which told us that our concentration on the marketing should only be on advertising the service rather than providing information literacy support.

Apart from the frequency of access, our worry was on the connectivity of the users as we were also conscious of how they get connected to the internet as this will directly impact on our design process. This is mainly to determine the amount of graphics to use, the amount of data to provide and so on. If the users are using their data packs to access internet the best possible idea is to minimize the graphics and balance the content. A question on how the users access internet was asked:

### 6.4 Internet Access of Mobile Phones:

Access Type	No of response	Percentage
2G/3G data packs	<b>106</b>	<b>48%</b>
Campus Wi-Fi	<b>71</b>	<b>32%</b>
Wi-Fi hotspots	<b>44</b>	20%
	221	100%

Once again we were surprised to find that close to 48% of the users use their own paid data packs followed by 32% using our campus Wi-Fi and the rest using commercial hotspots. This made us to decide that content should not be filled with graphic on should be light for downloading as it might impact on their finance. Also a question on how they would like to see the library website was posed to them as this will make the design process easier:

### 6.5 Mobile website Preference:

Content Preference	No of response	Percentage
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Balanced	<b>160</b>	72%
More text and links	<b>33</b>	15%
More Graphics and texts	<b>28</b>	13%
	221	100%

Close to 72 % of the respondents replied that they would like to have a balanced content which we thought is a fair call as it clearly reflected our thinking as well. Once we had all these details a more specific question was asked about which links they would like to have prominently in the website.

### 6.6 Links preferred in the mobile library website:

Preferred Links	No of response	Percentage
OPAC (Book search facility)	<b>188 (221)</b>	<b>85%</b>
E-Resource database link	<b>150 (221)</b>	<b>68%</b>
Instructions on how to access databases	<b>84 (221)</b>	<b>38%</b>
Library tours	<b>57 (221)</b>	<b>26%</b>
Library rules	<b>46 (221)</b>	<b>21%</b>

Most of the users preferred to have the OPAC as their main preferred link in the mobile library website, closely followed by the Electronic Resource database link and circulation related information as the next preferred link. Keeping these preferences the design phase of the library website was handed over to the technical team for further action.

## 7. Responsive Web Design:

Keeping the above results in mind the design team of the library website started working on developing a new website for the library. The important question asked at that time is whether to develop a desktop version of website for the desktop users and to have a stripped down version of website for the mobile users. Keeping the usage of smartphones in mind and the overwhelming statistics of close to 95% users using smartphones a decision was taken to create a website which will suit both the desktop users as well as the mobile phone users. After a careful study of all the available choices, and considering the amount of work involved in maintaining two websites if desktop and mobile websites are maintained parallel, a conscious decision of developing the website using responsive web design technology was adopted. Responsive Web design aims to provide a single solution which could cater to all the users who use different gadgets including the majority of desktop users.

Responsive web design which was first introduced by Ethan Marcotte in 2010 provides flexible solutions to some of the problems highlighted by the traditional web design and allow the users to have a single design for multiple devices. The basics of Responsive web design rests with the fluidity in the design phase. There are a number of responsive elements one can insert in the design phase. For example Responsive web elements and media can be inserted using image resize commands with percent width. Also it is possible to have

responsive layout using min-width and max-width properties or by controlling the layout with relative padding. The main advantage of Responsive Web design is to have one design for many devices with the possibility of automatically zooming and easy navigation. The basics of Responsive Web Design are in the design phase where a careful wireframe diagram of each and every step of the website is pre-designed so that it serves the purpose of all users.

### 7.1 Responsive web design – UNISWA Libraries

The design team of the University of Swaziland Libraries embarked on the mission to create a Responsive Web design for the Library website and the result is given below.



Fig.1 Display of Library website in Desktop, iPad and mobile phone

Keeping the survey in mind the graphics for the library website was kept on the minimum. The menus were designed using responsive image resize method using the relative width statements in the cascading style sheet. The number of buttons in the menu was decided on the user survey where the most wanted links were retained. The least wanted items like, Library Tour, Notice Board and Regulations were kept as options in the homepage.

### 7.2 Challenges:

The first and foremost challenge we faced came from the desktop computers. The computers which ran below Internet Explorer 7.0 had lot of problem in translating the media queries adopted by the Responsive Web. A conditional CSS had to be written to eliminate these problems. A separate CSS was formed for browsers with explorer 7.0 and below. For a library website with a number of external links especially with a number of electronic databases it is always a big challenge to provide them within the library website. The first problem was with the library online public access catalogue which uses an external server to generate an html on the fly using a cgi script. In order to capture this in the library website an object field had to be crated with the webpage targeted to display in the parent window. This provided a big problem for browsers which were not supporting object fields. In the case of external databases the design team decided to open them in separate windows which solved the problem.

As the website was basically meant to be used by all the devices more care was taken to accommodate all the different types of browsers used in the entire network including the mobile, tablet and other display devices. To validate the website an exhaustive website testing and validating was conducted.

## 8. Mobile Library Websites – Testing and Validating:

For conventional web sites, designing and coding a site that will work in all browsers is much simpler as most of the html editors provide an easy preview option which covers most of the browsers. But incorporating the same design for mobile sites it is a tedious process as there are thousands of devices and hundreds of browsers available for anyone to test. This is especially tedious when a single design is used for desktop as well as for the mobile and tablet devices. W3C which works towards establishing standards and best practices has provided Web Best Practices 1.0 (MWBP) working group which has a suite of software package called mobileOk Checker (<http://www.w3.org/TR/mobileOK/#check>). This provides the facility to automatically check mobile conformance of a website. This package is in Java and it is an open source available under W3C License. The mobileOK software is designed to improve the web experience for users using mobile devices by rewarding content providers that adhere to good practice when delivering content to them. It is a challenge for checking a site which is basically meant for desktop as well as for mobile devices as the result will be one sided depending on the device one tests. Kim Griggs (2011) and others feel that validating and testing are continuous processes whereby it is tested as and when new codes are added. With sites such as libraries which often need continuous updating it is imperative that they are tested periodically. Since there are provisions to test the development in the desktop itself it is easy to test the mobile websites in the local development stage. Once they are tested locally they can be either loaded into simulators such as opera mini or iPhone safari or iPhone SDK which can be downloaded and tested.

## 9. Conclusion:

With all the advancements in ICT and in the Satellite communication system there is no doubt that the future of Information dissemination and information service delivery will use mobile technology in all forms. The underlying principle of the next generation of library services is to link – people, technology and information together; to link them using the choice and mode of communication which is relevant to the users and which the users are comfortable with. Mobile websites will be the initial mobile presence any library will be looking to start with. There is no doubt that such a mobile venture should start with the understanding of the user's behavior and needs and at the same time the available tools and technologies which the library possesses. The word of caution though is not to recreate the entire spectrum and services of the desktop based website but to start small and elegant and add the complexities as the users become familiar with the mobile sites.

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## Biography

**John Paul Anbu**, is currently the head of Periodicals at the University of Swaziland Libraries, Swaziland. His contributions include an open source circulation control module for UNESCO's CDS-ISIS, an information system on "Tea Disease Management" for United Planters Association of Southern India and a number of automation and digitizing projects in India and Swaziland. He has also contributed close to 45 research articles in various journals and books and co-edited 3 volumes of books. He is instrumental in piloting the SMS based content alert system for the University of Swaziland through the Emerald Publishers. He is a

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