

Mobile Technology Based Library Services: Issues In Implementing

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Abstract - Mobile devices, initially which were devised with an intention to replace telephones using wireless technology, become a very important part of daily communication not only for telephone service users but also for the internet users in the present society. In order to fulfill the user needs, many libraries around the world are now adopting mobile technology to augment the library services. As there are many tools and platforms for application development and further there are many services that can be offered using mobile phones. So various libraries provide number of services using different platforms based on user needs and requirements.

Key words: Smart Phone, Library Services, M-Technology, M-Learning, Mobile Technology,

I. INTRODUCTION

With the rapid advancement in technology in last two decades, mainly because of the advent of internet, the world no longer works the same. The advent of wireless networks and more recently mobile devices such as smart phones, tablets etc following the internet, contributed a lot to make mobile technology come into existence. Recent studies conducted at different places reveal that the volume of usage of internet using mobile devices is increasing at a very rapid pace. Main reasons behind success of mobile technology is the benefits such as mobility and ubiquity served by mobile devices. The current innovation is clearly anticipated that would enhance fairly more in future. These are the reasons why versatile innovation is viewed as eventual fate of correspondence by many. Cell phones require a underlying support from Operating System and furthermore require equipment and programming backing to impart appropriately. The gadgets convey crosswise over different platforms utilizing a communication channel so they additionally require a characterized set of protocols and network support so as to communicate and as mentioned earlier they need internet connection to communicate.

The explanation for accomplishment of mobile technology is the benefits such as mobility and ubiquity served by mobile devices. Mobile devices today have the capability to play rich multimedia content, take into consideration propelled client intelligence, run progressively complex programming and cooperate with cloud administrations. New equipment and innovations, for example, Bluetooth, accelerometers, and multi-touch screens, as well as text messaging, smart phone software applications, mobile websites, global positioning systems (GPS), Wi-Fi, and media creation and capture tools, are all part of the portable

mobile environment. Mobile technology is seeing an undeniably extensive variety of uses in our daily lives. (Xu, J., et. Al 2015). stated that approximately one third of the libraries use WeChat as a marketing tool to promote collections and services for users in china. The existing technology is obviously expected to improve rather more in future. The use of mobile technology in any field is highly beneficial and is the reasons why it is seen as fate of communication by many.

Mobile devices need an underlying support from Operating System to efficiently manage and manipulate the hardware resources available to the device and also need software support to carry on operations smoothly without any glitches. Two of such handheld mobile devices may run on different platforms with a few differences in architectural and organizational design. These devices also need to communicate with each other if they are part of same organizational system or often they need to communicate across devices of other organization as well. Such communicating devices may have different underlying platform. For this very purpose we need network support so as to communicate across devices not only of similar platform but also of different platforms. The communication is carried out using a communication channel so they also need a defined set of protocols in order to carry out communication in a standardized form. And as mentioned earlier they also need a working internet connection to carry out communication. Extent of success of mobile technology is mostly dependent on mobile devices and network support. Hence we can come to a conclusion that the design of mobile devices and networking has a large impact on implementation of mobile technology.

Defining Characteristics

The reason that mobile technology is considered as fate of innovation is a direct result of the properties it possesses such as mobility/portability, ubiquity, resource sharing and utilization etc. In this section, we discuss about various such properties of mobile library that makes it different from traditional libraries. Let us have a look at few of its following properties:

1. Availability/Ubiquity

Almost all the traditional libraries around the world have a specified operation time during which they are available to users and are also location specific. Unlike traditional libraries these mobile libraries can be accessed from anywhere and at anytime. This is the sole motivation that would draw users towards it. This essential factor is of exceptionally significant in today's world because the majority of the works today are being completed in circulated form and it would be very valuable to have the capacity to get to assets from remote places too. It additionally ensures accommodation to clients in getting to the substance wherever and whenever they want. Being able to access contents from remote places will eventually open doors of possibilities of educating people of far off remote places, where it was considered to be very tedious task earlier. Subsequently simple and helpful worldwide access to assets is the primary defining characteristic of mobile library.

2. Resource Utilization and Sharing

In traditional libraries once a resource is issued to user of the library other users cannot access the same resource until the user returns it or the library has another copy of it. With this approach there is always a chance of resource exhaustion and a user may not get the resource he seeks for. With mobile library, however, we would not face any such problem as it would rather give users access to digital copies of resources while being available to distribute digital copies of it to other users who seek for it as well. This will guarantee a user that he/she may definitely be able to get access of any resource available in the library and also need not go through hectic formalities of issuing and returning of a book as specified in traditional libraries. This sharing of resources is of high importance especially in case of academic resources because a traditional library has to keep several copies of same documents for being able to provide resources to all of the users while a mobile library will simply enable access to its digital contents for all the users who have a access to it. Mobile libraries, however, can always set limit to the number of users that can access same resource at a time.

3. Cost Efficient

Present people of the world has become more and more conscious on economy and any organisation wants to maximize its profit while minimizing its expenditure.

Mobile library would prove to be cost efficient to both administrators such as library administrators and users. A traditional library requires a huge physical infrastructure (Building) to keep all of the resources in one place. Then it needs a lot of library space and human resource as well. As the traditional libraries provide physical copies of resources there is always a risk of damage to its resources which demands for its replacement as and when required. While a mobile library needs a small building to protect all its hardwares from external risks and once it is installed, the administrators only need human resource for its maintenance. The very low expenditure on library resources however is the main advantage that will motivate administrators to make a transit to mobile library. The users however have less prospect of economic benefit but will definitely be benefited to some extent.

4. Popularity of Mobile Technology among youths.

It is another very important aspect to look out for. Majority of the user population belongs to youth and mobile technology is something that they are extremely acquainted with and is exceptionally well known among them. Mobile devices have now turned into a vital piece of life for a large portion of the young people and they are likewise great at utilizing it and do possess capacity to find and adapt up to changes as and when required. This helps to sort out issue of socio-technological implementation to a great extent. It is also something that is expected to grow more and will eventually become an inseparable part of living. In this way, it can be productive to change to the utilization of portable innovation to the extent libraries are concerned. Since it is very much in trend so traditional libraries might feel boring to some users and if library administrators do not realise this fact as soon as possible users may lose interest in library.

5. Mobility/Portability issues for users

Library users need not carry the books along with them wherever they go. They just need to have access to the library system and then can access the contents without needing to be physically near the library system. It not only provides physical portability but also various operational mobilities.

6. Miscellaneous

It would also prove to be environment friendly as it would reduce the paper usage by a very huge margin all over the world as most of the works would then be digitized. It can also ease the task of building unnecessary library buildings which would specially turn out to be beneficial in rural areas because all we need then would be internet connectivity.

Digital Technology has given quicker access to data and it is additionally testing the libraries to reevaluate and redesign their administrations by embracing the technological changes. Today mobile phones are turning into an indispensable piece of regular day to day existence

and are changing the way one interfaces and associates with the world. In this evolving situation, Mobile Technology will be of incredible help to libraries towards reinforcing their relationship and giving improved client arranged administrations to existing clients. The innovation move from traditional desktop computing to mobile computing affects many areas including digital libraries. This brings up the issue how libraries will advance in face of this portable innovation insurgency. Thus our goal is to identify what the technology evolution to mobile technology is i.e. the way its execution is unique in relation to the customary approach, its characterizing attributes and how libraries have adjusted mobile technology i.e. how effective are libraries at utilizing this innovation.

II. LITERATURE REVIEW

Mobile computing is a term coined after use of mobile devices for computing purposes using mobile technology. The introduction of mobile computing has transformed the way of interaction with information. Within a few years of its introduction smart-phones have gained immense popularity resulting in skyrocketing in its ownership and thus the use of e-readers has been steadily on the rise. With these propelled portable devices we can get to data quickly, crosswise over limits of subject, teach and industry, nearly from anyplace and at whenever.

Background

Libraries can better serve their users by embracing the growing capabilities of mobile technology. They can promote and expand their existing services by offering mobile access to their websites and online public access catalogs; by supplying on-the-go mobile reference services; and by providing mobile access to e-books, journals, video, audio books, and multimedia content. Infact, libraries today are in the process to upgrade themselves to fulfill increased demand for electronic collections.

Ayoob Nazi, Sakineh Ghamsepour and Leyla Asgari (2014), conducted a descriptive survey by collecting required data from 150 randomly selected samples using a questionnaire developed by researcher (Nazi, A., Ghasempour, S., & Asgari, L. (2014)). The results showed that 68 percent of respondents supported the use of mobile phone in the library. Mobile of 89 percent respondents had support multimedia and internet browsing facilities and 54% said they would upgrade their mobile phones in future. Further the library services suggested were SMS based services, Website based services, Client/Server based services for all popular mobile platforms and operating systems, mobile hardware based services, and Voice call based services.

Open University of Malaysia (OUM), the pioneer in open and distance learning in Malaysia initiated and introduced OUM Mobile Library to support its learners in their acquiring knowledge and learning process (Ibrahim, S. E.

(2012). In August 2011 OUM Mobile Library was introduced and initiated to support its learners in their acquiring knowledge and learning process. Since there are different devices with different capabilities, OUM Mobile Library makes use of Wireless Uniform Resource File (WURFL) API, Drupal Mobile Tools Module and conditional CSS to cater each device with different capabilities. More powerful device will have extended display such as better button and dialog boxes and the less powerful devices will have lighter theme to reduce CPU load.

The traditional library services are now moving to mobile library information services. There are the challenges in providing the necessary information to users at the right time. Mobile technologies have made communication and information access very convenient and timely to users. The adoption of mobile technology alters the traditional relationships between libraries and their users and introduces novel challenges to reader privacy. There is the shift from 'd-learning' (distance learning) to 'e-learning' and now from 'e-learning' to 'm-learning' will be the next big wave, which will reform education in India. (Mohan Lal Vishwakarma, Shyam Lal Maurya, Shivani Govil, 2013)

Mobile technology holds great promise for enabling libraries to provide enhanced services in a form users increasingly are demanding. The explosion of advanced mobile technology and robust digital information collection capabilities should prompt libraries to examine carefully the ramifications for user privacy without imposing burdensome security measures or annoying interruptions. (Dheeraj Singh Negi, (2014))

(Sagar S. Kumbhar and Rohan R. Pawar, 2014) have discussed about mobile technology and focused on its application and challenges in library services. With help of mobile devices, libraries can produce new services and provide faster access to its collection. The implication of mobile library services has created opportunities as well as challenges for academic libraries.

Following are some of the worth noting surrounding factors that made smartphone experience better:

- Costs of smart phones coming down.
- Transition from 2G to 3G and 4G networks offering very high transfer speed.
- Wi-Fi becoming widespread and often free in locations, allowing a shift from phone calls only to widespread use of mobile media as well without incurring large costs.
- Mobile devices got equipped with advanced features like GPS and the also capability to install apps as per requirements from app store.
- Meanwhile advancement in processing capabilities, memory and storage capability, introduction of multi-core processing and multithreading etc opened opportunities for its application in new fields.

III. PLATFORM FOR DEVELOPING MOBILE LIBRARIES

Options for library development for mobile users are diverse. Initially it seemed there were 2 main options, websites and apps, for developing mobile applications. However it seems there are more options.

As of late Responsive Web Design has built up an awesome arrangement. Likewise in-program applications or web applications are another region that has become the dominant focal point. In this way we have portable sites, local applications, web applications and responsive website composition as various choices for creating library application.

Responsive sites are intended to take a shot at any stage as it is a custom CSS template that influences the site to look awesome on any gadget. It enables you to have a solitary site that consequently fits the screen size of the gadget on which it is being seen. This is achieved by adapting the content, design, navigation and method of interaction to deliver the same comfort and usability to the mobile user as to the desktop user. An absolutely responsively composed site is positively the vital way to deal with as and when finance and technical resources allow, the entire website displaying useably on any sized mobile device as well as desktops and laptops.

A mobile website is designed specifically for mobile devices considering about every one of the impediments and chances of the stage. While developing a mobile website the small screen size, interaction methods (touch) and limited connection speed (2G/3G/4G) are considered. . Content must be effortlessly available, fast-loading and readable. As there are different mobile devices with different screen sizes and interaction types, it is impossible to create a website per device type even a mobile website has to be a little responsive to fit every screen.

A native app is software programming particularly created for mobile devices that run physically on the mobile device and are coded specifically for the operating system of that device. They are usually designed for a very specific and narrow purpose like a game, for banking purpose etc. Clients need to download the application for the most part from a particular OS store, similar to Google Play or the Apple Store and introduce it on the cell phone.

A web application imparts attributes to both a local application and a responsive site. Like responsive site a web application is fabricated utilizing HTML, CSS and Javascript. However, where a responsive site is content orientated, a web application is task focused in much the same way as a native app. Web applications look and feel especially native apps – they even store data in browser's cache.

Responsive Website vs. Mobile Website

In case of responsive website one has a single website to maintain thus making maintenance easier. However in case of mobile website there will be two sites in this manner changes should be made on both. Similarly, users get a similar experience regardless of device being used if web design responsive. Responsive web designs are simple for SEO (Search Engine Optimization) as it influences less demanding for Google to index a single site. Further developing one site is cheaper than two which makes it cost effective. Mobile websites will give better client encounter as it is enhanced particularly for mobile devices. Similarly it will load fast and easy on mobile platforms.

Web App vs. Native App

Every mobile platform uses a different native programming language. While iOS uses Objective-C, Android uses Java, Windows Mobile uses C++ and so on. Web apps, on the other hand, use languages such as JavaScript, HTML 5, CSS3 or other Web application frameworks as per the developer's preferences. A native app is totally compatible with the device's hardware and native features, such as accelerometer, camera and so on. Web apps, on the other hand, can access only a limited amount of a device's native features. Native apps are more expensive to create. However, they are faster and more efficient, as they work in mobile device they are developed for. Also, they are assured of quality, as users can access them only via app stores online. Some native and Web apps look and work similarly, with very little difference between them. The decision between these two sorts of applications must be made by whether to build up a client driven application or an application-driven application.

Mobile Services for Libraries

Mobile Libraries are libraries that deliver information and learning materials on mobile devices such as cell phones, PDAs, palm top computers and smart phones to allow access by anyone from anywhere and at any time. Clients currently can utilize any administration gave by the library even while in driving instead of the regular libraries whereby students are restricted to physical structure or building. This outcomes in students having control of when they need to learn and utilize library's assets. Thus the mobile services can be as simple as sending a text message alerts about reservations of available books or as complex as accessing an eBooks and journal articles through their library subscriptions on any mobile devices. The libraries can provide following mobile services:

- ❖ News and Events
- ❖ Mobile Online Publics Access Catalog
- ❖ Journal finder
- ❖ Suggest a purchase
- ❖ Location of the library
- ❖ Audio Tours
- ❖ Image Services
- ❖ Research consultation and instruction

- ❖ The overdrive service / Mobile Library Databases
- ❖ Mobile library instruction and mobile learning.
- ❖ E-books and e-book readers.
- ❖ Short Message Service Notifications (SMS notification; SMS query; SMS Consultation)
- ❖ SMS reference
- ❖ Virtual reference.

IV. IMPLEMENTATION ISSUES

The implementation of mobile technology in libraries is a multi dimensional task, each posing various challenges in its implementation. In this segment we discuss about various such dimensions and issues it poses on its implementation.

The term socio-technological alludes to association amongst innovation and individuals at work environments. Whenever there is technology it involves a skilled and well trained actors to utilize it to yield a better efficiency in its use. Here the actors can be any of mobile library administrators or users. Innovation is something that can quickly change in a flicker of an eye, so it requests the performing artists that follow up on it to be open and prepared to learn new things and react rapidly to mechanical changes and upgradations as and when they happen, which is indeed an lifelong phenomena that is expected to occur when we talk about embedding technology to workstations. Mobile Technology is still considered to be in its early stages as of now so we can expect a lot of changes to occur in the existing technology and to cope up with the changes a lot of expertise and ability to respond to changes and upgradations will be required.

The utilization of mobile technology for library will introduce an entirely different environment for interaction between user and library services than the traditional libraries. In the traditional libraries all the contents and resources of library are on full display within the physical library building where, users can interact with librarians, browse the stack of books and journals, and use computers for an immersive information search and retrieval experience. This level of intelligence and connectedness has not yet been accomplished in the library experience through mobile technology due to various challenges posed by the practical considerations — such as connectivity, hardware, and mobile interface design.

The ability for users to interact with library services virtually or through mobile devices is however advancing inspite of all the challenges lying in its way, offering new opportunities for information search and retrieval. The library experience for users is expected to improve rather more in the future with the progression in technology. Continuous researches in the field of virtualization techniques and real-time embedded systems are expected to

yield some productive discoveries and inventions that can be embedded with the innovative mobile library.

The implementation of mobile technology for libraries demands the actors to be dynamic as it involves an entirely new library experience and rapid adaptation to the latest technology which may be completely different than the existing one. This might in turn demand a few changes in working ways of library administration & management and may also force its users to learn new things before they can make use of it, which may be inconvenient to a few. Subsequently, each of these parameters talked about above ought to be taken into genuine thought while setting up a mobile library.

The implementation of mobile library demands an extensive use of technology at different levels. Any compromises in the implementation of such technological aspects at any level might result in inefficient working of the library and will definitely affect library environment. The technological execution of mobile technology includes various aspects such as networking issues, hardware and software issues, system organisation and architecture issues, etc. It would be better to discuss them seperately. A concise understanding of the implementation of each of them is discussed below.

The first and foremost issue regarding technological implementation would be networking. The whole idea of mobile technology is relied on networks and the extent of success is largely dependent on effeciency of networks and its implementation. The effective execution of mobile library needs to ensure reliable network connectivity that can work 24x7x365 without any glitches and errors. Apart from this, the network should also be secured from external threats and protected from internal errors for that would guarantee an uninterrupted service. Any external threat to the library can result in the leakage of potential information to the wrong hands can be fatal. The result of any mishandling of library information or the any alteration in the original information would be a fatal setback to the library system. It can even lead to complete reconstruction of the mobile library. A client's private information, assuming any, will likewise be in a wide range of risk which will to a great extent impact the client encounter as well. Internal protection of the system holds equal importance for the successful implementation. At times there can be some issue regarding extent of access of one library resource by another library resource. Provisions regarding this should also be thoroughly determined to protect the system from any internal damages.

When we discuss working framework in this context we are talking about operating system at both the ends i.e, user and the library, as both are engaged with the conveying procedure of the portable library frameworks. An operating system by definition, is a program that manages system hardware and software resources and provides common

services for computer programs. It is also responsible to ensure interaction with different gadgets

Operating system at library end has a larger role to play in this context as the usability of the library system is entirely dependent on it. It handles all the resource access requests made by the users and grants, rejects or delays the access to the resources based on authenticity of the request, availability of the resource and other access parameters defined by the library administration. As specified earlier it will also manage all the hardware mechanism at the library end. The role of it is to ensure that all the authentic users get the same treatment by the library system. The Operating system can also have mechanisms for protection and security of the entire mobile library system. While operating system at client end has no effect on usefulness of the mobile library system by other users. The only object user needs is that the OS should allow user to connect to internet so that he/she can access the library contents wherever and whenever.

Each system is made out of various fittings and virtual products, which are a basic piece of any innovation. Hardwares are the physical components of a system and softwares are programs designed to specifically perform one or more tasks. Hardware implementation includes establishment of central system for the library, so only the administrators are alarmed with the issue. After setting up the system, more important part of its implementation is the routine upgradation of hardware components as the technology that is based on the hardware keeps changing demanding changes in hardware as well. Hardware replacement should not affect the working of other hardware components and if it does affect, then it may require some changes in other hardwares as well.

As technology changes quickly, any system requires to upgrade its softwares or programs very rapidly and swiftly to cope up with latest innovative technology out there in trend. As acknowledged from the pattern so far development of equipment is an ease back process when contrasted with evolution software. Therefore the library system administrators should always be prepared to embrace the new technology. Sometimes software changes may also lead demand in hardware changes however the vast majority of the circumstances programming changes are based around the current equipment, with the goal that we require not roll out equipment improvements each time we need to update the product.

In computer engineering, system architecture describes the functionality, organisation and implementation of the system. It includes major aspects system instrumentation such as Instruction Set Architecture (ISA) design, micro architecture design, logic design and implementation. The way in which system information flows, the instructions get executed and processes work is termed as organisation often known as micro architecture. Same design can be

utilized as a part of various association and same association can likewise be utilized over various structures. Both these elements are surrendered over to library overseers as it is an outline decision. The administrators can choose a system architecture and organisation well suited to their needs, capacity and reports based on other feasibility studies.

While talking about giving online access to the users situated outside, there always involves a risk of possible privacy breach for both, the users and the library system. For a user, a library system can keep track of details of contents that the user accessed by them, which sometimes a user may not be acceptable to the user. Such monitoring over content access or access time may indifference the user leading to negative impact on user understanding. The client can sometimes be forwarded to third party resources which may not be reliable and may also unconcern the user. As the communication process takes place in both directions, the library system is also exposed to equal threats and risks. A cruel user may try to infect the system, so the system should also be fully aware of the malicious activities carried out by the cruel user. As any user can access the electronic resources via online, there is always a concern regarding copyright, publication and distribution rights. Also, the contents of mobile library must not pose any kind of threat to the society and people. If there is any information of such potential, it should be handled carefully. For example, in most of research on terrorist activities, it was found that they use internet as a means to prepare and upgrade to new technology arms and gadgets. All these issues must be considered while designing the library system to make the system work flawlessly without any legal or privacy intervention for disseminating information of user needs. One of the method that can be adopted to resolve this issue can be use of QR codes as a means to verify registered user.

V. CONCLUSION

Mobile applications can support learning processes by making library resources more ubiquitous, by bringing new users to the library through increased accessibility to the resources libraries offer, and by creating a new way to enhance connections between users and libraries. This increased use of mobile phones provides an untapped resource for delivering library resources to users. Mobile Technology for libraries will impact existing libraries. It will greatly reduce the need of traditional libraries. Setting up a mobile library is easier than building infrastructures and hiring 24x7 working staff for a traditional library. Also because of its benefits most people would opt to choose using mobile libraries over traditional ones. The role and knowledge base of librarian for a mobile library would be very different than a traditional librarian. The librarian then would be required to be knowledgeable about the technology used for the mobile library. User Environment

would also be greatly influenced by the introduction of mobile libraries. It would be very convenient to the users not having to go all the way to library, go through the formalities of issuing a resource then finally returning it. With this there is always a possibility of misplacing the issued resource and losing it. A user will never face any of these issues while using mobile libraries. The user also need not be physically near the library to issue/return resources. All these factors would help to improve user experience as compared to the quality of services offered by traditional libraries. The user experience can be further improved by adding services like instant messaging for inquiry purpose.

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