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Application of Mobile Technologies to Libraries

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ABSTRACT

Libraries have always set an example in experimenting with new technology developments, whether it is automation or adopting other information and communication technologies to improve their services. This paper presents an outline of the application and use of developments in mobile telecommunication systems, web technologies (internet/intranet) and geographic systems like GPS/GPRS to provide ubiquitous, user-friendly, personalised and dynamic up to date information services to library users. This new technology will be of great help to libraries towards strengthening their relationship and providing enhanced user experience to existing users. Libraries may well reach out to the new/remote users who were considered unlikely to connect because of absence of a medium. This should be adopted in compliance with the information security policies and standards of the parent organisation.

Keywords: Library services, mobile devices, information services, instant messaging, SMS alerts e-learning, e-resources

1. INTRODUCTION

Both library and technology are growing organisms. Dynamic nature of technology has significant impact on every aspect of modern life. Particularly information and communication technologies (ICT) has provided faster access to information and it is also challenging the libraries to rethink and remodel their services adopting the technological changes. In the past few decades, libraries have adopted ICT and passed through developmental stages like automated house-keeping operations, providing faster access to its collection, and digitisation to provide multiple accesses at users desktop. In the modern world, libraries are not lone information providers, Web provides wide range of information although the content may not always be free and/or with value addition. To benchmark its place as an information provider, libraries must not hesitate to adopt all possible new technologies like ICT, Wi-fi, mobile communications, and Library 2.0 and 3.0 to redesign, and transform its services so as to deliver information and its services to the more demanding users whenever, wherever and however they prefer.

The focus of this paper is on hand-held mobile devices like PDAs and smart mobile phones, although the phrase 'mobile devices' is used in general. Use of mobile devices depends greatly on constantly changing mobile technology, device design, data transmission rate, battery life, cost, standardisation, etc.

2. APPLICATIONS OF MOBILE PHONES

The wireless technology and mobile phones are becoming an integral part of everyday life and are changing the way one connects and interacts with the world. Mobile phones have wide variety of applications. Already mobile devices have made significant impact on banking, tourism (Web GIS), and health services. An innovative application of mobile phones in agriculture is made where Indian farmers are using low-cost water pump activation system called 'Nano Ganesh' developed by Tata Teleservices. A cell phone application with modem allows farmers to remotely access their irrigation pumps and to check availability of power to their irrigation systems and turn on/off the pumps. Doctors are also using mobiles to access electronic medical record, view medical images, access drug information, and take notes. Latest is mobile real-time remote patient monitoring and an iPhone application, iStethoscope to monitor heart rates of patients on the go. Already mobile phones are no longer a luxury, but a necessity not only for simple voice or text communication, but also for accessing the internet. Such connectivity seems to be the wave of the future.

As per International Telecommunication Union[1] (ITU) ICT facts and figures, 2011, there are about 6 billion mobile-cellular subscribers. Mobile-broadband subscriptions have grown 45% annually over the last four years and today there are twice as many mobile-broadband as fixed broadband subscriptions (Fig.1).

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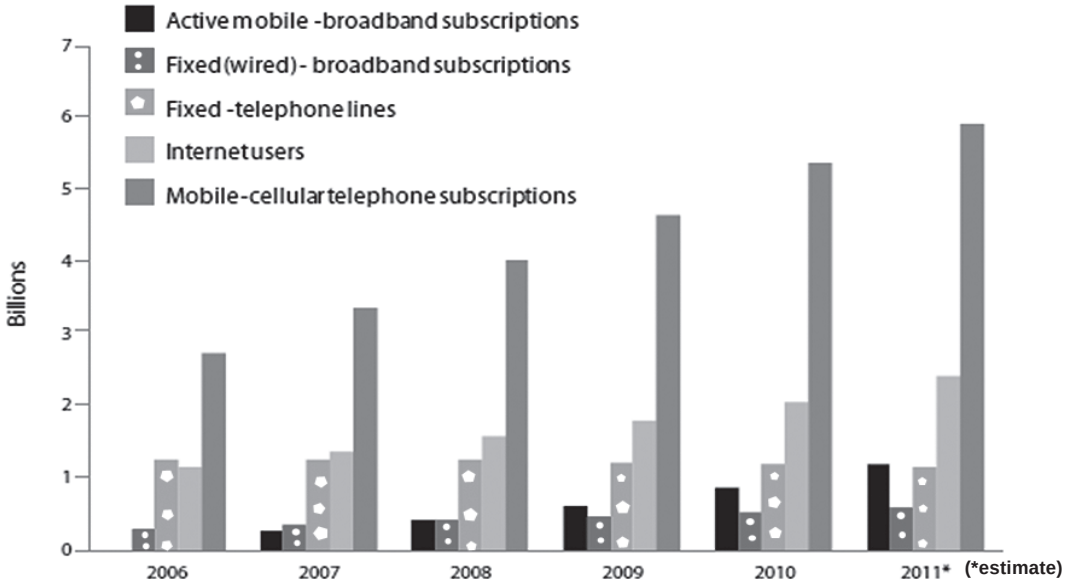

Figure 1. ITU world telecommunication/ICT indicators database[1].

- Total 159 economies worldwide have launched 3G services commercially and the number of active mobile-broadband subscriptions has increased to almost 1.2 billion.
- While people in developed countries usually use mobile-broadband networks in addition to a fixedbroadband connection, mobile-broadband is often the only access method available to people in developing countries.
- Percentage of the population covered by a 2G mobile-cellular network is twice as high as the population covered by a 3G network. 3G population coverage reached 45 % in 2011.

This passion for mobiles by common man has thrown ample opportunities for libraries to create mobile-friendly library and information services, which may lessen the risk of exclusion. The libraries need to switch over from 'physical places' to 'virtual places' to embrace and serve 'netgens' and 'digital natives'[2] who prefer their libraries to be where they are and prefer to access and share information from anywhere at anytime.

3. PRESENT SCENARIO OF MOBILE COMMUNICATION

There are wide range of mobile computing platforms in the market from smart phones to multimedia phones with different types, styles, models, and with many inbuilt features and capabilities like cameras, touch screens, bar code scanning, Wi-Fi, bluetooth, instant messaging, GIS/GPS, RFID, operating systems, varying additional storage space, etc. Revolutionary iPhones and smart phones (3G and 4G phones) can be used to run many software applications including internet access with faster connection speeds. Availability of automatic configuration of GPRS-enabled mobile phones, which help the subscribers to be online with few clicks.

Emerging technologies like speech technology in mobile phones has enabled disabled persons to use mobiles effectively. Dr Ponani Gopalakrishnan, VP, India Software Labs of IBM in an interview with magazine '*Digit*, Jan 2010' talks about the spoken web and they are working on technology that will translate the experience of the web to the mobile phone platform where people can speak and interact with web information through voice.

These smart phones are becoming increasingly ubiquitous to make the dream of 'pervasive library' a reality. The mobile phones with operating systems, capability to scan barcodes, text recognition may help libraries to interface with other applications to introduce users to online library transactions, database querying, relevant full-text information download and interactive sessions.

4. ADVANTAGES OF LIBRARY INFORMATION THROUGH MOBILE

4.1 User-friendly Aid

Familiarity with their own devices and technology helps the users in accessing information quickly and does not require orientation and training. Mobile users are using the facilities on mobile phones like SMS, instant messaging, web browsing, e-mail effortlessly to communicate. Most of the features are pre-installed on mobile devices or option for data plan packages.

4.2 Personalised Service

Personalised service helps users to interact with library staff to seek specific information or reference away from library.

4.3 Ability to Access Information

Information access from anywhere at anytime will be of great help for users who cannot visit library in person and provides a constant link to required information resources.

4.4 Time Saving

Users need not record information about resources while browsing and searching library resources or wait at library transaction counter to renew/reserve books and hence the time of the user is saved.

4.5 User Participation

Libraries can enrich OPAC by allowing users to incorporate user created content like notes or images uploaded by users.

4.6 Location Awareness

Mobile communication enables libraries to offer location-based services/content through global positioning system (GPS) capabilities. Libraries can guide the users to the location of specific document or service through maps and navigational tools.

4.7 Limitless Access

All online resources accessible on their desktop also become accessible through mobiles.

4.8 Access to Print-disabled Users

Mobiles communications help providing services orally to vision-disabled and physically-handicapped users.

5. LIBRARY & INFORMATION SERVICES ON SMALL SCREEN DEVICES

In view of the capabilities and developments in mobile technologies and their advantages enumerated above, libraries can design and provide the following specific services on mobile devices, compliance with the information security policies and standards of the parent organisation.

5.1 SMS/Texting (Alert Services)

Existing e-mail alert services like bringing new books to the notice of users for suggestion, intimation of arrival of indented documents by users, informing availability of reserved documents for collection, appraising about which/when books are overdue, library circulars, e-journals subscribed, change in timings, information about important events, etc., can be upgraded by sending through SMS/text-alert services[3] to meet the information needs of 'netgens'. Such alert notifications can be generated automatically using integrated library management system/software. SMS messages can be sent to group of users simultaneously through many free applications, and intermediary websites/clients.

5.2 Formal Education, Distance Learning and E-learning

Students are very versatile in using their mobile phones and various mobile applications. Academic libraries can harness the advantage to lead implementation of library services through mobile devices to support distance learning, formal education, and research activities in e-learning environment by making the information resources ubiquitous. Libraries should redesign their services keeping social networking sites in mind, which are heavily used by younger generation for interaction, communication, and information sharing. Library services should also blend with teaching and research practice of colleges/universities, scientific community or other patrons whom they serve.

5.3 Instant Messaging for Reference Services

The reference and referral services have already become virtual with ICT applications and internet. The mobile devices can further appreciate the service with instant answers like definitions, meanings and other information from digital libraries and web. If the organisation has its own secure and private enterprise IM network, libraries may as well make use of these as they are more reliable and secure; or else use web-based free instant messaging services from Google, America Online, Way2SMS, etc., as an intermediary to have interactive sessions with users to answer 'reference queries'. As these free messaging services can be withdrawn anytime by the providers, libraries' may subscribe to fee-based tools like Text a Librarian, LibraryH3lp, MyInfoquest, and Shoutbomb. These tools offer mobile customers all of the benefits of virtual reference services without being tied to a website. Librarians can provide instant answers, and links to articles/references in real time.

5.4 E-resources with Mobile Interfaces

Some publishers are already delivering e-books (both text and audio) that are accessible via mobile phones. Using free Plucker e-book viewer, one can access about 20,000 free e-books from Project Gutenberg. Mobipocket of Amazon is one of the stanadard e-book reader applications and the website has over 40,000 titles (about 11,000 free). A large collection of audio books both free-and subscription-based services are available for download and also transferable to mobile devices. LibroVox is a collection of free audio books from the public domain. OCLC's NetLibrary collection is providing e-book and audio book titles on library subscription. Libraries can make use of multimedia messaging service (MMS) on mobile devices to share photos, videos, and audio. Most of the e-book publishers provide 24x7 access to the library subscriptions from any internet terminal within the campus, as well on

mobile devices, such as iPads, Android devices, and Kindle. Just like any other library databases, users are prompted to log in using user-ID and password, when they are off-campus to access e-books on their mobile devices.

One can get todays' news on their mobiles either by accessing the web portals or SMS text messaging on their mobile phones. Newspapers like *Wall Street Journal*, *Washington Post* and *Chicago Tribune* offer news for small screen. In India, NewsHunt, a mobile application by Eterno Infotech Pvt. Ltd. is designed to read newspapers on GPRS-enabled mobile phones.

The greater challenge is to provide access to e-journals through mobile phones as the libraries and publishers prefer authentication limited to campus wide IP address. Libraries must convince the publishers to provide user id and password mode in addition to IP address based authentication to access e-journals on mobiles. Publishers like IEEE Xplore, Elsevier's Science Direct, PubMed, EBSCOhost, Encyclopaedia Britannica, American Institute of Physics iResearch iPhone application, etc., are already offering their databases for mobile devices. The nature.com app from Nature Publishing Group is providing access to read full-text articles, view full-size figures and save references.

Libraries can offer their digital collections (institutional repositories and in-house databases) on mobiles phones that can be accessed remotely. Greenstone[3] digital library software runs on mobile handsets and allow access just like accessing any other Greenstone server with searching and browsing multimedia collections.

5.5 Mobile Optimised Library Webpages

With the increased use of Internet through mobile, libraries are required to redesign their web pages as mobile optimised interactive and participative library web pages to provide dynamic information services to users on a 24X7 basis via mobile devices. While redesigning library must take into consideration the basic models of mobile phones to the smart phones with greater capabilities and functionalities as some of the iPhones and smart phones are compatible to access the web pages designed for larger screens. But the time taken to access is more and downloading is very slow and expensive. To overcome these difficulties, it is necessary to make mobile-friendly websites by using (cascading style sheets) CSS or auto-detect and reformat (ADR) software, which allows a website to rearrange its content and navigation to suit the size of the screen it is being viewed on. Libraries should be aware of mobile web browsers, screen resolutions and size, etc., while creating webpages. The website must be redesigned to have less graphics, so that the page loads much faster and with minimal keyboard operations, to ease the mobile user. In this context, text-only websites are easier and faster to navigate and fabricate into new applications.

5.6 Library Instructions and Virtual Tours

Library tours, instruction/induction/orientation programs have been quite significant in bringing the nonusers to libraries and also help the remotely located or users located in different geographical locations. Library users, who don't have time or inclination to attend an on-site workshop, can get access to library tours on their mobile devices. Audio/ virtual library tours can be produced fairly quickly, inexpensively, and could reduce the amount of staff time spent helping new users to orient themselves in the library and explaining the facilities available. It can easily be provided both as downloads from the library website and on mobile devices.

5.7 Online Library Catalogs on Mobile Phones

Libraries are required to interact with the software vendors to create mobile compatible WebOPACs[4]. For example, AirPac add-on product will auto detect the type of device you are using and format accordingly the catalogs without graphics for better viewing. libSirsi-Dynix, Innovative and LibraryAnywhere developed by Library Thing have similar options. OCLC's WorldCat Mobile application pilot allows users to search for and find books and other materials available in their local libraries through a web application they can access from a PDA or a smart phone[5].

To provide location-based services, libraries have to use mobile telecommunication system, the internet/web-based OPAC on intranet and geographic system like GPS. Many phones have built-in GPS, which allow users to navigate to locations and, if activated, allow others to find them. OCLC's Worldcat mobile application for iphones makes use of this feature when identifying local libraries. Libraries with multiple branches like public libraries can capitalise on the GPS function to create custom maps and navigational tools to branch locations.

5.8 QR Codes on Mobiles

QR code[6] stands for 'quick response', and basically a two-dimensional bar codes that can contain any alphanumeric text and often used to store urls, text, etc., known as 'mobile tagging'. QR codes are used in commercial tracking, logistics, inventory control, and advertising. Data can be translated into a QR code by any QR generator, many of which are available as free download. Users simply enter the data to be translated, and the generator produces the code, which can then be displayed electronically or in printed format. Decoding the information can be done with any mobile camera phone that has a QR reader, which is freely available online for most devices.

Libraries can use QR codes to label books, journals, audio/visual, offprints, add QR codes in WebOPAC and other places. Users with phones that have a camera and free barcode decoder software can take a picture of the barcode, then the software decodes the picture, and translates the data into title, barcode, and location information that can be displayed on the phone.

The QR code can be scanned, and saved for further use on mobile. QR codes not only link to websites, but also can be used to send prewritten SMS to phones, transfer phone numbers, and provide further text. They are designed to cope with a high-level of error, hence are suitable for outdoor use.

5.9 Mobile-based Library Lending Service

As in banking and financial sectors, libraries can formulate regulations for using mobiles for circulation of reading materials and maintenance of users account. The SirsiDynix company has developed a handheld circulation tool called 'PocketCirc', which enables libraries to access the unicorn library management system on a PDA device. This wireless solution enables staff to assist patrons in the stacks, checkout materials while off site, such as at community or campus events, and update inventory items while walking around the library.

Mobile phones make ILL/document delivery services faster and cut-down the time to request/visit different libraries and complement the geographically remote users.

6. PREREQUISITES FOR IMPLEMENTING MOBILE-BASED LIBRARY SERVICES

- It is necessary to have a carefully planned requirement study to know the practical situation like, the kind of services to be provided on mobile devices and type of devices to be used.
- Library need to acquire the required hardware and software after market survey.
- Library must provide physical and virtual environment for using mobile devices and accessories.
- One needs to ensure that the customers having mobile phones of different network operators are in a position to avail the services.
- It is a prerequisite to optimise library OPAC, website, and databases for mobile devices and introduce new services wherever possible.
- Security and authentication is a matter of concern in mobile services particularly due to availability of web contents on a 24x7 basis to prevent damage or loss to the data.

7. SKILLS REQUIRED

Librarians should acquire and apply the following skills if they wish to provide mobile-based services:

- Knowledge of hardware and software of mobile devices
- Create/tailor mobile-optimised content including interactive and participative library homepages, OPAC, virtual tours, and databases
- Familiarity with internet/intranet services like using e-mail, SMS and spam preventing, etc.
- Develop expertise in protecting privacy and security levels as more personalised information is involved in using mobiles for library services
- Skills related to searching and navigating through mobile devices, mobile web applications like push e-mail, etc.
- Skills for interacting with users via smart phone applications, mobile-friendly webpages, and third party intermediary clients
- Skills relating to training and user orientation to market these services to users

8. APPLICATION OF MOBILE TECHNOLOGIES IN ISAC LIBRARY

In lieu of sensitive nature of information generated as well as used and dealt with from security point of view, ISRO employees are not permitted to use their mobile phones inside ISRO Satellite Centre (ISAC) campus except for the employees who have been officially provided with mobile phones to meet exigencies. Hence, the ISAC mobile library services can be introduced in the first phase to only senior scientists/engineers who are allowed to use mobiles in the campus, employees on tour, scientists/engineers sponsored for higher studies/research (study leave), those enrolled for distance learning through open universities, and faculty and students of Indian Institute of Space Technology (IIST).

All information services hosted on ISAC library homepage accessible through intranet and spacenet can be straight away optimised to mobile-based services. Initially library's alert services like information on new books for suggestion, books on display, arrival of indented document, reserved documents ready for collection, books overdue, library circulars, information about important events, etc., can be provided.

The mobile enterprise devices that run on intranet are used in some of the hot segments like organised retail, logistics, transportation and the government sectors like the Indian Railways, the Department of Posts, and Police Departments. Similarly, in future the above library services and other new mobile-based services like mobile OPAC, circulation, etc., can be introduced with controlled security risk by adopting mobile intranet-based applications or mobile enterprise application (MEA) in ISAC.

WebOPAC of ISAC library can be enriched with user participation, i.e., by allowing users to

comment on the items in catalog and letting users to comment directly from their PDAs and mobile phones to library databases. For example, they can upload some of their memorable experiences, photos or pictures related to that particular project in case of internal technical reports/papers published as value-addition and they become far more valuable to ISRO community as such.

QR codes can be introduced in ISAC library WebOPAC, webpages and virtual materials to help users to capture, store, and retrieve the information about library services and resources that saves the time of the users. In future, QR Codes could possibly be linked to RFID tags, so that users could do self-checkouts.

9. CONCLUSIONS

Library policies and services should be flexible and open so that new information needs of users in pursuit of organisational needs are met with new technologies. The task of libraries is to exploit new technology in a more effective way to promote and integrate them into the design of future library services in a cost efficient manner.

However one cannot neglect the policies and standards of information security of the organisation. Since, the feature like 'always on' and continuous connectivity makes new devices more vulnerable to security threats, the same need to be addressed cautiously before setting up the library services for mobile devices. While the financial institutions like banks are making use of such technologies without exposing the customer to much risk, it may not be an impossible task for the libraries to overcome such security threats in providing library and information services on mobile devices. It is very essential for libraries to be dynamic and change their outlook to adopt new technologies and to develop new kind of relationships with users.

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