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IMPACT OF MOBILE TECHNOLOGY ON LIBRARIES

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ABSTRACT

Purpose: *This paper discusses the need, benefits, limitations/barriers, and solutions for the proper implementation of the mobile technology in libraries. It also explores the type of infrastructure that libraries require to deliver those services in libraries.*

Design/Methodology/Approach*: Extensive review of related literature was adopted for this study. Library, mobile and technological terms were used to develop this article for readers to understand the concept/title of the paper, impacts of mobile technology on libraries.*

Implication: *Technology has given quicker access to information and the libraries are also challenged by embracing the technological changes to reconsider and remodel their facilities. Mobile phones are becoming an important part of everyday life today and are changing how one communicates and interacts with the world. Mobile Technology will be of great help to libraries in this growing scenario in improving their partnership and providing improved user-oriented services to existing users. Libraries may well reach out to remote users who have been considered impossible to connect due to the lack of a media.*

Originality: *Libraries should conduct analyses and make smart decisions, such as - support staff education, explore partnerships new funding models, ready to compromise when it comes to their traditional information delivery models. Protect themselves from deceptive content agreements with third-party providers. As the use of mobile technology grows, library staff need to learn and use the technology to serve library users where they are, and libraries will face management, funding, and training challenges in meeting this need. However, expert technical knowledge must flow throughout the profession.*

Keywords: *Mobile Technology, SMS notification services, Mobile document supply, e-resources, Digital Technology*

Paper type: *Conceptual*

Introduction

Mobile technology has made contact and access to information very easy and timely for consumers from the comfort of their own homes and offices and from wherever they are on the move with their mobile phone units or PDAs. The mobile phone subscriptions worldwide are at 3.3 billion-equivalent to half the world population. Those statistics are substantial evidence of people interacting with information everywhere. As cell phones today have more features and capabilities than ever before, including MP3 players, image messaging, streaming video and becoming more data-capable, fewer people need a computer to gather information. Users use a cell phone as their primary device to surf the Web, listen to music, watch TV, read books and communicate with friends. The mobile phone has thus become one of the key interfaces people use for accessing and sharing information over the past decade. Libraries are social institutions that connect people with information, and people with it. We are becoming more and more not just physical areas. It is time for libraries to take advantage of mobile technology as most library users own a mobile phone and

growing numbers of these are smartphones. Mobile technology can help novices as well as seasoned librarians stay relevant in a digital society. We need to be aware of technological changes, look ahead and prepare for the future of mobile connectivity between libraries. Librarians need to be in line with this trend and move into the mobile environment if they want to offer improved consumer services. Mobile devices and programs offer great convenience for those wishing to profit from library services.

A user lying at a beach can access e-books and multimedia material from a local library with a quick 3G link. Smartphones can reach networks, and content can be broadcast over a network continuously, providing content on demand, and making it impossible to retain a paper copy of the data. Google is designing first for the smartphone, and second for the desktop. Apple is getting its desktop computers more like its mobile devices. Mobile devices, besides providing convenience, present new ways for libraries to encourage access and extend scope. Mobile computing has become more popular with widespread use as technology evolved, and is on track to replace personal computers (desktops and laptops) as the primary means of accessing online information and communication. Accessing digital libraries through mobile devices has the high potential to reach a broader user community that will also raise issues related to making digital libraries available via mobile devices. Mobile technology is changing the way we communicate, teach, read, entertain and make a choice. Mobile devices today can run complex software that enables users to send and receive information almost anywhere and at any time with advanced interactivity and new hardware and technologies such as Bluetooth,Wi-Fi, global positioning system, mobile web sites. Libraries can better serve by embracing the increasing mobile technology that provides mobile access to their websites and public access catalogs, and by offering mobile access to e-books, newspapers, video, audio books and multimedia content.

Digital Libraries

A digital library is a special library with a collection of digital objects that can include text, visual material, audio material, video material, stored as electronic media formats along with means to organize, store, and retrieve the files and media contained in the library collection. Digital libraries provide an interface for searching which allows finding resources. Computer software, hardware and dependency on high-speed networks are the foundation of any digital library. Any digital library relies on components such as local networks with connections to the internet, databases with user-friendly interfaces for searching and administrative purposes which can index documents for fast access. A digital collection of documents is accomplished by acquiring original digital works such as articles, books, conference proceedings, pictures etc. made by original authors, converting original paper to digital format, addressing proper management issues such as copyrights. Today the digital library uses various formats of documents to store and represent the content.

A file format is an algorithm program to encode the data and the data information. In addition, they can be proprietary, developed by commercial enterprises or open file formats available to anyone. ASCII (American Standard Code for Information Interchange) and UNICODE are most widely used character set encoding. Similarly, MSWord is proprietary formatted-text formats. Page Description format describes shapes and the layout of a document. Portable DocumentFormat (PDF) is

the most used of these formats. Graphics Interchange Format (GIF) and the Joint Photographic Expert Groups (JPEG) are different formats used to store pixel information in still images,of audio and moving images, the formats are such as AIFF, MP3, AVI. Digital libraries include files, records, audio, photographs, video in various formats, generated by different software to create complex tasks of information retrieval. Further usability is affected by the knowledge of search topic or domain and the knowledge of system used by the user. For digital libraries, user experience and good search strategy are vital to getting the good search result. Digital libraries may be maintained by individuals, organizations or affiliates with established physical library buildings or institutions, or with academic institutions where content may be stored locally, or accessed remotely via computer networks.

Mobile Technology

With the rapid technological advancement in the last two decades, mainly due to the advent of the internet, the world no longer seems to work the same. Following the internet, the advent of wireless networks and more recently mobile devices such as smart cell phones, tablets etc. contributed a great deal to the emergence of mobile technology. Those handheld devices have seen a lot of progress over the last decade. Wireless networking and the internet have experienced many developments and discoveries that only made them better and more convenient for use in various mobile operations. As a consequence of which mobile technology has gone on miles since these discoveries and inventions and since then there has been no look back. Mobile devices, originally designed with the intention of replacing telephones using wireless technology have now become a very important part of daily contact not only for users of telephone services but also for internet users. These mobile devices are now popularly used to access content on the internet, particularly among youths. Recent studies at various locations reveal that the volume of internet usage using mobile devices is increasing at a very rapid pace.

In fact, research suggests that there were about 250 million wireless internet enabled devices in use in the United States in the year 2009. Ownership rates for mobile technology-based devices outrun those for non-mobile technology-based devices; in fact, there are eight times more iPhone/iPod Touch users 2 years after their launch than there were AOL users 2 years after its launch. Statistics suggest that there were about 4.6 billion mobile cellular subscriptions worldwide at the end of 2009, which represents two-thirds of the world population. Mobile industry analysts suggest that mobile data traffic around the world has doubled every year through 2013, growing 66 times between 2008 and 2013, according to the statistics. The reason behind the mobile technology's success is the benefits that mobile devices serve, such as mobility and ubiquity. Today, mobile devices can play rich multimedia content, allow advanced user interactivity, run the increasingly complex applications, and interact with cloud services.New hardware and technology such as Bluetooth, accelerometer, and multi-touch screens, as well as text messaging, smartphone software applications, mobile websites, global positioning systems (GPS), Wi-Fi, and media creation and recording tools all form part of the mobile environments. Mobile technology is recordingan increasingly wide range of uses in our daily lives. The existing technology is obviously expected to improve rather more in future. The use of mobile technology in any field is highly beneficial and it is the reasonit is seen as future of communication by many. Mobile devices need Operating System's underlying support to

manage and manipulate the device's hardware resources efficiently, and also need software support to operate smoothly without any failures. Two such mobile handheld devices can run on different platforms, with some architectural and organizational design differences. Such devices also need to connect with each other if they are part of the same organizational structure or if they also need to communicate through other organization's devices. Such communicating devices may have a different underlying platform. For this very purpose, we need network support so as to communicate across devices not only of the 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. The extent of the success of the 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 the implementation of mobile technology.

Library Services via Mobile Technology

SMS notification services: Libraries can provide users wherever they may go with notifications about the latest news, events, and notices via SMS and MMS. Users may be informed instantly with note notifications such as-alerts to bring new books to user notice for recommendation, intimation of user arrival of indented documents, notification of availability of reserved documents for collection, evaluation of overdue books, unpaid fines, reminders to return library items, renewal of books, library circulars, subscribed e-journals, change in timings, information about important events, loan request etc. These alert alerts can be automatically generated using integrated library management system / software. SMS messages can be sent concurrently to a group of users through many free apps, and intermediate websites / clients.

Formal education, distance learning and e-learning: Students use their mobile phones and various mobile applications in a very versatile manner. Academic libraries should exploit the benefit of leading the delivery of library services across mobile devices to promote distance learning, formal education, and e-learning research programs by making the information available omnipresent. Library services should also fit with the teaching and research activities of the colleges / universities, the scientific community or other customers they represent.

Data browsing: Libraries Database provides access to a variety of its resources and databases. Users may simply enter search terms, and see results specifically designed for mobile viewing. The service includes OPAC (Online Public Access catalogue), automated search, and original search for records. The WorldCat Mobile application pilot from OCLC allows users to search for and locate books and other materials available in their local libraries via a web application that they can access from a PDA or smartphone.

My library: My library is a personal library space where users can find information and resources of their choosing. Users can read updates, review records, renew services, request items, monitor bibliographic loans and requests for document delivery, set up new books and newspaper articles email notifications, set catalog search preferences etc.

Mobile Interfaces e-resources: Many publishers now offer e-books (both text and audio) that are accessible through mobile phones. This offers access to a variety of databases and digital services such as eBooks, e-Journals,

Internet databases, dissertations, audiobooks, music streaming, videos, pictures, and mobile article databases. Such items can either be accessed from the library websites on the user's own mobile devices, or they can be loaned from libraries that already have the collections on them. A large collection of free and subscription-based audio books is available for download, and can also be downloaded to mobile devices. Libraries may use Multimedia Messaging Service (MMS) to share photos, videos, and audio on mobile devices. Many e-book publishers offer 24x7 access to library subscriptions from any on-campus internet terminal, as well as mobile devices such as iPads, Android devices, and Kindle.

Library Guide: Libraries can provide users with the best library guide information such as Library Use Guide, Question Response Service, and Library Statistics that delivers rich content to the best of users. When users have questions and want to contact the librarian for assistance, they can use the mobile device to get a quick response from the library and find the appropriate information needed.

Mobile document supply: New opportunities for submitting document requests and scanned images and tracking the use of collections as well as automating administrative processes are provided in the mobile environment and technologies. It may facilitate transfer of electronic funds, supply chain management, marketing, online marketing, online transaction processing, electronic data interchange, and automated inventory management systems.

Text reference service: If the library receives a large volume of inquiries requiring brief answers, such as dictionary definitions, details, or service information, then Librarians can provide immediate responses and real-time links to articles / references.

Digital Library / Audio Tours: Library Virtual / Audio tours, instruction / induction / orientation services have been very useful in taking non-users to libraries as well as assisting remotely based or users located in different geographical locations. Consumers of the library, who have no time or inclination to attend a workshop on-site, can access the library tours on their mobile devices. Audio / virtual library tours can be produced fairly quickly, cheaply, and can reduce the amount of time staff spent helping new users to orient themselves in the library and explain the available facilities. It can be easily provided on mobile devices and as downloads from the library website.

QR Codes on Mobiles: QR code stands for 'quick response', and basically two-dimensional barcodes that can contain any alphanumeric text and often used to store URLs, text, etc., known as 'mobile tagging'. Any QR generator can convert the data into a QR code, many of which are available as free download. Users simply enter the data to be interpreted, and the generator produces the code which can then be displayed either electronically or in printed form. Any mobile camera phone that has a QR reader, which is freely available online for most apps, can decode the details.

Mobile Devices Used in Libraries

1. A Personal Digital Assistant (PDA), also known as a handheld PC, is a variety mobile device which functions as a personal information manager. PDAs have been mostly displaced by the widespread adoption of highly capable smartphones, in particular those based on iOS and Android.Nearly all modern PDAs have the ability to connect to the Internet. A PDA has an electronic visual display, letting it include a web browser. Most models also have audio capabilities, allowing usage as a portable media player, and also enabling most of them to be used as telephones. Most PDAs can access the Internet, intranets or extranets via Wi-Fi or Wireless Wide Area Networks. Sometimes, instead of buttons, PDAs

employ touchscreen technology. The technology industry has recently recycled the term personal digital assistance. The term is more commonly used for software that identifies a user's voice to reply to the queries.

2. **Smart Phones** are a class of mobile phones and of multi-purpose mobile computing devices. They are distinguished from feature phones by their stronger hardware capabilities and extensive mobile operating systems, which facilitate wider software, internet (including web browsingover mobile broadband), and multimedia functionality (including music, video, cameras, and gaming), alongside core phone functions such as voice calls and text messaging. Smart phones typically contain a number of metal–oxide–semiconductor (MOS) integrated circuit (IC) chips, include various sensors that can be leveraged by their software (such as a magnetometer, proximity sensors, barometer, gyroscope, or accelerometer), and support wireless communications protocols (such as Bluetooth, Wi-Fi, or satellite navigation).

3. **Cell Phones**are wireless telephone using a system of low-powered radio transmitters, with each transmitter covering a distinct geographical area (cell), and computer equipment to switch a call from one area to another, thus enabling broad-scale portable phone service. Such a wireless telephone that has other functions, as text messaging or Internet access.

4. **MP3 CD players** is aPortable CD players that can decode and play MP3 audio files stored on CDs. Such players were typically a less expensive alternative than either the hard drive or flash-based players when the first units of these were released. The blank CD-R media they use is very inexpensive, typically costing less than US$0.15 per disc. These devices have the feature of being able to play standard "Red book" CD-DA audio CDs. A disadvantage is that due to the low rotational disk speed of these devices, they are even more susceptible to skipping or other misreads of the file if they are subjected to uneven acceleration (shaking) during playback. The mechanics of the player itself however can be quite sturdy, and are generally not as prone to permanent damage due to being dropped as hard drive-based players. Since a CD can typically hold only around 700 megabytes of data a large library will require multiple disks to contain. However, some higher-end units are also capable of reading and playing back files stored on larger capacity DVD; some also have the ability to play back and display video content, such as movies. An additional consideration can be the relatively large width of these devices, since they have to be able to fit a CD. It is an electronic device that can play MP3digital audio files. It is a type of digital audio player (DAP), or portable media player. Most players play more than the MP3 file format, such as Windows Media Audio (WMA), Advanced Audio Coding (AAC), Vorbis, FLAC, Speex and Ogg.

5. A **tablet computer**, commonly shortened to tablet, is a mobile device, typically with amobile operating system and touchscreen display processing circuitry, and a rechargeable battery in a single, thin and flat package. Tablets, being computers, do what other personal computers do, but lack some input/output (I/O) abilities that others have. Modern tablets largely resemble modern smartphones, the only differences being that tablets are relatively larger than smartphones, with screens 7 inches (18 cm) or larger, measured diagonally,and may not support access to a cellular network. The touchscreen display is operated by gestures executed by finger or digital pen

(stylus), instead of the mouse, trackpad, and keyboard of larger computers. Portable computers can be classified according to the presence and appearance of physical keyboards. Two species of tablet, the slate and booklet, do not have physical keyboards and usually accept text and other input by use of a virtual keyboard shown on their touchscreen displays.

The design of mobile devices and services is important for accessibility. As reading becomes more inclusive of diverse communities, libraries will need to address the ongoing accessibility challenges of the mobile world.

Components

1. The user
2. The devices
3. The operating systems
4. the services,
5. the content,
6. The research tracking (how users currently engage with information on the World Wide Web via their mobile devices.)

Mobile Site Development Tools

While libraries may build their own mobile sites, there are also numerous tools that convert the website into a mobile-friendly interface. Through the use of CSS (Cascading Style Sheets) or ADR (Auto-Detect and Reformat Software) that allows a website to rearrange its control and navigation according to the screen size on which it is displayed. In this way websites will look good at all screen sizes including the common net books and libraries will be well placed to meet future demand. The Library websites (with or without OPACS) which are specially designed for viewing on mobile devices are as- American University Library, Boston University Medical Center Mobile Library, Cambridge University Library, Cornell University Library, Duke University, Florida International University Libraries, London School of Economics (LSE) Library

Advantages of Implementation of Mobile Technology in Libraries

User-friendly Help: Familiarity with their own devices and technologies helps the users in accessing information easily and does not require orientation and preparation. Mobile users are using the facilities on mobile phones like SMS, instant messaging, web browsing, e-mail effortlessly to communicate. Most of these functions are pre-installedon mobile devices or the data plan bundle option. With the installed devices users are able to browsed the net, download and have access to information as they desire

Personalized service helps: Users connect with library staff to check for specific information or resources away from the library. They are no longer obliged to visit the library at regular open hours to meet all their information needs. They search the library online catalogue, use of subject guide or Database access the full text of article from the web-based e-resources, they may browse an electronic journal, fill out an inter-library lending form, e-mail a reference question via the ask-a librarian service or borrow an e-book all by remote access (Ibrahim, 2004).

Accessibility of accessing information: Access to information at anytime from anywhere will be of great help to users who are unable to visit the library in person and provide a constant link to the information resources required. Access to information means unhindered access to-all the citizens which reflect the interest of the citizenry. It also refers to the means and mode through which information is made available by providing entire range of possibilities for making Information and information services available to the public. Accessibility can be viewed as the 'ability to access' the functionality, and benefit, of libraries. This includes distance and

transport, building design, assistive technology, relevant and usable content of resources, suitable format of resources, and the languages of the resources and spoken by the staff. Acceptability denotes two related issues: First, inquirers may be reluctant to accept a particular source as credible, regarding it with suspicion as having inadequate "cognitive authority" (Wilson 1983). Second, the inquirer may be unwilling to accept the evidence of the source because it is unwelcomed in what it signifies and conflicts with other beliefs, a matter of cognitive dissonance (Festinger 1957; Greenwald and Ronis 1978).

Time-saving: Users don't need to log resource information when browsing and checking library services, or wait to renew / reserve books at the library transaction counter and thus save the user time. It saves users time, users need not required to come library, from their mobile phones they can easily access library OPAC to know the status of available resources, reserve their resources, etc.

User Participation: Libraries can enrich OPAC by allowing users to add user-created content, such as user-uploaded notes or images. Through designing of mobile based website, library makes it more interactive by adding chat rooms, blogs, social interface, etc.

Location Awareness: Mobile contact allows libraries to deliver location-based services / content through the capabilities of a global positioning system (GPS). Libraries can direct users through maps and navigational software to find a particular document or service. From any part of the globe, they can access the library. Things only needed are an active internet connection, access to library website and a smart mobile phone. A single resource of the library can be accessible frommany mobile phones.

Access to Print-disabled Users: Mobiles communications help to provide services orally to vision-disabled and physically handicapped users.

Drawbacks of Mobile Technology

- compared to wired Internet service,
- relatively slow transmission speed
- Inconvenient input and output interface
- Insufficient contents
- High price

Limitations / Barriers

Although mobile Technology holds great promise for library services, there are some limitations or barriers in providing library services such as content ownership and licensing, usually expensive and resource intensive limited memory of mobile devices digital rights management, access to information in the digital age. Reach of an external vendor into the digital collections and technologies – sustained access will be an extremely important issue for libraries if they adopt mobile Library technology and services that offer content from providers outside of the library. Another pressing concern about mobile technology in the library is privacy - because of the risk that patron usage information can be used and exploited by law enforcement officers and those who commit identity theft. Mobile technology is changing the relationship between libraries and their users--by expanding services and posing new challenges to reader's privacy, issues related to trust and security - Libraries should be wary of entrusting user information to locations in the cloud that may offer a different level of protection from that provided by in-house library infrastructure some of the digital content can only be accessed on certain devices, and this can have a "chilling effect" on learning and library service because it locks some people out. Lack of appropriate

mobile-friendly academic content to meet learners' needs;difficulty in supplying content to an increasingly mobile student body problems in finding and accessing the content needed for mobile learners from the Library perspective, The use of wireless devices is increasing rapidly, yet there is a concern in the scientific community that this technology could have adverse side effects.

Lack of staff awareness and familiarity- For example, setting up text alerts needs technical expertise from staff who understand how the library management system produces notifications, as well as staff or consultants who can assist in setting up an interface with a Sim card modem or an appropriate service to deliver these notifications as text alerts the lack of technological expertise among staff members and increases red staff. However, people are increasingly dependent on their mobile phones and there is a growing minority who do use them as diaries, for taking notes and for e-mail and internet access. As a consequence, Library users can expect that libraries will provide some services in a mobile-friendly manner.

Mobile Technology Implementation

Mobile Technology is a technology that allows transmission of data, voice and video via a computer or any other wireless enabled device without having to be connected to a fixed physical link. The main components of mobile technology are mobile software, mobile hardware and mobile network.

A cellular network or mobile network is a communications network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. This base station provides the cell with the network coverage which can be used for transmission of voice, data and others. In a cellular network, each cell uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed bandwidth within each cell. When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers (e.g., mobile phones, pagers, etc.) to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations, even if some of the transceivers are moving through more than one cell during transmission.

Second generation 2G cellular telecom networks were commercially launched on the GSM (Global System for Mobile Communications) standard in 1991. 2G technologies enabled the various mobile phone networks to provide the services such as text messages, picture messages and MMS (multimedia messages). All text messages sent over 2G are digitally encrypted, allowing for the transfer of data in such a way that only the intended receiver can receive and read it. 3G telecommunication networks support services that provide an information transfer rate of at least 200 kbit/s. 3G telecommunication networks support services that provide an information transfer rate of at least 200 Kb/s. Later 3G releases often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mb/s to smart phones and mobile modems in laptop computers. A mobile hardware is mobile devices or device components such as a smart phones, notebook, Personal Digital Assistant (PDA) WAN modem, LAN adapter etc. Samsung, Apple, Nokia, Xiaomi, Lenovo are few vendors for manufacturing mobile device. Mobile Software is operating system or OS-type software that resides in mobile device. It may be Andriod, Blackberry, and iOS;Application user interfaces with application logic in handheld device or an application software or database server software. Mobile software deals with the

characteristics and requirement of mobile applications.

Solutions

Libraries should conduct analyses and make smart decisions, such as - support staff education, explore partnerships new funding models, ready to compromise when it comes to their traditional information delivery models. Protect themselves from deceptive content agreements with third-party providers. Want the knowledge of mobile devices to flow through the field and not only in the hands of recent library school graduates inform users about the thousands of free mobile books available from initiatives such as Project Gutenberg to create opportunities to educate staff, establish local expertise and encourage dialogue by providing training sessions and professional development option. Host lectures or discussion groups or include such information on their websites, blogs, or newsletters. As the use of mobile technology grows, library staff will need to learn and use the technology to serve library users where they are, and libraries will face management, funding, and training challenges in meeting this need.Instead, expert technical knowledge must flow throughout the profession.

Conclusion

There is a growing influence of mobile technology in libraries, especially as network access becomes more affordable and reliable, and mobile applications have seen mainstream acceptance in teaching, learning, and research. This trend is likely to continue and one-way libraries should respond to this emerging trend by making the website of the library easily accessible through mobile devices that are allowed on the Internet. Libraries should make conscious choices about what they want to offer in this arena and act accordingly and only time will tell if a completely mobile-accessible library, in terms of its services and collections, will become commonplace. "By going mobile, a library takes a giant step toward becoming a round-the-clock service".

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