

Digital library services : towards mobile learning

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Digital Library Services : Towards mobile learning

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INTRODUCTION

Academic libraries today spend a large proportion of their materials budget on electronic resources. In the 2007-08 statistics reported by the Association of Research Libraries (ARL) in U.S.A., the average spending on electronic resources was 51% of total library expenditure. At the Nanyang Technological University Library, our expenditure is about 64% each year. Many of our library services therefore relate to helping users to make full use of this huge investment.

As with everything in the digital world, changes are rapid and often disruptive. Libraries have to constantly keep in tandem with technological development as well as changing user behavior. One of the rapidly developing areas that is likely to impact on library services is mobile computing. This presentation will discuss some of these developments and explore some issues in providing digital library services for mobile learning in academic libraries.

VALUE AND MAIN ROLES OF LIBRARIES

The value of libraries

First, it is important to consider new developments in the context of the fundamental roles and functions of libraries. The value of academic libraries today, and possibly in the future lies in 3 broad areas of activities – (1) provision of space for users, (2) enabling access to information resources and (3) helping people use information. Each of these functions has undergone tremendous changes in recent years, but the basic goals of libraries are still largely the same.

Changes in roles and functions of libraries

Space - Adequate library space was critical in the past primarily to accommodate growing print collections. Today, the focus is on configuring library space for users to engage in various forms and modes of learning outside of the classrooms.

Access - Access to information was mainly dependent on having a large physical collection in the past, but as we know now, the shrinking of information into digital media and the wide spread availability of non-traditional information materials has diminished the centrality of the Library collection. Yet, the role of the Library is providing access to quality information among the chaff is more critical today, particularly in supporting scholarly and deep learning activities.

Use - Helping people to use and exploit information has always been a time honored tradition for librarians through activities such as reference, instruction and information dissemination. These

activities have changed as well. In the past universe of scarce information, the focus of reference work was in searching, finding and providing answers whereas the deluge of information today has created a new set of challenges for helping users to choose, authenticate and use reliable information.

LIBRARY FUNCTIONS

In concrete terms, a library fulfills the above roles by carrying out the following main functions:

- a) Provide access to documents through its collection or subscriptions. A library builds and organizes collections from trade and non-trade sources, institution generated contents and donations. It subscribes to electronic resources such as journals, databases and e-books hosted elsewhere. It adds further value by building and providing catalogues and finding tools for access to its collection and external resources.
- b) Provide transactions to facilitate the use of library resources and facilities. A library puts in place policies, procedures and service points to make it easy for users to get the most out of using resources and facilities. These include borrowing, returning and reservation of library materials, authenticating access to use of electronic resources, booking of resources and facilities, payment of fees, providing inter-library loan and document delivery services and receiving and processing requests for new materials & resources.
- c) Provide add-value services in supporting research and learning activities. A library provides conducive space for users to browse, consult and use library materials; maintains computing equipment and peripherals for users' access to electronic resources for their work and study; provides other learning and content production tools, e.g. AV equipment, language learning equipment and printing and document reproduction aids. More importantly, a library provides reference services, guidance and instruction to ensure that users maximize the use of information and are well supported to engage successfully in the learning and scholarly environment. An important aspect of service is also ensuring users' awareness of the availability and usefulness of library resources and services.

MAIN MODE OF LIBRARY OPERATIONS: THE PAST AND THE FUTURE

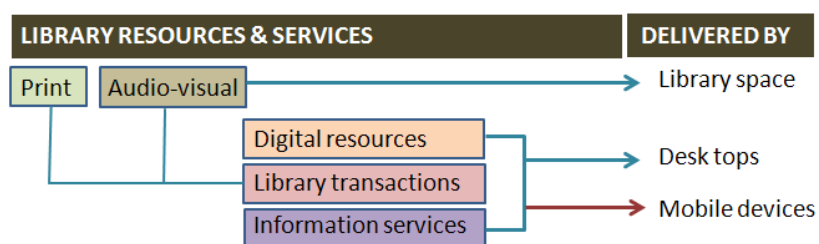
Main function of libraries

If we can sum up the main function of libraries in one sentence, especially in the eyes of the user, it is the delivery of relevant and appropriate information (in whatever format it is stored in) for the expressed consumption by the user. The rest of the functions can be seen as supporting, enhancing and maximizing the value of this primary function. Thanks to technological advances, this primary function can be performed in many ways today.

From Library stacks to mobile devices

Not long ago, the main mode of information delivery is through printed materials. Books are retrieved from the shelves and the information within consumed by users in the library or borrowed out. Subsequently, with the development of more digital resources, particularly in the serial literature, information was predominantly delivered through computers right to the desktop of the user office, home or laboratory. This has created a revolution of sorts, which greatly transformed the way libraries operate and see themselves. Looking forward, it is quite certain that mobile technology

will add another significant information delivery channel, this time freeing the information consumer from his desktop and fixed location.



Co-existence

However, it is important to note that we are not talking about the replacement of one form of information delivery channel by another. Thus mobile devices will not completely replace the need for desktops and laptops in the same way that desktops did not replace the need for printed materials or other forms of physical information containers. Each type of delivery has their peculiar niches and advantages that will resist complete replacement. The main issue for libraries is in determining the proportion of each of these channels and therefore allocating resources and attention to support and develop them.

In the rest of the presentation, we shall look at the reasons why we need to focus our attention on mobile information delivery, explore some existing and future applications in mobile devices and lastly, discuss key issues that academic libraries need to consider and prepare for.

MOBILE DEVICES

Mobile devices - From lap-tops to e-book readers to smart phones

The result of more than 2 decades of development of cell phones and portable computers has resulted in a convergence of technology that we see in the current generation of smart phones and mobile devices today. They are of course known by different names, including handhelds, mobiles, etc., but for the purpose of this presentation, we take mobile devices to refer to those that have the following basic characteristics:

- Telecommunication functions such as voice, email, data services (SMS),
- High speed access to Internet
- Screen for viewing and interacting with multimedia content
- Able to run third-party software, with PC-like functionality
- GPS functions
- Highly portable, i.e. without being an extra burden when a person is moving about

The last requirement rules out laptops and large e-book readers. A prime example of mobile devices as defined here is Apple's iPhone. More competitors running on Android, Windows mobile have also been around or are emerging rapidly.

Compared to older generations of smart phones and PDAs, the likes of Apple's iPhone are likely to change significantly the way in which people use mobile computing. Increasingly the mobile device will move beyond the currently predominant role as a communication and entertainment device and

become a mobile learning tool as well. We are living in a Learning society, not just an Information society. The greater speed of life requires everyone to learn and to relearn all the time. The mobile device will become an important extension of our body and it is this aspect of change that libraries have to be adequately prepared for.

WHY ARE MOBILE DEVICES IMPORTANT?

There are several characteristics of the current crop of mobile devices that make them killer applications.

1. It is convenient to use. Its high portability means that it will always be at a person's disposal wherever he or she is. There is no need to delay looking for information until one has access to a laptop or desktop.
2. It is ubiquitous. Almost everyone, rich or poor carries a phone. Some countries have more phones than their population!
3. Competition in the market place will also ensure that the technology in everybody's phone will increase in sophistication rapidly over time. It is typical that one upgrades one's phone once a year. Eventually everyone will have a smart phone, whether one needs it or not.
4. It is a multi-function computing machine. Unlike current e-book readers – which are generally dedicated to reading digital text, mobile devices have a wide variety of uses : voice communication, texting (SMS), video calls, email, taking pictures, writing notes, playing video games, finding the location of amenities, getting alerted to traffic conditions, finding and watching youtube videos, listening to podcasts, watching movies, reading an e-book or PDF file, etc., With 30,000 apps to download from the Apple store for iPhone users, the list of things that can be accomplished is quite staggering. The more things you can do with a device, the more likely you are going to carry it around with you all the time.

Impact on libraries

The constant proximity of an intelligent and always connected mobile device is akin to having a library in a pocket. In theory, just a few touches of the screen can call up the digital resources of a library, connect to a virtual or real librarian for assistance as well as perform routine library transactions such as booking or seats, facilities or resources.

Impact on learning

A mobile device enables learning to be carried out anytime and anywhere and is not restricted to particular locations or time schedule. As the primary learning environment is at the learner's end, where he or she is in control of the time and pace of learning, there is greater opportunity for self-directed learning. Unlike classroom learning, where the pace of teaching is dictated by the teacher regardless of the needs of each individual student, mobile learning provides greater flexibility for students to be more engaged and self-directed because he/she can self tailor his/her pace. Mobile learning need not replace formal classroom learning and can perform supplementary roles.

As the strength of libraries is in supporting self-directed and independent learning, libraries could play an increasingly important role in this mode of learning. Libraries could provide access to

resources tailored to mobile devices and services to guide users in their self-directed learning effort. In general, whenever there are learning activities, there are also opportunities for libraries to play an active role. Thus, the increase in mobile learning in the future will give rise to higher usage of library services.

APPLICATIONS IN LIBRARIES

Library services incorporating mobile devices as a key component can be described in the 3 broad areas of library functions discussed earlier in the presentation : Access, transactions and services. Examples of such library applications in academic libraries are described in articles by Lippincott (2008), Hahn (2008), and others as well as in Megan Fox's website on Mobile Technologies in Libraries (<http://web.simmons.edu/~fox/pda>).

Document Access

a) Access function

Providing and delivering documents for scholarly work and learning activities remains a core function of academic libraries (the term document here refers to all forms of recorded evidence – from text, audio and video). Both print and digital documents provision can be enhanced by deploying mobile technology. For digital documents, mobile technology provides a truly anywhere, anytime access. We just need to whip out the smart phone in our pocket to access any digital document in the Library's collection. Though this immediate availability of documents on the go may not be seen as essential among most users today, the ever increasing pace of life could change the level of demand in a short period of time. Already, some medical practitioners have been using PDAs on their hospital rounds to instantly access medical literature while interrogating patents for some time now.

b) Supporting learning anytime anywhere

The increasing use of self-directed learning and other constructivist pedagogy in teaching will likely lead to greater dependence on mobile devices for instant access to library resources whenever the learner needs it. Increasingly, learning will take place at any time and not just confined to classroom settings and fixed timetables. More modes of access and use of documents - using the Library physical space, accessing on laptops and e-book readers and getting them on the go in mobile devices, will make for a rich learning environment that a learner can choose depending on circumstances and needs.

c) Reading documents on mobile devices

Documents delivered through mobile devices need to be formatted differently due to limitations of screen size. One cannot render a web page or even a 2 column page of text exactly in a mobile device screen without seriously affecting readability. This remains one of the chief objections to using mobile devices for reading text. However the technology has improved markedly in a short period of time and is likely to yield better solutions in the future. For example some application software reformats PDF pages on the fly, whatever the number of columns, by reflowing the text to be read continuously as one column (see illustration below).



d) Publishers are providing mobile interfaces

Some publishers are beginning to offer their content in mobile friendly formats, e.g. EBSCOhost, IEEE, Factiva, Westlaw, etc. ArXiv (the physics pre-print service) and PubMed (from National Library of Medicine in USA). Currently, the number of publishers providing such interfaces is few and far between. There are issues relating to the state of technology, user demand, content licensing and cost benefits that publishers are concerned with in further development. Some of these issues are discussed in interviews with a few publisher/vendors by Spire (2008). With 3.5 billion mobile phone users in the worldwide marketplace and younger smart-phone-raised students entering higher education, it is likely that we will see more publishers pursuing mobile services and embarking on further developments in this area.

e) Library generated content

Academic libraries are also increasingly providing content through their institutional repositories. Though current repositories focus more on providing access to self-archived publications by academic staff, other content types such as course and teaching materials, institution-owned special collections such as images may increasingly be offered. Libraries can provide mobile-friendly access to them to increase their awareness and use. There are good opportunities for libraries to tailor their content in ways that suit the learning needs of students used to accessing and using information in the small screen footprint and incorporating the multimedia functions of the smart-phones.

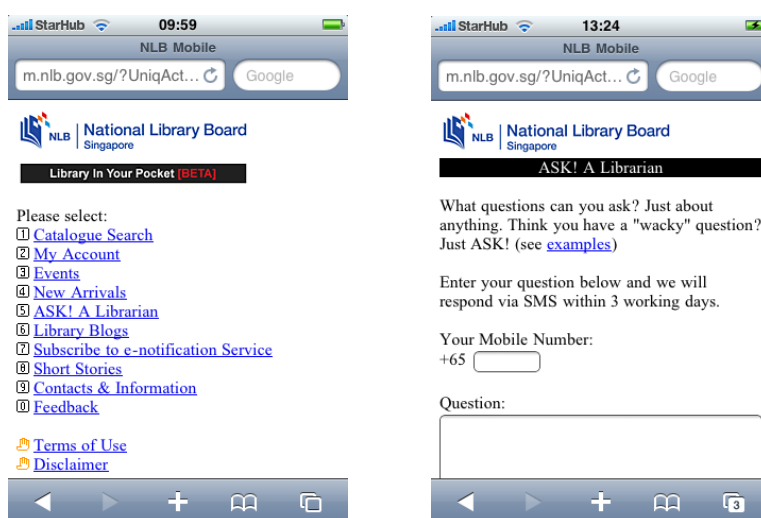
Transactions

One of the most likely areas for mobile applications is in facilitating various types of routine transactions between libraries and their users. Transactions refer to services that assist in the use of library resources and facilities such as finding and booking or completing a task (e.g. paying fines or borrowing a book). One of the earliest applications was the use of SMS to send various types of notices such as overdue loans, book on hold and reminders to users. Usually these services are offered on an opt-in basis as users may not like to have their phone flooded with all kinds of library notices especially when SMS messages are chargeable.

a) Library websites

Today, a number of libraries are offering various transactions through the mobile web, i.e. “the World Wide Web which as accessed through a mobile device ranging from a cellular phone to an iPod touch” (Kroski, 2008). Incidentally, Kroski’s paper also provides a good introduction and round up of mobile applications, though not necessarily confined to library services.

Some libraries provide mobile device users with mobile friendly access to frequently used functions in their home websites. An example is the “Library in a Pocket” project at the Singapore National Library Board. The clean interface allow the user to search the catalog, connect to reference service, use a highlighted service (short stories), provide feedback and get contact information, and check his/her account, events, new materials and library blogs, all in a functional and easily accessible front end. Many good library websites are marred by difficulties in finding basic information such as library opening hours and contact address due to complex graphical web interfaces and the clean interface for mobile access can be refreshing.



b) OPACS

As the key access point to resources in the library, the OPAC is the natural focus for developing applications for mobile devices. The basic step is to make the Library’s OPAC much more amenable to reading and use for the mobile user. Megan Fox lists several of these sites in her useful resource page “Mobile Technologies in Libraries” (<http://web.simmons.edu/~fox/pda/>). A example of a good implementation of OPAC for iPhone was developed by DC Public Libraries and the source code is also available under the Creative Commons license (<http://dclibrarylabs.org/projects/iphone/>). The DC Public Library mobile OPAC is simple to access and use, fast and informative.

c) Simple applications

Apart from providing catalog access, we can also think of useful applications that the ubiquitous mobile device in our pocket can enrich our experience in using the Library. Simple mundane tasks such as taking down the call number of a book identified in a catalog can be replaced by a click on the record in the Library catalog of Bryn Mawr, Haverford and

Swarthmore colleges. The click sends details of the call number to your mobile phone which you can then call up later when looking for the book in the stacks.

The screenshot shows the tripod library website interface. At the top, there's a navigation bar with links: Home | Login | Reserves | Blackboard | Get Help. Below this is a search bar with a dropdown menu set to 'KEYWORD' and the text 'iphone' entered. To the right of the search bar are buttons for 'start over', 'request', 'save records', 'MARC display', and 'return to list'. Below the search bar, it says '(Search History)' and '6 results found. Sorted by relevance | date |'. There's a 'Record: Next' link. The search results show the following details:

Author [Boudreaux, Toby Joe](#)
Title **Programming the iPhone user experience / Toby Boudreaux**
Publisher Sebastopol, CA : O'Reilly, c2009

LOCATION	CALL NO.	
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Below the table, there's a 'Send via Text Message' button, which is circled with a red dashed line. At the bottom, there's a 'Descript' section showing 'xii, 174 p. : ill. ; 24 cm'.

Other common uses of mobile technology in transactions are in booking library rooms and facilities, checking shelf inventory, self-guided library tours in audio, submitting requests for new books and materials, inter-library loan requests, etc. Though some of these can be accomplished through usual library websites, mobile implementation can add a new layer of efficiency particularly with a growing population of smart-phone carrying students.

d) Using the Library with mobile technology

As we trace the steps in which library users visit and use the Library, more applications using the mobile devices could be envisioned, using the technology inherent in the mobile device, such as camera, location awareness capability, audio, video and multimedia functions and constant Internet access. In addition, deployment of other associated technologies such as mobile RFID and QR code (i.e. Quick Response code or two-dimensional barcodes) will create compelling applications. For example, a user could be guided to the location of a book found in the catalogue using RFID technology. While browsing books on the library shelves, a user could take a picture of the QR code on the book, which instantly links it to further information on the book, such as synopsis, comments by other readers (from websites and databases) and suggestions of other similar books (via subject headings and author indexes)

Services

Library and information services refer to value-added services that help to satisfy the information needs of users and support their research and learning activities. Reference services have been at the forefront of library services for decades. However its nature and mode of operation have changed significantly since the beginning of end-user searching and the advent of the Internet. Even though students in campuses are still flocking to libraries, their dependence on librarians to mediate between them and information resources is lesser. That does not mean that users today are much more skillful in information discovery and use, but rather that there may be issues with their perception of their need and their awareness of the ability of librarians to fulfill their need. There is a

need for librarians in intermediating between users and the complex environment of information, though the way it is conducted is likely to change.

a) Reference services

Many librarians today recognize that it is critically important to reach out more pro-actively to users in order to remain relevant and useful to them. An effective way to do so is to be present among the range of tools and activities, such as mobile communication, that users are constantly engaged in. Many libraries have therefore been using mobile technology such as text messaging (SMS) and instant messaging (IM) to provide additional points in reference services.

It is likely that future reference transactions will take place mostly in virtual environment due to convenience of access and greater need for users to make sense of the complex information world as and when they encounter it. Making special trips to the Library reference desk is just going to take that much more effort to discount their use. Reference services making use of mobile devices not only allow more immediate response at the time of need, but also make better use of expertise in the Library as queries can be directed to the appropriate staff without depending on the randomly scheduled duty librarian at the reference desk. On the flip side, this will require libraries to re-arrange their staffing structure and re-organize the way they provide reference services.

b) Library instruction

Another area of application for mobile technology is in the area of instructional services. Traditionally known as bibliographic instruction, it has become a mainstay of academic library work today. Instructional services focus on equipping users with skills not only in using library facilities, resources and services but more importantly, to help them develop into life-long and independent learners. In NTU Library, the instructional program offers a range of classes from awareness of resources, familiarity with the research process and learning techniques, using the whole range of library and information resources and achieving competency in using tools such as Endnote to manage their learning and research process. The challenge for the program is to reach out to more than 30,000 students a year and to ensure that the learning outcome is achieved.

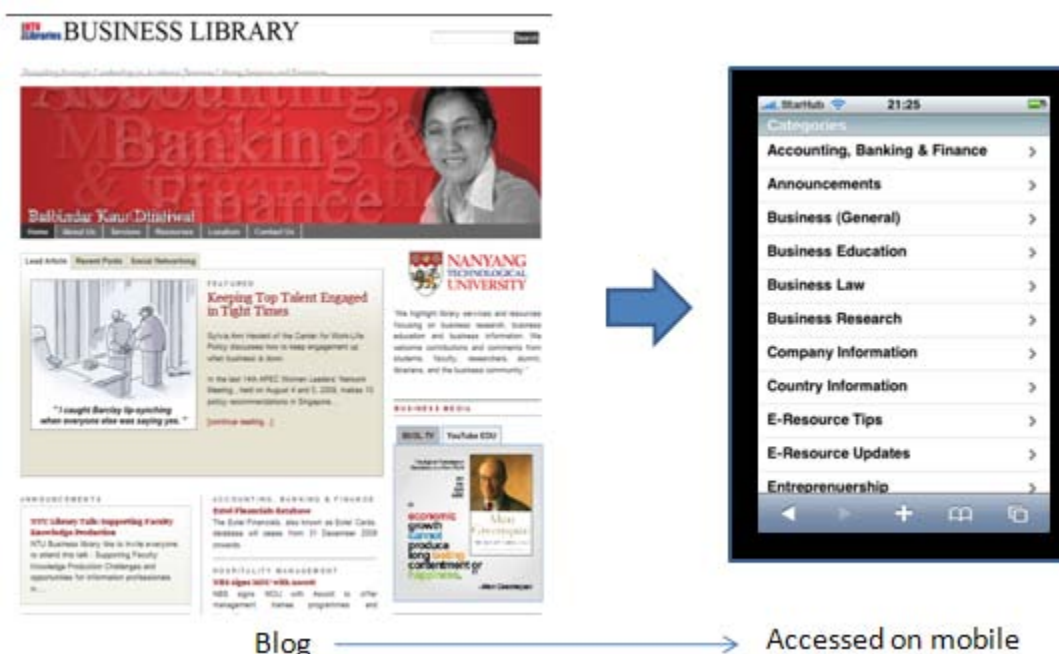
Though face-to-face instructional programs have great merit for both students and the Library when conducted by good instructional staff, libraries must also cater to different learning preferences among a wide variety of students. Web delivery, videos and podcast implemented for mobile access help to enhance library instructional programs. When appropriately designed (i.e. concise, focused and clear), they can reach students who do not attend face-to-face instructional sessions and also supplement and enforce learning of those who do.

c) Gateway to mobile information

The growing availability of high quality information resources available on the Internet from global digitization efforts, institutional repositories and open access sources means that users will find them increasingly relevant to their needs. However it is also increasingly difficult to identify reliable and trustworthy resources among the billions of documents available on the Internet. To help users (and themselves) in managing this universe, many libraries have been creating web-based library guides (also known as subject guides,

webliographies, pathfinders, etc.) of late. According to Springshare, a company that provide LibGuides, a platform for creating subject guides, more than 67,000 guides have been created by 1,036 libraries worldwide on their system.

Such guides are also implemented in blog, wikis and other web platforms in other libraries. Providing these guides on mobile devices will further enhance their use. Wiki and blog platforms can be viewed in mobile friendly modes. For example the subject library blogs (not subject guides) at NTU Library uses WordPress and can be accessed by users in mobile friendly reading format on their smart-phones.



PROVIDING LIBRARY SERVICES IN A MOBILE LEARNING ENVIRONMENT

It is only in recent years that mobile devices have developed into powerful multipurpose portable devices that make them compelling tools in our social and learning environment. Though the technology and usability in current smart-phones is impressive, there are still functionalities that need further development to make them universally appealing as learning tools. For example, readability on mobile devices is the key to widespread use and acceptance as learning tools. Further improvement in this area could either come from development of improved reading software on the phone or from content providers adapting or transcoding their offerings. Ultimately the use of mobile devices is limited by their small screen footprint. They will not be able to do what websites can do in communicating information in full multimedia effect. Mobile content delivery will have to develop its own unique communication approach, style and interface to maximize its advantage as a highly portable and personal device. The readability constraints will inspire designers to focus on what matters in communicating information on the move – for example, clarity of information structure, quick response and bite-size delivery.

Furthermore, the support industry and environment around the use of mobile devices and services needs to develop in tandem with the technology. The opening up to third parties in building tens of thousands of applications for the iPhone is a key factor in the success of not only iPhone but mobile

devices and mobile computing in general. Android, the cross platform open source operating system backed by Google will only propel and spread the use of mobile computing rapidly.

Mobile devices will be used in many areas of a person's work and life. Libraries should focus on their use as ubiquitous learning tools since supporting learning is an area where libraries have great strength and expertise. Mobile devices are not just new tools for retrieving information. The accompanying technology of image capture, location awareness, telecommunication capabilities, multimedia interaction and playback and even tactile response (a company in Singapore recently developed a pulse monitoring remote medical application using the iPhone touchscreen capability) provides ample opportunities for developing new forms of learning support. Libraries should look holistically at meeting learning outcomes rather than an information retrieval outcome. Thus new mobile learning services should not just provide access to resources but provide ways to interact with the resources that can help make an impact on the user using them.

CONCLUSION

One of the most important success factors of Internet is its convenience of use. Convenience even beats pursuit of quality. Most people prefer to look for information on the Internet on their home or office computer instead of searching systematically in library catalogs and then making a trip to the Library to get quality information. Apart from serious scholars and students, most people will just stop their information search altogether if they cannot find what they want on the Internet and not take the next step to go to the Library because of its relative inconvenience in this day and age.

Mobile devices today are taking convenience to a new height. The mobile device is fast becoming an appendage of our body. It is in the company of innovations as the personal computer, Windows, the Internet and Google which will revolutionize the way we work and live. Just as libraries responded to the new reality when digital resources began to transform the information landscape, libraries will have to prepare for the mobile learning environment.

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