Mobile learning for the twenty-first century librarian

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Abstract

Purpose – This paper aims to present a review of selected mobile learning literature and programmatic approaches for librarians interested in developing mobile digital library services in order to equip readers with a framework for understanding and appreciating mobile digital librarianship.

Design/methodology/approach – A literature review is culled from distance learning, medical informatics and medical librarianship, internet social studies, and human computer interaction research. Much of the research reviewed focuses on recently released reports as well as library services utilizing mobile technology.

Findings – The study finds that mobile learning has seen increased service development, but has not yet evolved to be a robust field in librarianship.

Research limitations/implications – The field of mobile digital technology advances very quickly. This research represents the state of mobile learning in mid-2008.

Practical implications – Library and information professionals will gain a sound conceptual grasp of the social science of mobile technology; the science of mobile technology, and current applications for mobile technology.

Originality/value – This paper addresses issues about the feasibility and future development for library services utilizing mobile technology, provides directions for future individual study and institutional research and development.

Keywords Mobile libraries, Library systems, Learning, Digital libraries, Information strategy

Paper type Literature review

This article is intended to serve as a guide for librarians producing mobile learning (m-learning) initiatives. Presented here is a literature review of mobile technology use both within the library and information science arena and projects outside of this sphere, such as human computer interaction (HCI) and medical informatics research. As a literature review, treatment of the literature and service development is interwoven such that review and suggestions for development are not treated as separate topics. Indeed, at this time (mid-2008) there are projects making use of mobile technology underway in special, academic, and public libraries. Most libraries exist within and are difficult to divorce from, parent organizations, be they corporate, municipal, or academic and as such serve a population which accesses its information at a distance from this aforementioned home information provisioning complex – and yet, mobile technology use does not preclude the possibility for invigorating and delivering a compelling on-site library experience.

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As can be inferred from the frequent mention within the distance learning literature, m-learning is often situated within the domain of distance learning. Perhaps at this point it is a disservice to fruitful inquiry to say m-learning belongs to any specific discipline. Mobile technology utilization is not yet a highly robust development in librarianship. This paper explores the challenges ahead and strategies for managing the adoption of mobile digital services and collections. Mobile resource adoption rests in understanding the functions of technology and the pedagogy this technology enables. This paper begins with the social science of mobile technology progressing toward the underlying science of mobile employed to realize new forms of learning. The second section reports on mobile applications in libraries. The third and final section includes a review of resources and suggested philosophic frameworks for the inherent active nature of mobile. Without much advocacy or noise on the part of librarians the march to mobile is underway.

The significance of m-learning
Unpacked here is the sociotechnical significance of m-learning, the why you should care portion of the paper. Keep in mind that m-learning technology includes hardware such as cell phones and mp3 players and software such as operating systems and applications. M-learning still faces barriers to widespread adoption. The disposition of these barriers is web-based, economic, and design.

New technology
M-learning as a phenomenon has been in process, unintentional progress since the late twentieth century. The unintended consequence of smaller and faster computing is the enabling of an anywhere and anytime learning. In the course of scientific discovery products are produced which have novel application that are wholly unintentional. This is the unplanned nature of science – phenomena occur and exist before being named and investigated. Students learn through new technology before educators have inquired to their attributes. In this way we now play a game of catch-up. M-learning represents possibility (Eisenberg, 2007) minimally developed and remains as yet unrealized and has not been made of experiential and active use for users of our libraries or our students. M-learning represents a well-intentioned effort (perhaps not wholly fad-free, but withhold judgment for a moment) to further assist humanity in the development of its learning. For our highly scheduled, commodified, pressured students, there exists a need for any time anywhere information – structured information that is organized and accessible. This is surely the domain of the librarian; better yet, the librarian qua teacher. This article suggests that there exists an m-learning impulse occurring outside the domain of librarianship of which it would be wise to take notice (Traxler, 2007; Kukulska-Hulme and Traxler, 2005).

Demographics of use and users: the dispersion of mobile technology
According to the Pew Internet and American Life Project report Mobile Access to Data and Information, the cell phone ranks as the most highly valued technology in America, finding that it (the cell phone) is the technology which Americans are most unwilling to part with (Horrigan, 2008a). This preference has surpassed the internet and television: these results indicate a fundamental societal preference shift occurring in the past five years. Indeed it is crucial to note, as the report does, in large bold and
italicized type that: “62 percent of all Americans are part of a wireless, mobile population that participates in digital activities away from home or work” (Horrigan, 2008a, p. 1). The confluence of significant demographics include: the finding that for English speaking Hispanics the cell phone is a crucial part of their lives as they “are much more likely to say it would be hard to be without a cell phone than to be without the internet or email” (Horrigan, 2008a, p. 2), more so than Blacks or White Americans; of those who reported they would not wish to give up the cell phone over any other technology, the majority were people between the ages of 18-29 (Horrigan, 2008a). Horrigan’s (2008b, p. 1) analysis from Seeding the Cloud: What Mobile Access Means for Usage Patterns and Online Content is that “cell phone users are more likely to be found in groups that have generally lagged in internet adoption, such as senior citizens, blacks and Latinos”. By extension, it could very well be that mobile digital library services may be able to reach populations that have been heretofore underserved.

With regard to the worldwide dispersion of mobile technology, an April 2008 issue of The Economist features a series of special reports on mobile technology implications. One of the reports “Nomads at last”, related that:

According to the International Telecommunications Union, 3.3 billion people, more than half the world’s population, now subscribe to a mobile-phone service... so the internet at last looks set to change the whole world (The Economist, 2008).

An April 2008 a New York Times article “Can the cell phone help end global poverty?” (a question that has significance simply because it is asked) reports data from the International Telecommunications Union stating that, “by the end of 2007, 68 percent of the world’s mobile subscriptions were in developing countries” (Corbett, 2008, p. 3). This datum suggests that mobile technologies are the harbingers of something very, very significant:

A 2005 London Business School study extrapolated the effect ... concluding that for every additional 10 mobile phones per 100 people, a country’s GDP rises 0.5 percent (Corbett, 2008, p. 4).

The significance of this information is that mobile is at once a technological, educational, and commercial phenomenon.

M-learning is an important development considering that our users, to the point of ubiquity, own cellular phones, iPods, or mp3 players. Over time mobile devices become more affordable with advances in engineering and design. Consequently, learning can occur in a just-in-time manner for our users and students, by way of content that is equally of adequate size for time constraints, i.e. a kind of micro-content (Shih and Mills, 2007). M-learning, as a discipline of distance learning is in need of sustained longitudinal evaluative study (Kukulska-Hulme, 2007). To write about mobile technology use in libraries wisely is to address the historical continuities of previous library and information science research. The specifications and research on e-books and digital content is well trod and instructive for mobile digital librarianship.

Digital libraries and e-books
A traditional conceptualization of the digital library content experience is the a priori assumption that this material will be utilized on a desktop PC. The e-book is not solely for desktop PCs as evidenced by the container paradigm of the.epub file extension (IDPF, 2008) whereby the specification authors envision any given book reading device
(this need not exclude the most ubiquitous of devices such as iPods or cell phones, which can theoretically host reading systems) to be “reflowable” (Albanese, 2007). The authors behind this specification make the important distinction between e-book content and e-book processors writing that the specification “… enables publishers to create content in a single format that can then be rendered on a variety of reading devices” (Renear and Salo, 2003, p. 458).

The material nature of digital content (Manoff, 2006) is an important conceptual – although problematic, (Floyd and Renear, 2007) frame for the field of mobile digital learning. Questions that must be considered by librarians are the fundamental assumptions we make about our content and its extensibility into non-library systems. One m-learning research project is designed to be inclusive of libraries as a rather small facet of delivering learning content in course management systems to mobile devices (Rekkedal and Dye, 2007). These distance learning educators envisioned a type of “m-course management system,” where the presence of library like resources is included and of importance for mobile learners. The skills for library resource provisioning to students at a distance have been sharpened by web content librarians.

Technology: web-developers
The representation of information on-line suffers from linking content with representation (Renear and Salo, 2003, p. 458). The fundamentals of information modeling rest to some degree on an aptitude for understanding the importance of XML and its ability for serialization of disparate encoding standards. Representation of content for e-books is very much the same logical problem as the representation of web content for mobile devices. The initial design decisions for data representation online impacts its use for mobile devices. An important distinction to make is the “logical approach” separating structure from presentation (Renear and Salo, 2003, p. 475).

To format a web presence to be readable on mobile devices requires specialized web-based solutions. Goh and Kinshuk (2006) describe the principles involved in reformatting work. They term this work “adaptivity” laying out a guide for producing systems that adapt to user needs by device and person. This guide includes such strategies as using “Extensible Markup Language (XML), Extensible Stylesheet Language (XSL) transformation, Document Object Model (DOM) and Active Server Pages (ASP) for dynamic interaction” (Goh and Kinshuk, 2006, p. 176). Development of educational web content by way of Wireless Application Protocol 2.0 (WAP 2.0) and Wireless Markup Language (WML) for mobile device network access is instructive for web content developers (Chen and Kinshuk, 2005).

North Carolina State University is an example of one academic library that is working to reformat its presence onto mobile devices and provide access to library services from a user’s mobile device (www.lib.ncsu.edu/m/about.html). The MobiLib initiative features the ability to search the catalog from their mobile interface, as well as other library services such as computer availability and a campus directory search. They also include links to other mobile services such as Facebook mobile and Google maps mobile (www.lib.ncsu.edu/m/links/services.html). A speculation as to the reasons for these links (and an important design consideration) is the cumbersome nature of keying in URLs on mobile devices lacking a traditional keyboard interface.

At Athabasca University (http://library.athabascau.ca/drr/index.php; McGreal et al., 2005) the Digital Reading Room serves as a portal to mobile learning objects. This
reading room delivers course specific electronic documents; content in MP3 format, and podcasts. AirPac (http://aupac.lib.athabascau.ca/airpac/jsp/airpacIndex.jsp) is Athabasca’s mobile solution for searching their online catalog from a mobile device (McGreal et al., 2005).

Further examples of mobile reformatting work are addressed at the Super Patron Blog (Superpatron – Friends of the Library for the Net, 2007). Example initiatives include work produced by Black Hills State University (http://iis.bhsu.edu/lis/pda/) and Ball State University (www.bsu.edu/libraries/mobile/). These examples represent a non-exhaustive list and serve to provide an overview and introduction to models of mobile web presence starts. M-learning is a broader domain than the (still crucial) reformatting of the library web presence to mobile devices; it is necessary to have an appreciation for what the small computing devices our users now carry can enable. This new learning paradigm can be realized through new, yet unrealized combinations of hardware and software applications – but these applications must first be allowed through provider networks and proprietary systems.

Of economics and special barriers to m-learning
Future mobile digital library services hinge on these four interconnected economic issues of design and business models:

1. subscription data plans;
2. open source software;
3. content/presentation logic; and
4. user needs.

It is important to note that creativity, the most precious of all resources, is not expensive. It is important to guard against needlessly imposed barriers to one’s thinking in this domain; there are plenty real barriers to overcome.

As an example of creativity in closed systems, consider the case of the iPod. There are freely available resources: such as the iQuiz maker (www.iquizmaker.com/) for the iPod. Further hacks for the iPod include using the new Notes feature in the Extras facet of the iPod interface. It is relatively easy for a library staff member to copy and paste text (in manageable chunks) from an open access project such as Project Gutenberg, and then move this content as a text file over to the iPod. This technique works with the current release of the Fifth Generation iPod software (version 1.3), and experimenting with new functionalities in later software releases will be a cost effective way of working within what would (perhaps incorrectly) seem to be a closed off domain for creativity and service innovation.

It may well be the case that m-learning can help realize efficiencies for employees, students, educators, and librarians. John Traxler writes that the implementation of m-learning initiatives can save costs if one considers the resource intensive costs of computer laboratories (Kukulska-Hulme and Traxler, 2005, p. 174). Academic institutions (and in some regards public libraries) are challenged to “widen participation, improve retention and increase access; reduce unit costs; recognize student difference, diversity and individuality,” – making use of the technology students already use on a daily basis may help to meet these institutional priorities (Kukulska-Hulme and Traxler, 2005, p. 175). A good portion of Traxler’s (2005) chapter
“Institutional issues: embedding and supporting”) in Mobile Learning, discusses more on the economic perspective on mobile learning in an institutional context – it is a good synthesis generally on technology adoption, drawing also on the highly relevant work by Moore (1991), Crossing the Chasm: Marketing and Selling High Tech Products to Mainstream Customers.

Affordable data plans/wireless internet
Vendors of cellular phones and cellular network providers are two crucial components in the future of m-learning. Mobile devices may not be designed for repurposing by libraries, so the degree to which future devices adhere to interoperability specifications (such as the specifications the W3C will develop) will be important. It will be the people who purchase phones that can influence this market, the consumer who demands mobile device interoperability with their home PC and other information technology may help bring about more growth in mobile technological applications in the library space – space which exists partially within the political economic reality of vendor supplied content.

The walls to a broader mobile learning initiative are partially imposed by cell phone network providers desire to maximize profits. It is a businesses reason for being – they will only let these walls crumble if they can sell more, and it follows that the library vendors that exist for profit will only seek to develop via mobile if they believe there is a market. Robust mobile services may yet still be relegated to the early adopter set. The number of years we have to go until all barriers are gone cannot be justifiably asserted here. All told, a sub-corollary will be the falling prices of data service plans that are included in mobile phone subscriptions. Consumers will fear the adoption of data service plans (an accompanying component to a cell phone service agreement that is necessary for delivery of web resources) if it will mean they will have to pay more. Infrastructure developments like the new wireless network being constructed by a consortium of wireless providers for next generation cell phone internet access is an important development to watch (Richtel, 2008). The best argument to make for m-learning initiatives is that in the long term mobile service can actually make you a more efficient person, perhaps leaving you smarter and with more time.

Open source software
The Open Handset Alliance (www.openhandsetalliance.com/) is an important resource to watch, and may help erode the barriers to mobile learning both inside and outside of library space. Google Code (http://code.google.com/) and Sourceforge.net (http://sourceforge.net/) are essential resources for acquiring open source software for mobile devices. One such incredible application is the Encyclopedia download (http://sourceforge.net/projects/encyclopedia/) which allows users to place an e-book of Wikipedia onto their iPod.

Separating content from representation
Presented earlier with regard to e-books is the nature of content representation. Covered also is the presentation of format using reformatting principles. The separation of content from presentation in line with the logical model would actually negate some aspects of reformatting challenges, thus succeeding in the extensibility of library resources – beginning with the most obvious, the library homepage. XSLT is
Concerning the limits of user needs assessment: open world/closed world problems

Perhaps assessment of user needs has overlooked mobile technology for library service deployment. The 2008 Horizon Report by New Media Consortium and Educause Learning Initiative (2008 (http://connect.educause.edu/Library/ELI/2008HorizonReport/45926)) lists mobile broadband as “one of the six areas of emerging technologies that will have a significant impact on higher education in the next three to five years.” If one only examines that which occurs within the library one assumes a closed world stance. Closed world perspectives indicate that everything that can be known is known. This perspective underscores the limits of assessment of physical library space.

As librarians seek to know the totality of our users we will only glimpse a portion of the total narrative. We must be cognizant of the implications of the problematic nature of the narrative (as per Foucault (1972) in Archaeology of Knowledge) and recognize user assessment as only a fractured picture of an open world. Advocated here is not an end to assessment but rather a tempering of a positivistic impulse. To address the limits of empiricism, philosopher Jaspers (1955, p. 71) notes:

Deductions of actual occurrences from theories of some fundamental reality construct models, but they never succeed in grasping anything except limited realities, mere aspects of empirical existence.

Applications of m-learning

Applications of mobile technology enabling m-learning occur across a wide range of disciplinary space. HCI and medical informatics groups are perhaps most experimental within this domain. Innovations by these professionals will lead to service innovation in libraries. After exploring the implications m-learning means for service innovation generally, this section goes on to review mobile technology use in disparate library types: special, academic and school, and public; initiatives discussed in each are not mutually exclusive to the library group to which it belongs.

Service innovation

It is written in the monograph Georeferencing that “whatever occurs, occurs in space and time” (Wegener, 2000 as quoted in Hill, 2006, p. 1) Consider a typical undergraduate student (if such a person exists) researching an English paper. The research occurs in a time intensive/time critical manner. The student may be seeking information with limited space, i.e. the constraint of either not wanting to go to the library physically or the physical library being closed. A student may simply not know, given the stressors of time, what information resources may be available to them at the present. The mobile devices which students carry can be loaded with an application directing them through the information seeking process in a manner which considers space-time constraints. This is the yet unrealized potential of computing ubiquity and the library.

Technological capabilities of cell phones include, but are in no way limited to the following protocols, file productions, and allowances; true GPS, WiFi, video, picture,
text (SMS), multimedia messaging (MMS) data processing and storage capabilities. Many higher-end phones are able to create digital video, digital photos, as well as playing mp3s.

Medical informatics approaches for services on mobile devices include solutions which enable data sharing across multiple disparate work spaces. These initiatives can be viewed as an attribute of ubiquitous computing. Cell phone capabilities, the use of a patient “smart card” and web services are explored by Chan (2000) with their ability for facilitating access of patient data across multiple medical case sites. Further research into the ubiquity of what mobile devices enable include articles exploring prescription tracking on PDAs (Rubin et al., 2006), and further work on data entry and data access (Andrade et al., 2003; Cole et al., 2006). A reoccurring theme in the literature is the notion of a personal area network (PAN), the significance of which is explored by researchers exploring mobile device use in assisting patient treatment (Buchauer et al., 1999) or to expedite the processing of paperwork (den Hartog et al., 2006) and patient check in by way of mobile phone (Sax et al., 2005).

SmartLibrary at the University of Oulu in Finland is a localization approach which enables library users to locate collections through use of their mobile device (PDA and high-end cell phones) based on where they are within the library. This system is built on the context aware architecture SmartWare (Aittola et al., 2003). Health care literature describes context-aware services as “… an application’s ability to adapt to changing circumstances and respond according to the context of use” (Munoz et al., 2003, p. 38). A usability study of mobile assisted localization finds that navigating a physical library collection through the use of a mobile device may be most applicable to campus libraries which feature disparate collection locations (Aittola et al., 2004).

Research which sought to make full use of all cell phone hardware and software capabilities in tandem would be creating a service which did not have a true analog in the physical library. Combine the features of context aware solutions (Aittola et al., 2003) with student profile data (Granchev et al., 2007), and OPAC data or other search data (Jones et al., 2007; Schusteritsch et al., 2005), with digital picture data (Davis et al., 2005; Jia et al., 2006) and what you have is a truly unique resource – a library application that will guide students through research confusion and with a new tool for navigating the university successfully. The library as a lab for m-learning services is a future worth pursuing and realizing. The development of such a platform provides the library with a way to be an instrumental part of the student’s life.

New applications for mobile devices to suit library needs necessarily require a new discourse. Just as interface design and usability study was not a librarian skill-set when librarianship became a profession, so too must mobile technologies be integrated into the professional tool-kit. Librarians can understand what device development is most applicable to their students by accessing or collecting data about the technology their students carry. Surveying mobile use and needs “in the field” before tools are developed is a necessary first step for service development.

Academic librarians will find technological infrastructure for m-learning already exists on their campus. Educational information technologists are interested in new computing applications. Developing the infrastructure for m-learning need not be produced by librarians alone - - researchers in engineering, computer science, education, psychology, and sociology may be investigating m-learning or may have similar interests in new technology. Researchers may not be aware that what they are
investigating could serve a public service need and look for practical application for
their hardware. Librarians are well suited to provide this practical viewpoint.

Special libraries and workplace utilization of mobile technology
De Groote and Doranski’s (2004) article surveys health professionals, reporting that
health care professionals (a data intensive profession) are developing applications and
practical uses of reference sources on their portable digital assistants (PDAs).
Furthermore, this article reports on initiatives by medical librarians to instruct their
users in PDA use and purchase. These instruction sessions on using PDAs continue as
of this writing. Librarians of all user groups can revision the pioneering medical
informatics initiatives for any library user to realize novel technological pedagogy.

IBM considers itself a learning organization and mobile technology figures into this
vision. This organization utilizes a series of web lectures to connect their employees
who work at a distance to new information within the organization; these lectures are
available through the use of mobile technology and realize a kind of “just in time
learning.” Many of the attributes of mobile learning best practice discussed in this
paper can be summarized by the IBM experience – creating manageable chunks of
content given temporal and hardware constraints (ten minutes), the creation of
employee profiles (drawn from human resource data) so that individualized content can
be delivered based on professional need (von Koschembahr and Sagrott, 2005).

The productive nature of mobile is further underscored by Abram (2005) in an
Information Tech article wherein he writes that the PDA is a productivity tool, and has
replaced the desktop PC for common office tasks and has been utilized in the corporate
sphere to connect to projectors for presentations. Essentially, Abram (2005) is saying
that special librarians would be wise to adopt the tools which their primary users
(employees in auditing firms, the military, consultants, executives, medical, sales,
investments, finance types) employ so that they can better appreciate the challenges to
being a mobile user wherein the medium of mobile very much shapes the experience.

Civil engineering professionals have embarked on studying how to use cell phones
as a way to infer congestion problems. The research into this emerging field of study
can be found in an article by Qiu et al. (2007): “Investigate the feasibility of traffic speed
estimation using cell phones as probes”. According to an article in CNET, Google maps
traffic data culls its data from commercial fleets (Terdiman, 2008). Observant public
service librarians recognize Google as the first resource of choice for their patrons and
need no additional data to infer the ubiquity of cell phone use among the academic and
student user groups.

Academic and school libraries
In higher education the support of student persistence is one in which we see research
for both the first, (Upcraft et al., 2005, pp. 27-46) second, (Tobolowsky and Cox, 2007;
Schreiner and Pattengale, 2000) and later transitional years (Gardner and Van der Veer,
1998). M-learning has a part to play in addressing the problem of student persistence
and retention (Fozdar and Kumar, 2007). Fozdar and Kumar (2007) argue students who
cannot afford a PC do manage to purchase a mobile phone. The devices which enable
m-learning may help alleviate the problematic digital divide; a protracted battle on the
unequal dispersion of technological and information resources, of which librarians
cannot win with their current technology and collection resources taxed and shrinking.
The blended roles of instructional design and academic librarianship have seen scholarly inquiry in the monograph *Academic Librarianship by Design* by Bell and Shank (2007). Articles that discuss how teachers and students across the globe make use of m-learning technology include Peters (2007), who discusses educational approaches in the workplace in Australia, and Aderinoye *et al.* (2007), wherein m-learning is advocated to improve literacy skills in Nigeria. The application of m-learning in Nigeria is opportune in that PC ownership and internet access is relatively low as compared to the number of families owning cell phones. From the *New York Times*:

A “just in time” moment afforded by a cellphone looks a lot different to a mother in Uganda who needs to carry a child with malaria three hours to visit the nearest doctor but who like to know first whether that doctor is even in town. It looks different, too, to the rural Ugandan doctor who, faced with an emergency, is able to request information via text message from a hospital in Kampala (Corbett, 2008).

Instructional designers will be interested in the technological foundations on which m-learning is built (Caudill, 2007) and possibilities to build on the instant messaging successes that reference services have realized (Kadirire, 2007). A further pedagogical application of cellular phone use for learning includes the use of text messaging (SMS). Developing library services for a user’s cellular phone can be informed by educators experience with language learning. *Learning Italian via Mobile SMS* (Levy and Kennedy, 2005, pp. 76-83) relates findings from student surveys with regards to the best times to send messages (9-10 a.m.) and the rate at which to send (two a day). For school librarians working in media centers, the monograph *Handheld Computers in Schools and Media Centers* will provide a helpful introduction to pedagogy and technology for their special setting (Bell, 2007).

With the assistance of mobile technology, librarians can produce new research methodology for the way we study information search by students and in how faculty create knowledge. Current models of information seeking (Kuhlthau, 2004) do not include in their longitudinal view the use of mobile devices (or other attributes of ubiquitous computing), and may only give librarians a picture of a now past research archetype. Concomitant information literacy studies give the unique methodological view of students and their information seeking experience, finding information literacy to be a continuum of experiences (Bruce, 1997; Maybee, 2006). This methodology will be useful as a paired-with-mobile research method in further understanding how students experience the research process assisted by mobile devices. M-learning can give us a new conception of data in the world, the classic database text *Data and Reality* poses the question: what affordances can one expect from information systems and their correspondence with reality? (Kent, 2000) A close integration of the physical world with the database, a virtual (often imperfect) representation, is possible with mobile technology applications.

Public libraries

Public librarians interested in developing m-learning initiatives can situate new programming within their information literacy programming. Jehlik (2004, p. 9) writes:

Although the Omaha Public Library hasn’t taken the plunge into cell phone instruction, the demand is there. The request shows up frequently on computer class evaluation sheets and customer comment cards. In Finland 80 per cent of public libraries offered cell phone instruction during a program called Finnish Senior Surf Day.
This is illustrative also of the nature of mobile devices as a being a type of computing. For a public librarian looking to connect with their community, a geocaching activity can be sponsored. Geocaching games rely on GPS coordinates and a cache to be located at those coordinates. The cache can lead to other locations, contain a prize of some sort, or could just serve to introduce the citizen to their surrounding community.

Building on research from the Pew reports, the user group ages 18-29 may be willing to subscribe to a service whereby they receive text alerts from the library regarding in-library events, such as a the showing of a film or an author speaker series. This user group may opt to receive text alerts from the library reminding them of an event which matched their interests. The ideal service would allow the user to configure a profile such that the library will only send the user notices of events regarding those which most interest the user. Ideally the service would allow the user an option to opt-out and reconfigure at will. Such a service can be built by modifying existing e-mailer software.

Senior citizens and teenagers are challenging demographics and yet, each group has much to contribute to the other. In-library programming such as having teenagers show senior citizens the nuances of texting, how to purchase a phone, or how to create and send a picture or video through MMS. Texting should not be referred to as a kind of writing; teenagers do not view texting as writing according to a recent Pew Internet and American Life Project and National Commission on Writing Report: Writing, Technology and Teens (Lenhart et al., 2008).

All users will potentially make use of and benefit from a service like the one in operation on the Tri-County (http://tripod.brynmawr.edu/search/) catalog, where users can text the call number of a book to their phone. In this way the cellular device replaces a type of paper use in the library. The author has observed that students will enter library call numbers into their cell phone even in the absence of tools dedicated to facilitate this.

Setting up an automated alert that texts a users phone when the item they have requested is available might actually be more useful than the current method of e-mailing an “item available” notice to the user. Generally the user will need to know the book is available in the just-in-time method of getting a text alert so that they can re-arrange their daily schedule on the fly. This is in contrast to the passive experience of checking their e-mail when they have downtime in their schedule and realizing that the library is now closed or too far out of the current trajectory to pick up the item. Certain other courtesy notices can be included in this service sphere such as automating a text message service that alerts patrons when the item they have checked out is about to be due, or sending a reminder letting them know that items are quite overdue. To maximize user convenience, these services ought to be opt-in and easy for the individual user to configure preferences as it suits their desires. Tailoring the m-learning experience to user-defined profiles is an attribute of m-learning best practice. There is very little by way of philosophic framework for m-learning (see Nyiri, 2003 for conference proceedings dedicated to this topic).

**Resources for further study**

This third and final section suggests resources for continued m-learning study. Library and information science will make contributions to the emerging m-learning
movement. Librarian contributions need not be limited to information organization, preservation, and access. The domain remains an open world of possibility.

The following resources have been highly instructive for learning both technological and sociological implications of m-learning. A good deal of material can be found in research databases, but owing to their cost, free web based resources are included here as well. Subscribing to syndicated alerts is a useful strategy for staying current in a fast moving field.

The ACM Digital Library Portal and IEEE Conference Proceedings are valuable resources for learning more of the high-end applied research in mobile computing. There is a variety of research on visualization of route information on mobile devices in HCI abstracts (Burigat and Chittaro, 2005; Rodrigues et al., 2006; Kray et al., 2003) and creating digital maps for mobile devices (Nurminen, 2006) that are applicable to helping design library route finding applications. Research in a recent article in Library Hi Tech (Liarokapis and Conradi, 2007) explores how to design mobile interfaces for wayfinding in cities. Research on the conceptual models needed to develop wayfinding services is instructive as well (Li and Willis, 2006). Consider the application this has for the research university, which is itself a city to explore. In this way the library can position itself as indispensable; providing a new platform of orientation for new students, a new way of seeing the campus for the seasoned student, an easily navigated pathfinder for visitors to make sense of their environment, and finally, new forms of accessing, organizing, preserving, and creating research for faculty (Burigat and Chittaro, 2005).

Pew Reports are freely available at www.pewinternet.org/. Educause “Seven things you should know about” are useful and freely available briefs. Two that are germane to mobile learning include reports on augmented reality (http://connect.educause.edu/Library/ELI/7ThingsYouShouldKnowAbout/39384) and e-books (http://connect.educause.edu/Library/ELI/7ThingsYouShouldKnowAbout/39397).

The Mobile W3C Working Group (http://www.w3.org/blog/MWITeam) is the standards committee working to develop mobile web best practice. W3C is the World Wide Web Consortium which, according to their webpage (www.w3.org) develops, “interoperable technologies (specifications, guidelines, software, and tools) . . .” and is a great resource to learn about many emerging web components such as RDF, RDFS, OWL, and XML, all important in the continuum toward semantic web operationalization.

Search Technorati (http://technorati.com/) for the most popular mobile related Blogs and news stories. This paper has drawn heavily from the New York Times. This article’s author subscribes to a syndicated alert service which sends an e-mail notification when an article on mobile technology is published. This is practically a daily occurrence, with multiple articles available on some days. Owing to the interdisciplinary nature of the field, articles on this topic can be found in business, technology, and education portions of the paper.

Conclusion, with thoughts about m-learning philosophy for the librarian and the library
M-learning gives the library a way of becoming something more than it is now. M-learning is activeness in the learner and life for the library space. Building on this experience for our profession, being a librarian and experiencing learning of a type
made possible through technology is a grounding philosophy of m-learning for the library. Be wary of the having orientation, and seek to focus on being, which is to say a state of progress and for the person (Fromm, 1976). Ranganathan (1931), in his Five Laws of Library Science promulgated the idea that a library is a growing organism.

The existence of the library in mobile digital form will be something altogether unequal to the physical realm. The m-library is not truly the library on a portable device but rather a new unequivocal resource that can reshape scholarship, study, research, and librarianship. Digital library content on mobile devices is a new existence for the library.

The m-library does not mean the end of usefulness for libraries or librarians. Mobile devices are an opportunity for crafting new library services such as in-library exploration, social engagement, and outreach to traditionally underserved populations, as well as micro-instruction and learning – all of which lead to new efficiencies which enable the possibility of turning the tide on the unequal dispersion of information resources and perhaps one day closing an unjust digital divide. This orientation shows the institution, the profession and the person becoming something they have not been before, as opposed to having something it did not have. An alteration in your existence is no doubt terrifying. And yet, to assert existence in the face of non-existence is true courage (Tillich, 1952).

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