“Libraries are fully engaged in the process of adapting to increased demand for electronic collections and the ongoing acquisition and archiving of born-digital content.”

Lisa Carlucci Thomas, from Libraries, Librarians and Mobile Services, p. 8

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Libraries, Librarians and Mobile Services

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Want to go mobile? No money? The libraries in our special section share how they have managed this feat in these difficult times. In “Libraries, Librarians and Mobile Services,” guest editor Lisa Carlucci Thomas and her six authors (Dan DeSanto, Michael Whitchurch, Edward Iglesias & Wittawat Meesangnil, Tiffini Travis & Aaron Tay, and Jeff Wisniewski) offer useful ideas through case studies in academic libraries and more general advice relevant to many settings. They also review the kinds of mobile websites and mobile apps that libraries are creating as they add this latest wave of new and/or value-added services to their outreach.

Looked at from a different perspective, we could say our special section is also about information architecture (IA). Although the authors rely heavily on tools and prototypes that already exist, they urge local customization, usability testing and adherence to standards. In fact, Travis and Tay even provide guidelines for evaluating websites. In this light, Tibor Koltay and Thom Haller, the Bulletin’s associate editor for information architecture, each contribute to the discussion at a more general level. Koltay references a recent Bulletin article by Nate Davis on information architecture (IA) and its role in reducing information overload (IO) (www.asis.org/Bulletin/Jun-11/JunJul11_Davis.html). He discusses the various literacies associated with information, but particularly digital literacy (DLi), its role in managing IO and its relationship to IA. In his regular IA Column, Haller, asks, “Is IA dead?” He maintains that despite the cost considerations in building and testing a well-structured website, it saves users time, money and a great deal of frustration, a goal all our authors, whatever their means, vigorously endorse.

Career doldrums? Sherrilynne Fuller should inspire you. As the first presenter in the new ASIS&T Award Lecture Series, she urges increased development of proactive, prevention health informatics systems. These systems buttress public health – an under-developed area compared to the clinical systems aimed at supporting intervention in individual cases – and one that presents unique challenges. In “From Intervention Informatics to Prevention Informatics” she notes that the gap between prevention and intervention persists despite the much-increased threat posed by how quickly disease can spread in the modern era. Here, again, mobile technologies, especially cell and satellite phones, are playing a large role in gathering and transmitting data as well as communicating it. For a very helpful general overview of health informatics as a career field, please see our recent guide through the maze by Prudence Dalrymple, “Data, Information, Knowledge: The Emerging Field of Health Informatics” (www.asist.org/Bulletin/Jun-11/JunJul11_Dalrymple.html).

Finally, in her President’s Page, outgoing ASIS&T president Linda Smith discusses aspects of ASIS&T’s communications structure and the role of its various publications and urges our readers to contribute to them. Hear ye! Hear ye!
The publications of a professional society such as the American Society for Information Science and Technology (ASIS&T) benefit not only the members but also many others, including students, researchers, practitioners and policy makers. ASIS&T has an active publications program that is reaching an ever-larger audience through its digital library and other access points to the publications available in digital form. At the same time, print monographs remain an important part of the publications program.

The *Journal of the American Society for Information Science and Technology* (JASIS&T), edited since 2009 by Blaise Cronin, Rudy Professor of information science at Indiana University, “is the preeminent journal of its kind in the world and the enduring record of our field’s intellectual focus and evolution” [1, p. 5]. Contributing authors come from around the world. A recent addition to JASIS&T is “Advances in Information Science,” a series of in-depth review articles edited by Jonathan Furner of UCLA. Because these articles appear throughout the year, they can be more timely than the reviews previously published in the Annual Review of Information Science and Technology (ARIST) (which ended publication with volume 45 published in October 2010). The first such review appeared in the June 2011 issue of JASIS&T, authored by Miles Efron of the University of Illinois at Urbana-Champaign on “Information Search and Retrieval in Microblogs.”

The *Bulletin of the American Society for Information Science and Technology* benefits greatly from the dedication and expertise of Irene Travis, a member of ASIS&T since 1968 and Bulletin editor since 1997. The Bulletin is freely available online and transitioned to digital-only publication in 2007. The primary

The core publication is the *Journal of the American Society for Information Science and Technology* (JASIS&T), the primary channel for scholarly communications for the field. It is supplemented by the *Bulletin of the American Society for Information Science and Technology*, the Proceedings of the ASIS&T Annual Meeting, ASIS&T monographs, and the ASIS&T Thesaurus of Information Science, Technology and Librarianship. Access to these resources is expanding through the ASIS&T Digital Library. Together, the society’s publications serve as important and impartial communication vehicles for members and others. ASIS&T members are invited to share their expertise and opinions, contributing as authors to the *Journal, Bulletin, Proceedings* and monographs.

**KEYWORDS**

publications  
digital libraries  
scholarly publishing  
information science  
journals  
information technology  
monographs  

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**EDITOR’S SUMMARY**

The publications of the American Society for Information Science and Technology (ASIS&T) continue a strong, 60-year tradition of disseminating professional information started by the American Documentation Institute and its successor, the American Society for Information Science. ASIS&T’s publications inform members and others seeking knowledge of the field, its practice and of policy related to information, associated technologies and information access. The core publication is the *Journal of the American Society for Information Science and Technology* (JASIS&T), the primary channel for scholarly communications for the field. It is supplemented by the *Bulletin of the American Society for Information Science and Technology*, the Proceedings of the ASIS&T Annual Meeting, ASIS&T monographs, and the ASIS&T Thesaurus of Information Science, Technology and Librarianship. Access to these resources is expanding through the ASIS&T Digital Library. Together, the society’s publications serve as important and impartial communication vehicles for members and others. ASIS&T members are invited to share their expertise and opinions, contributing as authors to the *Journal, Bulletin, Proceedings* and monographs.
audience is information science practitioners, and articles provide timely coverage of topics of broad interest as well as ASIS&T news and opinion pieces. Often an issue has a theme with several related articles on a topic such as information architecture, search, information behavior, information science education, crisis informatics or knowledge organization.

Each ASIS&T Annual Meeting has an associated conference Proceedings. Conference proceedings from 2009 and 2010 are freely available (www.asis.org/proceedings.html), providing easy access to the wide range of papers and posters presented. The ASIS&T Digital Library provides access to older volumes of the proceedings (2002-2008), as well as issues of JASIS&T and its predecessors (Journal of the American Society for Information Science; American Documentation) back to 1950, the Bulletin since 1996, and ARIST volumes for 2002-2005.

ASIS&T monographs, published by Information Today, Inc. on behalf of ASIS&T, take a variety of forms. The ASIS&T Thesaurus of Information Science, Technology and Librarianship (with a 3rd edition published in 2005 by Alice Redmond-Neal and Marjorie M. K. Hlava) provides an authoritative terminology reference. Other sample titles illustrate the range of topics covered (http://books.infotoday.com/asist): Theories of Information Behavior; Covert & Overt: Recollecting and Connecting Intelligence Service and Information Science; Digital Inclusion: Measuring the Impact of Information and Community Technology; Information Representation and Retrieval in the Digital Age; and Introductory Concepts in Information Science. The most recently published monograph (August 2011), Introduction to Information Science and Technology, is the result of a unique collective effort made possible by use of a wiki to support collaborative authorship. Edited by Charles H. Davis and Debora Shaw of Indiana University, both past ASIS&T presidents, the 14 chapters represent a synthesis of the work of more than 80 contributors. The wiki that supported the collaboration presents considerably more detail, opinions and interpretations than could be included in the print edition. The intent is to provide ongoing access for ASIS&T members to the wiki, with the goal of continuing development of the text in anticipation of publication of a second edition at some point in the future.

In the first issue of American Documentation, published in 1950, Vernon Tate noted that the editors and publishers were “motivated only by the spirit of scientific inquiry and service to users of documentation.” He characterized its aims as follows:

...to serve as an impartial clearing house and channel of communication for information from any source about documentation; for the publication of original research in the field; for reporting investigations of new techniques, mechanisms and devices for documentation and their applications both in the United States and abroad; to assist in the development and adoption of basic standards; to provide bibliographic and other control of the literature; to serve as an effective medium for national and international cooperation and exchange in documentation; to stimulate and discuss new ideas and approaches to existing or future problems; and for the publication of material originated by the American Documentation Institute. Its pages are open to all. [2, p.3]

In the intervening 60 years, the publications program of ADI/ASIS/ASIS&T has expanded to offer even more opportunities for individuals to contribute to the literature of information science and technology. In conclusion I echo Tate’s invitation to become an author and share your expertise, whether in JASIS&T, the Bulletin, the Proceedings of the Annual Meeting, or the ASIS&T monograph series.

New Faces to Join the ASIS&T Board of Directors

Each year at the ASIS&T Annual Meeting, a new administrative year begins, and the first official order of business is the introduction of newly elected members of the ASIS&T Board of Directors. When the membership gathers in New Orleans this month, the changing of the guard will take place with the inauguration of a new president and the seating of the new president-elect and two new directors-at-large.

Positions filled through the summer balloting process are for three-year terms. Those elected are Andrew Dillon, president-elect, and Diane Neal and Jens-Erik Mai, directors-at-large.

As new members take their seats, Diane Sonnenwald, elected last year as president-elect, will assume the presidency from Linda Smith, who continues on the Board for an additional year as past president.

Andrew Dillon is the dean and Louis T. Yule Professor of information science at the School of Information, University of Texas at Austin, where he also holds appointments in psychology and information risk & operations management. Formerly serving on the faculty of Indiana University and as research fellow of Loughborough University, United Kingdom, he earned his PhD in 1991 from Loughborough and a master of arts (first class) from University College Cork in 1987. He has been a member of ASIS&T since 1995 and has served as director-at-large, as editorial board member of JASIST, as program chair for both the ASIS&T Annual Meeting and the IA Summit and as member of the Publications Task Force. He also wrote a regular IA column for the Bulletin. His research and teaching interests are in human-computer interaction, reading and writing, design and creativity.

Jens-Erik Mai is associate professor in the Faculty of Information at the University of Toronto, where he previously served as vice dean and acting dean. Jens-Erik was formerly on the faculty at the Information School of the University of Washington where he also co-directed the Center for Human-Information Interaction; prior to that he was a faculty member at the Royal School of Library and Information Science, Denmark. He earned his PhD in library and information science from the University of Texas at Austin as a Fulbright Scholar and his master and bachelor degrees from the Royal School of Library and Information Science, Denmark. His research interests lie in the broad area of representation and organization of information; his current scholarship questions the conceptual foundation of classification and it seeks to establish an epistemological foundation that accepts the plurality of interpretations across communities. He teaches courses on representation of information, classification, design of controlled vocabularies and the theoretical foundation of information studies.

Jens-Erik is past chair of SIG/Classification Research. He has chaired the Best Information Science Book Award jury twice and been a member of the SIG Cabinet Steering Committee. He has served the International Society for Knowledge Organization as executive board member and is currently consulting editor of the Knowledge Organization journal.

Diane Neal is an assistant professor in the Faculty of Information and Media Studies at the University of Western Ontario and holds the permanent title of visiting scholar at the University of Sydney in Sydney, Australia. Since earning information science degrees (MS, PhD) from the University of North Texas, Diane has also held academic appointments at North Carolina Central University and Texas Woman’s University. Additionally, she has been a systems librarian and a corporate information technology professional.

ASIS&T has been central to Diane’s career since 2001. Currently, she is the...
2011 Annual Meeting’s Knowledge Organization Track chair, Webinar Task Force chair, Information Science Education Committee co-chair, a Chapter Assembly advisor, a Bulletin Advisory Board member and a New Leaders Award Mentor. She has presented at or moderated over 10 sessions at Annual Meetings and was 2008’s posters co-chair. She has multiple publications in the Bulletin and JASIST. Her ASIS&T commitment has been recognized with accolades and elected roles. In 2009, the Bulletin special section she guest edited won the Special Interest Group (SIG) Publication-of-the-Year Award. She has actively chaired two SIGs: Classification Research and Visualization, Images, & Sound. Also, she was a founding officer of the Carolinas Chapter and chaired the North Texas Student Chapter.

Leaving the Board are past president Gary Marchionini and directors Deborah Barreau and France Bouthillier.

The International Science Calendar of Information Science Conferences (icisc.neasist.org) is a nonprofit collaboration between the Special Interest Group/International Information Issues (SIG/III) and the European (ASIST/EC) and New England (NEASIST) chapters of the American Society for Information Science and Technology, with the additional support of Haworth Press.

J. Stephen Downie, professor in the Graduate School of Library and Information Science (GSLIS) at the University of Illinois at Urbana Champaign, has been named the school’s associate dean for research, replacing Allen Renear, who is stepping down to pursue further research activities. Downie will coordinate all aspects of research at GSLIS including working closely with faculty on research plans, overseeing GSLIS research centers and facilitating the development of GSLIS research strategy. Downie joined the GSLIS faculty in 1998.

Former ASIS&T presidents Charles H. Davis and Debora Shaw are the editors of Introduction to Information Science and Technology, a new ASIS&T monograph published by Information Today. This new guide to information science and technology presents a clear, concise and approachable account of the fundamental issues, with appropriate historical and theoretical background. The book is the product of a unique scholarly collaboration which brought together more than 80 individuals with specialized expertise. They contributed drafts, reviewed and edited initial contributions, advised the contributors and tested content with their students.

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ASIS&T Special Interest Group/International Information Issues (SIG/III) has completed judging for its 12th International Paper Contest. The following individuals and paper titles are the winners in 2011:

**First Place**: Eustache Mêgnigbêto, Republic of Benin, for Structure of the Reachability Social Network of Beninese Library and Information Professionals.

**Second Place**: Muzammil Tahira, Pakistan, for What Next? New Databases, Metrics, Services or New Epistemology for Research Evaluation.

**Third Place**: Swati Bhattacharyya, India, for Exploring the Notion of Contextual Use: A Case Study of the Use of Electronic Resources in an Indian Research Organization.

Maqsood Shaheen, chair; Alma Rivera, co-chair; Fatih Oguz, co-chair; and members of the SIG/III board served as jurors for the 2011 competition.

The principal authors of each of the three winning papers will be awarded a two-year individual membership to ASIS&T. In addition, the first place winner will be awarded a minimum of $1,500 to attend the 2011 ASIS&T Annual Meeting in New Orleans.
Madeline M. Henderson, 88, of Frederick, died on July 17, 2011, at Frederick Memorial Hospital. She was a longtime member and pioneer of ASIS&T. She was also a member of the American Chemical Society and the American Association for Advancement of Science.

Madeline was predeceased by her husband Richard who died in 2008. She is survived by her children, Anne DeRito and husband Frank of Florida; Matthew R. Henderson of Boonsboro; Katherine DiLima of Germantown; and Laura Hicks and husband Brian of Frederick, and by ten grandchildren and one great grandchild.

Those desiring may make memorial contributions in her name to the Homewood Foundation, P.O. Box 250, Williamsport, MD 21795.

Our thanks to Robert V. Williams for the following look at Madeline’s career.

Madeline M. Henderson: From Chemical Information Science Pioneer to Architect of the New Information Science

by Robert V. Williams

Madeline M. (Berry) Henderson was an active contributor to and innovator in the field of documentation/information science. Her professional life provides multiple examples of the phrase “present at the creation” during the early development of information science in the period 1950–75. Her first significant contribution was in chemical information science, where she was a close associate and co-worker of James W. Perry, one of the foremost developers of the early ideas about information retrieval and chemical information science. With Perry and others, including Allen Kent, she coedited the first two significant publications on the use of punched cards for information retrieval systems and was the leader in the first efforts to evaluate chemical notation systems for use in information retrieval. These efforts brought national and international attention as well as numerous citations to her work.

Three years after the 1952 establishment of the National Science Foundation’s Office of Scientific Information, Henderson was evaluating grant proposals for the emerging field of documentation/information science and in the process of crafting two of the most significant publications that both tracked and influenced the development of the field. She not only was the creator of these two publications but also did the “legwork” investigating the projects, thus likely becoming the most knowledgeable person in the field about research and development work during this period. Her work at the National Bureau of Standards on copyright, standards and fostering cooperation among the libraries of U.S. federal agencies was an important factor in their success, particularly in library automation.

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Libraries, Librarians and Mobile Services
by Lisa Carlucci Thomas, guest editor of special section

EDITOR’S SUMMARY
In recognition of the rise of mobile computing, a collection of articles is presented to explore its transformative influence on libraries, librarians and library services. Libraries are offering an expanding array of electronic resources, and patrons are eager to access them on their smartphones, tablet, and similar devices. Despite technological and budgetary challenges, librarians are finding success through creativity and collaboration. This special section explores several aspects of mobile computing in the library context. The articles describe innovative projects made possible by partnering with experts offering programming and other skills, technology implementations that expand users’ awareness of and access to resources and practical solutions to common challenges of mobile sites for libraries.

KEYWORDS
digital libraries
librarians
library and archival services
mobile applications
diffusion of innovation
collaboration

Libraries are fully engaged in the process of adapting to increased demand for electronic collections and the ongoing acquisition and archiving of born-digital content. Supporting mobile access to these resources is the next step, and mobile efforts are under way. These are challenging economic times for libraries to take on new technological initiatives, yet librarians across the country and internationally are seeking creative solutions to providing mobile library services. Innovative projects, such as Dan DeSanto’s exploration of mobile, place-based, access to the University of Vermont’s Long Trail digital collection, described in “The Mobile Future of Place-Based Digital Collections,” and Michael Whitchurch’s QR Code implementation at Brigham Young University, as reported in “QR Codes and Library Engagement,” link the mobile user to the physical and virtual collections offered by the library – thus enhancing the user’s experience and expanding the reach of the library’s rich and diverse collections.

Technological skill and programming ability are often cited as barriers to implementing mobile technologies, particularly among information professionals who haven’t had formal training in these areas. DeSanto, at UVM, and authors Edward Iglesias and Wit Meesangnil, both from Central Connecticut State University, achieved their vision beyond skill barriers by establishing partnerships in support of mobile development at their libraries.

Lisa Carlucci Thomas is digital services librarian at Buley Library, Southern Connecticut State University. She can be reached at thomasL10<at>southernct.edu or on twitter: @lisacarlucci

Mobile computing is transforming how people search, receive and interact with information on a daily basis. In just a few short years smartphone ownership has skyrocketed and popular use of e-readers has been steadily on the rise. These advanced mobile tools provide portable, instantaneous access to the world of information, across boundaries of subject, discipline and industry.

Libraries are fully engaged in the process of adapting to increased demand for electronic collections and the ongoing acquisition and archiving of born-digital content. Supporting mobile access to these resources is the next step, and mobile efforts are under way. These are challenging economic times for libraries to take on new technological initiatives, yet librarians across the country and internationally are seeking creative solutions to providing mobile library services. Innovative projects, such as Dan DeSanto’s exploration of mobile, place-based, access to the University of Vermont’s Long Trail digital collection, described in “The Mobile Future of Place-Based Digital Collections,” and Michael Whitchurch’s QR Code implementation at Brigham Young University, as reported in “QR Codes and Library Engagement,” link the mobile user to the physical and virtual collections offered by the library – thus enhancing the user’s experience and expanding the reach of the library’s rich and diverse collections.

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Iglesias and Meesangnil detail their experiences and lessons learned in “Mobile Website Development: From Site to App.” Through their collaboration, they discovered that they could stage the development of the library’s mobile website, and once the primary goal was accomplished (a mobile library website for the university library), easily adapt the product into a more advanced result (an Android application).

Collaboration offers several advantages in the mobile environment. Mobile projects require the in-depth knowledge of librarians, that is, those who know their library collections well, who understand the services needed to support their research community and who are trained in the organization of information. Mobile projects also require computing and programming ability and the expertise to design user-friendly interfaces that are intuitive for the multitasking mobile user. The combined intellectual power of like-minded information experts with unique technological skills creates the opportunity to move mobile projects forward, as well as to foster reciprocal learning, gained from the pooling of knowledge to overcome technical and cultural gaps and advance shared goals.

When it comes to mobile information exchange, we’re all currently developing best practices for language, design, development and engagement as we ourselves interact via text messaging (SMS), mobile platforms, social media and location-based services. As information professionals experiment with these technologies, they’re putting their professional skills and knowledge to use evaluating existing options and making recommendations for peer implementations and improved next-generation products.

Librarians Tiffini Travis, California State University, Long Beach, and Aaron Tay, National University of Singapore, provide a look at how mobile-ready platforms can provide cost-effective mobile solutions for libraries in their article, “Designing Low Cost Mobile Websites for Libraries.” They describe the pros and cons of employing mobile-friendly tools to offer access to library information and services on a shoestring, while paying close attention to the mobile usability needs of users, as detailed in their valuable “Library Mobile Site Checklist.” Likewise, mobile web expert Jeff Wisniewski from University of Pittsburgh offers his take on “Mobile Usability” – outlining what it means to be where the users are and to recognize and design for mobile user needs. He concludes: “Build well, test and retest, and continuously improve to ensure a mobile web experience that both satisfies and delights users.”

Innovation, collaboration and experimentation are essential to successful mobile projects. As mobile technologies evolve, we rely on our own experiences as mobile information consumers, our knowledge and expertise as information professionals and our partnerships with interdisciplinary colleagues to gain insight about the norms and necessities of mobile culture, the mobile computing needs and expectations of our users, and the emerging vision of the mobile future, defined by each of us working together at the edge of information technology today.
As the number of patrons carrying iPhones, Androids and other mobile devices continues to grow, an opportunity has arisen for libraries to make their digital collections accessible via these mobile devices. Mobile technologies can be used to provide another access point into a digital collection, and, in the case of place-based digital collections (collections focused on a certain geographic location), mobile technologies can provide access to a collection at the geographic point where the collection is most relevant. A patron might download an application, or app, that delivers historical digital items related to the place where he or she grew up. That patron could then use this app to directly access the materials provided by a place-based digital collection while traveling around that town or neighborhood. The patron might stand on a mountain summit and use a mobile device to view the historic images of that summit provided by a library’s digital collection. By integrating place-based digital collections with mobile technologies, patrons are offered a way to inform their current experience of a place with the rich historical context within libraries’ digital collections.

This article presents the process of developing a place-based app for the University of Vermont Center for Digital Initiatives (CDI) Long Trail Collection. The Long Trail Collection houses images of Vermont’s Long Trail, the oldest long-distance hiking trail in the United States. The collection comprises over 900 digitized lantern slides, many of which were hand-colored, with original photos taken during the early days of building, cutting and hiking the trail, 1912-1937. The app developed for this collection will provide hikers with a means to access the collection’s historic images of the Long Trail as they hike along it. This one project is representative of both the opportunities and challenges of designing apps for place-based digital collections, and it is an example of the library field’s baby-step advances in an area of development that will soon be off and running.
The Long Trail to a Place-Based Digital Collection

For a number of different reasons, the Long Trail Collection distinguished itself early on as being well-suited to mobile development. USGS Geographic Names Information System (GNIS) headings, which provide latitude and longitude points, were included in the item record metadata so that the collection could be accessed via clickable points on a Google map. This geospatial metadata allows us to build a similar smartphone map view. The Long Trail Collection in particular has a potential user base of hikers as well as a well-recognized organization, the Green Mountain Club, dedicated to publicizing and maintaining the trail. The Green Mountain Club offers an avenue for outreach and cooperation during and after the app’s development. Further, the Long Trail is widely recognized throughout Vermont and New England. While it has a focused potential user group, interest would not be limited to one town or city; rather, a user might be anyone who has ever hiked or is planning to hike the trail. Considering these factors, the Long Trail Collection in particular seemed to lend itself to mobile development.

However, choosing this collection for mobile development is not without its obstacles. Perhaps the biggest of these is the spotty cellular and data connections along the trail. The app would not be usable in spots with little or no cell coverage, and there are many such places along the heavily wooded Long Trail. The app’s design also needs to take into consideration battery usage issues which become increasingly important if a user is also using the smartphone as a means of emergency contact. As to the first issue, cellular coverage can be quite adequate above the tree line and on the summits of many of the trail’s peaks, and cellular coverage will only improve in the future. As to the second issue, the app will need to poll for a signal only when prompted by the user, helping to save battery life. If these concerns prove to be a barrier for this collection, the project can serve as a framework for use with other digital collections.

Work began on the app in October of 2010. A colleague and I hatched the original idea over coffee and, by the time we had walked back to our offices, the notion of a Long Trail Collection app seemed quite feasible. I had no prior mobile programming experience to speak of, so I started reading app development documentation and trying to familiarize myself. The first decision was whether to begin working with the Android platform or the iPhone iOS platform. Apple provided very extensive development documentation but charged a $100 fee for a developer’s license. By paying the licensing fee, one may download Apple’s development suite: Xcode, Interface Builder and iPhone Simulator. Android development is free, but, at the time, there was no way to do development without having an Android phone. Google released a product called “App Inventor” around this time, essentially a DIY app-creation product, but I could not find anyone with an Android phone nor did my institution have phones available to use for development. Because Apple offered the iPhone simulator, a “virtual phone” that lives on your computer for the purpose of development, I chose to begin working with iOS on the iPhone. From that point forward, I charged headlong into familiarizing myself with Apple’s Objective C programming language and slowly worked my way through Beginning iPhone 4 Development: Exploring the iOS SDK by Jack Nutting, David Mark and Jeff LaMarche. After creating a number of small test apps, I began to gain a bit of competency and was able to develop a partially functioning Long Trail Collection app that at least had the look and feel of what I hoped to create. My roadblock became the back-end querying – pulling the jpgs and metadata that would provide the heart of the app’s functionality. Having limited programming knowledge, I knew it was time to seek out expert help.

At the 2011 ACRL National Conference, I presented a poster titled, Hitting the Trail: Making Digital Collections Mobile. My goal was to assess the level of interest in the project and to perhaps meet those working on similar app-based projects. While there was a high level of interest, very few libraries were developing mobile projects, and I met no one who had built an app for a digital collection. Upon returning to campus, I sought out help from the computer science department here at the University of Vermont. I eventually found myself at the door of Robert Snapp, a professor teaching a computer science course titled Integrative Computing. The course will use mobile phone development to synthesize a number of different technologies, such as database management and geospatial location, in order to teach students to design practical apps for mobile phones. After discussing the Long Trail project, Snapp agreed to help design the app. The Long Trail
Collection will provide his class with a pragmatic example of how mobile technology design integrates multiple computing skills and also how this technology can be used to benefit the larger community.

Indeed, the unexpected positives of the project have continued to grow. As design has taken place, the possibilities for lived experience (“being there”) and historical experience (viewing the collection) to intersect have become increasingly apparent. Images continue to identify themselves as potential learning opportunities. In partnering with the computer science department, the process of building the app will become a practical teaching tool. Perhaps most importantly, the project may benefit the field of digital archives by introducing an app that is extensible to other place-based digital collections. This last point is of great importance. The creation of a toolkit for building digital collection apps is poised to become a necessity in the very near future.

Mapping the Possibilities for Future Mobile Projects

Beyond good design, an additional goal of the Long Trail Collection app project is to create a product that could be used by other collections, both at the UVM Center for Digital Initiatives and possibly at other institutions. The Long Trail Collection’s metadata already includes geospatial coordinates (the aforementioned GNIS headings), but it may be feasible to retroactively add these headings to other place-based digital collections, therefore making them also deliverable in a geo-mobile format. Those creating new place-based digital collections might consider initially adding geospatial coordinates to their metadata in order to leverage both web-based and mobile possibilities for delivery.

Libraries might further choose to deliver multiple collections in one app. A state historical society may have multiple collections from different places around the state. In a mobile format, that historical society would have the option to build one app that maps all or some of the items in their digital collections to different points around the state, regardless of an item’s parent collection. They could include or exclude whatever items or collections they chose, differentiate with different icons as they saw fit, and provide as much or as little item-level information as they desired. By

embarking on mobile development, archives can design means of delivery that best fit the needs of a collection or an entire archive.

The types of flexibility promised by mobile technologies may also open up new avenues for collaboration. Two archives with collections focused around similar themes could combine access to their collections in the same app. If two similar collections are focused on the same place, the collections might be featured together in order to provide a deeper perspective into that place’s history. As long as metadata standards are uniform across partnering institutions, it is feasible for those institutions to collaborate and build expansive access through one app’s interface, rather than be constricted by the demands of each archive’s method of delivery.

Mobile technologies provide all of the options for extensibility and visual representation delivered in a web-based format (maps, timelines and so forth); yet the added benefit of being mobile, of the patron actually “being there,” can create a meaningful experience that is greater than the sum of its parts. Libraries now have the option of providing high quality digital materials and associated metadata to patrons at a collection’s point-of-interest. Much more than a virtual tour, mobile technology can offer patrons robust access to digital collections, presented in a number of visual formats, at the very point that a patron might best enhance his or her historical and cultural understanding.

A Fork in the Trail for Mobile Development in Libraries

Mobile technologies have presented digital archives with a tremendous opportunity to make collections available where patrons are most interested in them. It remains to be seen whether libraries and archives will be proactive in developing library-centered mobile technologies or whether libraries will passively wait for proprietary companies to design and sell the technology back to us. As libraries scramble to build mobile access to their catalogs and websites, it would be a great loss to, in our haste, forget about the possibilities for greater access to digital collections. Just as the greater library must begin thinking about creating infrastructure that best capitalizes on the proliferation of mobile devices, so must libraries’ digital archives begin thinking about the same issues of mobile access and delivery.

We in libraries have the opportunity to develop the suites and toolkits
that best meet our mobile development needs, and there are examples of collaborative development for us to follow. Recently, the Library of Congress’ National Digital Information Infrastructure and Preservation Program (NDIIPP) and its 185 partners have worked with a company named Zephira to create an open-source software called Recollection. Recollection (now in beta) can be used to create visually enhanced, web-based displays for digital collections and allows metadata to be leveraged in order to populate graphical displays. Partnering libraries and institutions have contributed to and will benefit from the project, and it will be distributed as an open source product. The Recollection project provides an example of how a graphical display product can be designed for digital collections with an end goal of open-source distribution to libraries.

The map for discipline-wide collaborative development exists, both in process and in content. Yet, the question remains: Will we do it? Will we lead the development process of mobile technologies for libraries and digital archives, or will we allow others to do it for us and create yet another line in library budgets five or 10 years from now?

If libraries choose to embark on their own path of mobile development, digital archives may have the chance to deliver collections in new ways, in new places, providing users with a completely new experience of accessing a digital collection. For the Long Trail Collection, this means providing hikers with historic views of vistas, lodges and mountains as they experience the same vistas and lodges en route. The Long Trail Collection mobile development project is one small effort toward creating point-of-interest mobile access to digital collections. It serves as a model for other collaborative, extensible mobile development initiatives, and its completion may allow other digital archives to move forward with making their own place-based mobile digital collections.
QR Codes and Library Engagement
by Michael J. Whitchurch

EDITOR’S SUMMARY
QR codes are two-dimensional patterned graphics that, when read by mobile devices, represent text and link to Internet content. At numerous libraries, QR codes are being used in a variety of ways to promote student engagement, supporting library services that are unique or improved over past approaches. Descriptions of successful implementations abound on library-oriented wikis. Brigham Young University’s Harold B. Lee Library has adopted QR codes for use in marketing materials, for a library audio tour and to reserve group study rooms. Implementation hurdles are manageable and include producing and designing the codes, locating them effectively and having access to compatible hardware, though student ownership of smartphones is rising rapidly. Libraries adopting QR codes should focus on implementations that add value, educate intended users, customize the code to reflect the school’s brand, are creative and track code usage.

KEYWORDS
marketing
libraries
engagement
library users
mobile applications
library and archival services

By now, most of us are aware of QR codes, two-dimensional codes that can be read by a QR reader on a camera-equipped mobile device (cellphone, tablet or iPod touch). These codes are useful due to their ability to represent alpha and numeric data. Similar to bar codes, which represent a series of numbers, QR codes represent text that is then used by the mobile device for performing an action. Codes can be created to link directly to a URL, create a vCard (saved to the mobile device) or initiate a phone call, text or e-mail, among other functions. Because QR codes can represent so much data (up to 7089 characters) the potential uses are varied. QR codes, used mostly to provide a link to content on the Internet, are increasingly seen in many locations, such as toothpaste tubes, advertisements or UPS packages, and formats including print, video, magazine. Though the most common use of the codes is for Internet linking, the codes are also used for simply saving information (for example, phone number, address, call number) to a mobile device. Regardless of the function of the code, text is decoded by the device, at which point the user decides how to use that text (open a link or save). Mobile devices need not be connected to the Internet to save the textual information, but an Internet connection is required to follow a link to connect to web-based content.

This article contains a small sampling of current QR code implementations as well as a summary of what has been done to encourage student engagement with the library through the use of QR codes at the Harold B. Lee Library at Brigham Young University.

Student Engagement in the Library
Over the last two decades students have been increasingly drawn into a world of immediate, online access to information and social connections.
More recently we have seen almost ubiquitous mobile access to information. While becoming more involved with the virtual world of information, students have become less connected to physical libraries and the information provided therein, instead preferring online access.

To encourage more use of the library space – and to increase student engagement with information – many institutions have created high-tech spaces in an attempt to draw students into the library. These spaces are often called Commons (Information Commons, Learning Commons, Knowledge Commons and so forth) harkening back to the time of a commons as a gathering place for social and economic benefit. While these library spaces have garnered support from students and faculty, they have simply provided another space for student study and work. In fact, as I look out on our commons I see students looking at Facebook, reading email, watching the latest episode of their favorite TV show or chatting with friends online and/or in person.

As librarians we need to adjust our philosophy of librarian as guardian and disseminator of information. The Internet has permanently changed the role of librarians. Students want to feel connected to and involved with the information; they are more social now than ever before. We need to encourage this type of interaction between information the library provides and the users. QR codes are a means of encouraging this type of interaction.

**QR Code Use in Libraries**

The flexible nature of QR codes allows for myriad applications. Many institutions have already implemented QR codes for services to users – services that encourage engagement with the library. Many of the examples described here are listed on the “QR Codes” page of the “Library Success: A Best Practices Wiki” (www.libsuccess.org/index.php?title=QR_Codes). Of the examples I reviewed, the most useful and successful implementations are those that provide some value-added service for the users. Adding value means that using the QR code is better or easier than using the existing service or that the library is providing a service that is uniquely useful via QR codes.

For example, while teaching a first-year writing class, I saw a student use her cellphone to take a photo of the computer monitor displaying the call number and library location of an item she wanted to find. There is a better way to allow users to capture this information. At Ryerson University and the University of Huddersfield QR codes are dynamically generated and displayed among the details page of every item in the catalog. The QR code, when scanned, saves the call number, title, author and location to the mobile device for later use. Having the information saved directly to the mobile device removes the possibility of the photo or written note not being clear or complete enough to use when looking for the book in the library. This feature will become even more useful if indoor location-aware services become a reality.

There are many examples of using QR codes for marketing and promotions in the library: they are used on posters (Marathon County Public Library), bookmarks (Syracuse University), range end signs linking to subject guides (Half Hollow Hills Community Library) and even at the Denver International airport, as reported by David Lee King (www.davidleeking.com/2011/03/07/give-away-some-ebooks/), connecting to “‘free’ out-of-print classics” (1st Bank). Similarly, Contra Costa County Library, as part of their “Snap & Go Project” (http://guides.ccclib.org/content.php?pid=105914&sid=797175#4774453), displays QR codes on public transportation providing links to books for commuters.

Other libraries use QR codes to provide links to library tours. Ryerson University Library and the University of Bath provide a MP3 download through a QR code, while the Mudd Library at Lawrence University provides a QR code linking to the virtual tour.

Trying to summarize all current QR code implementations is not possible. Therefore, I recommend consulting the Library Success wiki (www.libsuccess.org/index.php?title=M-Libraries) and searching out articles for other examples of QR code implementations. Most of what I found when searching the academic databases for published articles referenced using QR codes in industry for inventory management. Though not specific to libraries, some of those uses can be adapted and applied to library services.

**Our Implementations**

The Harold B. Lee Library (HBLL) at Brigham Young University (BYU) uses QR codes to enhance the library experience of the students by providing
interactivity and flexibility. QR codes are being used as an additional format for marketing materials, taking the library audio tour and for reserving group study rooms.

The audio tour, developed for the first-year writing courses, consists of 21 QR codes spread throughout the 665,000 square foot building and located in areas about which the students need to know to pass the post-tour quiz. Using the audio from the existing audio tour, which provided a linear tour of the library, the audio for the tour using QR codes uses no directional content and instead relies on a map to show the locations of all the codes in the library. Students interact by scanning the QR code (see Figure 1) to get the audio and are allowed the flexibility of visiting the areas in any order. As long as each code is visited, the necessary information will be heard and hopefully learned.

One of the issues we had to overcome was the need to track QR code usage. In order to verify the usefulness of the codes we wanted to show how often the codes were being used. The way QR codes were implemented for the audio tour was to direct the student to the audio track when the code is scanned. The audio is in the MP3 format, which provides no way to gather statistics. There are commercial products that provide a way to track usage, some even free, but recognizing the volatility of the mobile market (how long would the service continue?), we created a work-around to track the usage. Instead of linking directly to the MP3 file, the QR code links to a HTML page that has two important pieces of code. The first is code for Omniture, web analytics software, which tracks page usage. The second piece of code is a redirect that points to the MP3 file. This process is transparent to the students.

The second implementation of QR codes at the HBLL is the reservation of the 47 group study rooms (GSR) in the library. Reservations can be made using the online system (http://groupstudy.lib.byu.edu/) or through the mobile site (http://lib.byu.edu/m/). If, however, a student is by a room and wants to make a reservation at that moment, finding a computer or trying to navigate the mobile site to the specific room is more difficult than scanning a QR code. Each GSR has a QR code (see Figure 2) located under the room number linking to a reservation page allowing the student to reserve that room, if available. The page also provides options if the room is already reserved: reserve that GSR for another time or another GSR in the library.

Setting up a system to gather statistics for the GSR system was easier to accomplish. Each code links to a web page for the specific room; those pages each have Omniture code for tracking the usage.

**Issues with Implementation**

As QR codes were being implemented in the library, a variety of issues became apparent. First was determining the location of the QR codes for the audio tour. Finding the best location to place the codes was, and still is, difficult. Despite having a map of the locations, we received feedback from the students that some of them were not easily found. With this feedback we have adjusted placements in hope that the codes are more easily found.

QR code production and design were also addressed. The first codes produced were simply printed black-on-white and mounted on black foam core before being placed (see Figure 1). While creating the codes is not difficult, making so many was time consuming. Between the two projects (audio tour and GSR) there were a total of 68 QR codes that needed to be created, printed and then placed.

By the time we began the process for the GSR project we had learned some things about designing QR codes. An article by Hamilton Chan for *Mashable* (http://mashable.com/2011/04/18/qr-code-design-tips/), about designing QR codes that are more visually appealing, gave great insight into options for customizing the codes. Figure 2 shows the code developed for the GSR project. Notice the color of the QR code and the image in the middle. Customizing the codes is another way to form a connection with the students and encourage engagement.
With only 14% of students on the BYU campus owning smartphones (unpublished BYU Academic Technologies Report, 2010), providing this technology seemed a little ahead of the time when we began the project. However, smartphone ownership is increasing continually, and with the introduction of the new iPod Touch (which also has a camera) toward the end of 2010, the potential for more users increased dramatically.

Having access to the hardware is only one of the issues we face. Another, perhaps more important, issue is that of education. Most library users are still unfamiliar with QR codes and how to use them. This inexperience presents a need for continual education efforts in the library. To this end a subject guide was developed (http://lib.byu.edu/sites/qrcodes/) that contains information about QR codes, how to find a reader for a mobile device and specific details about the HBLL implementations (audio tour and GSR).

**Conclusion**

When developing and implementing QR codes in the library, consider the following keys to success we used in the development of our QR code projects. Remember that keys to success for using QR codes will vary for each institution.

- Use the codes only when the implementation will add value to the experience of the user. Using QR codes for the sake of the technology is seldom a good reason.
- Modify the codes with colors or images to be customized to your institution.
- Provide as much education as you can about QR codes, including how to use them and how to install a reader. Simply using the codes effectively is a great marketing tool.
- Start with temporary signs and move to more permanent signs as the implementation becomes more permanent.
- Experiment and be creative with different uses to find those that work better. This requires that usage of the codes be tracked.
- Codes are cheap and easy to produce. Adapt existing codes to how they are used.
- Just because one implementation is not used does not mean that QR codes are not worthwhile or effective. Try another project until you find implementations that work well in your environment.
- Have fun with the codes and broaden the possibilities of how to use the codes to help students engage with the library and content provided.

In our efforts to disseminate information and to engage with a generation of mobile, social and always-connected students, QR codes have tremendous potential. Using this technology provides an opportunity to not only facilitate library tasks but also to strengthen connections with this generation.
Mobile Website Development: From Site to App
by Edward Iglesias and Wittawat Meesangnil

EDITOR’S SUMMARY
Staff and volunteers at Central Connecticut State University’s Burritt Library responded to the surging demand for a Library website readable on many mobile devices. An intern and a core group of individuals with common understanding of the goals and needs undertook the development process, starting with the recognition that a library’s mobile site should and could not replicate the full content of the existing website. They focused on basic library information, library catalog search, and an instant messaging link to the reference desk. Developers adopted packaged mobile frameworks to first create a simple static mobile site and subsequently took the further step to develop a dynamic library app, distributable through an app market. The app design supported expanded features and functionality, including an interactive library map and QR code scanner. The Burritt Library experience illustrates important lessons about the process and that, with determination and a modicum of skills, developing a mobile website and app is achievable and timely.

KEYWORDS
websites
mobile applications
libraries
software engineering

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The Burritt Library at Central Connecticut State University is part of a consortium consisting of four universities and the Connecticut State Library. All of the institutions have separate websites allowing for a great deal more freedom in approach to user experience and information architecture. Burritt has no formal developer position, and web duties are taken on by different individuals, including the systems librarian and the electronic resources librarian. Our department was fortunate enough to obtain an intern who had a great deal of computer experience and was completing a masters in computer science. He made creating a mobile web application for the library his capstone project, which worked out very well for the library.

Library and Mobile Technology
The need for a mobile presence for the library’s resources is well documented. Interested readers can refer for a good introduction to a recent issue of Library Technology Reports on the libraries and mobile web services by Cody Hanson [1]. When developing the library’s mobile web presence, it is critical to focus on design that displays well on mobile devices such as cellphones and tablet devices.

The library environment faces certain challenges in displaying mobile information primarily because we control so little of it. Libraries are increasingly dependent on database and library software vendors for providing mobile software solutions and mobile access to prepackaged content. However, homegrown, third-party solutions and custom code can go far to manipulate the display into a mobile friendly environment, as was our experience at the Burritt Library. One key consideration is understanding that all of a library’s website simply cannot, and should not, go into a
mobile website. Emphasis should be on the content of most use to offsite users, such as library hours, the online public catalog, research guides and directional aids.

**Mobile Site Development at Burritt Library**

If you have experience building websites, it’s actually not that hard to create a mobile version of a website. You can develop a mobile website from scratch using HTML and CSS with some extra knowledge specific to mobile, such as viewport, CSS media queries and mobile usability. Creating a more interactive version of a mobile website that more closely resembles a web application – for example, one that provides transition between pages – requires more complex coding involving JavaScript, CCS3 and AJAX. This more complex coding can be daunting for an average webmaster.

The initial decision to create a mobile-friendly website was based on a review of current trends in how users access library content both within Burritt Library and on the web as a whole. Michael Ricci [2] summarized his reaction to the importance of a recent Forrester Report encouraging mobile development [3] as follows:

- **First**, because it highlights the fact that consumer adoption of mobile and advances in carrier network technology are driving explosive growth in mobile browsing, app downloads and consumption of new rich media content as well.
- **Secondly**, it highlights the increasing sophistication of smartphones and tablets and advances in device usability & functionality that are taking place and explains how this is driving increased enterprise usage.
- **And finally**, because it underscores the fact that measurement of this channel is either token at best or absent altogether with most brand practitioners and this is odd given the increasing importance of digital eCRM programs.

One might think that the third point does not really apply to libraries, but as we increasingly move into an era of brand awareness it is important to realize that our websites are often the only part of the library many users see, and it is vital that we use this as an opportunity to build loyalty to the library.

What made our mobile project possible was having an intern who was willing to take it on and devote considerable time to it. The library provided very few resources other than a supportive environment and access to the server. The rest was based on skill. The other advantage we had was a fairly small core group that made most of the decisions. Nothing ruins a website quite as much as a large committee. Having a core group that shared an understanding of what was needed in a mobile website and not having to seek permission made for a very successful project.

One approach to building mobile websites is the framework approach. Software frameworks are collections of tools that let the user accomplish tasks more easily. They often work by providing a *library* – a list of often-used commands that can be included instead of writing the code from scratch. The main advantage of this approach, besides saving time, is reliability and repeatability of the code. This code is also usually vetted so that security risks are minimized. Like other web development tools, there are many options available to help make the development process more efficient, such as the jQuery library for JavaScript that helps make working with JavaScript a lot easier. In mobile development, currently there are many mobile frameworks. The following are of particular interest and freely available:

- iWebKit (http://snippetspace.com/projects/iwebkit/)
- JQTouch (http://jqtouch.com/)
- Sencha Touch (http://www.sencha.com/products/touch/)
- jQueryMobile (http://jquerymobile.com/)

We chose to go with the jQuery Mobile approach since using a framework allows us to create an interactive mobile site. The framework also provides default sets of user interface elements that are also a good starting point to ensure the usability of the mobile website.

You can get your mobile website up and running in just a few hours using frameworks. The basic concepts of using these frameworks are very similar. First, you need to include the code in the `<head>` section of your HTML file. Secondly, parts of the mobile page must be defined such as top menu bar, content and footer, in different `<div>`s in the HTML file. By
using a framework, you can create a simple, static mobile website with frequently used information about the library in less than 80 lines of code. For an example, the code available at jQueryMobile Documentation (http://jquerymobile.com/demos/1.0b1) or at jQuery Mobile Tutorial (www.codeforest.net/jquery-mobile-tutorial-basics) will create a static but decent looking mobile website with basic and frequently used information without extensive coding (Figure 1).

**Mobile Site Content**

From the start, as we mentioned, it must be acknowledged that the library’s mobile site simply cannot contain all of the information found in the regular site. Therefore, it should contain only crucial, frequently referenced information for users on mobile devices. The most concrete way to find out the most frequently used information in your website is to use analytic data. Google Analytics is a free and very powerful service that works very well for this purpose. We learned from our analytic data, which follows the same pattern as other libraries, that users are looking at basic information such as hours and contacts most frequently. For example, users are searching about hours of the library specifically in search engines: the second top incoming keyword is “CCSU library hours” (5.06%), while the first is “CCSU library” (44.29%).

Professional mobile websites are systematically designed with a complete separation of content and presentation. It is functionally possible to create a mobile version of a page for an entire website by creating unique mobile-optimized style sheets for all existing web content. For an average library website, however, this effort would be too complicated and cumbersome, and it is not necessary. A mobile version of the website is just as easily created as a separate version of the primary website and placed into a sub-directory on the web server (for example, www.mylibrary.edu/mobile). Users accessing the site on mobile devices can then be redirected to the mobile site automatically. Since the mobile version does not represent the whole content of your website, you should always provide another link that allows users to access the full version of the website.

Having a mobile version of the library website as a separate entity creates the problem of having to maintain information in two places. On the Burritt Library mobile website, we have information about contacts and hours. Contact information does not change that often; however, hours of the library can be quite dynamic. Instead of changing the information in two places, we do a data fetch from the regular website. In our case, we use jQuery to populate the data.

When designing the mobile website, keep in mind that you can link to other existing services that have a mobile-friendly interface. Many library catalogs come with mobile interfaces or have them available for purchase. At Burritt, we use Mobilecat (http://code.google.com/p/mobilecat/), an open source project developed by Tri-City College in Pennsylvania, which allows us to create a mobile version of our online catalog. Other services suitable for a mobile library website include chat reference – for example, libraryh3lp (http://libraryh3lp.blogspot.com/2010/01/improved-mobile-widget.html) – and research guides, such as Lib Guides (http://help.springshare.com/content.php?pid=149687&sid=1271358).

The final product of CCSU’s Burritt Library mobile website (http://library.ccsu.edu/m) consists of three main menu options. First the “Library Info” list provides users with the hours of the library, contacts, directions and news. The second or “Find” list allows users to search the library catalog from within the mobile interface. It also allows users to search database articles by directing them to the mobile version of Academic Search Premiere. The last list is the “Help with Research” list, where users are directed to live instant messaging with a reference librarian. Libraryh3lp provides a very nice mobile widget at the site mentioned above that you can include into mobile website by using the <iframe> tag. Users can access research guides via a mobile version of LibGuides.
version of the CCSU Burritt Library website can be accessed at http://library.ccsu.edu/m (Figure 2).

** FIGURE 2. Homepage of CCSU library mobile website **

<table>
<thead>
<tr>
<th>Burritt Library</th>
<th>Library Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday, 8-1-2011 8am-7:45pm</td>
<td>Contact</td>
</tr>
<tr>
<td>News</td>
<td>Find</td>
</tr>
<tr>
<td>Library Catalog (Books)</td>
<td>Articles via EBSCOhost Database</td>
</tr>
</tbody>
</table>

**Mobile Applications**

Since the introduction of Apple’s App Store in 2008, one year after the introduction of the first iPhone, the term *app* has become a popular buzzword. Many businesses have created apps specifically for their organizations, and this trend is not limited to business. Many large public and academic libraries have also developed their own apps. The Apple App Store is a huge success; currently it has more than 500,000 apps available with 10 billion apps downloaded. But do libraries need to have an app?

There are pros and cons to having an app versus a mobile website. Technically, you can develop a mobile website accessible via a smartphone web browser that has almost the same functionalities as an application downloaded from the App Store. Mobile websites are easier to develop across platforms, since every smartphone that has a modern mobile web browser will be able to access the same website. Essentially, you code once and it works for multiple platforms. It’s also easier to update and maintain since you control content and design. Finally, you don’t have to wait a lengthy period of time for an approval process to publish or update an app.

That said, there are benefits of having an application in a centralized distribution platform like Apple’s App Store, or Android’s App Market. Firstly, it helps increase discoverability and has a coolness factor to it. Library users will likely be excited when you tell them that they can now download the library app from App Store, compared to just accessing the library website with your smartphone. Secondly, applications have access to native device functionalities such as cameras and sensors or the accelerometer. These functionalities could be especially useful if you wanted to develop a more complex application.

**From Site to App**

At CCSU, our first intention was not to develop a library app, but once we started with the mobile site the possibility became appealing. The easiest way to get an application into the App Store is to create a native application out of the mobile website you’ve already built. You will need someone with basic programming skills. The first step is to create a native application with a WebView object that displays your website or web application. The WebView object is basically an in-app web browser. The users cannot select which websites they want to visit. The URL of the web page is assigned in the code. It displays the exact same thing that your mobile device would display if you were using the dedicated mobile web, however, when users download and start the application they’ll be under the impression that it’s a native app not a web app. With relatively few lines of code, you can also create a native application based on your existing mobile website and then distribute it over an AppStore/Market. See the Android Developer Documentation at (http://developer.android.com/resources/tutorials/views/hello-webview.html) or an Android SDK tutorial at http://mobile.tutsplus.com/tutorials/android/android-sdk-embed-a-webview-with-the-webkit-engine/.

**Burritt Library’s Mobile App**

At Burritt, we were fortunate to have graduate students from our computer science program who volunteered to do their capstone project developing a mobile application for the library. We decided to develop for the Android platform first since our developers are more familiar with the programming language used to develop Android applications. Android has also enjoyed an astonishing growth in market share, and many predict that it will become the most dominant mobile platform [4].

When designing the app, we decided to expand on the basic functionality of the mobile website and add more features. If we had not decided to add more features, we could have created an application with two tabs: one for
the mobile website and the other for the mobile catalog. Instead, we included features such as an interactive map function and QR code scanner. The interactive map allows users to see the library floor plan and interact with each location on the floor. Another map-related function is a book locator (inspired by Wayne State University Library [5]). When users search items in the library catalog they can use the book locator function, which will display the approximate location of items in the stacks (Figures 3 and 4).

The QR code scanner allows patrons to scan and read content embedded in the QR codes via the library’s app. Our immediate goal was to increase patron awareness of QR codes. In the long term, we plan to use more QR codes in the library and having the QR code scanner built into the library application will add convenience for users.

Testing

Testing mobile applications provides an interesting challenge because the library often doesn’t own the devices being tested. Just as a website must be viewed on a wide variety of browsers to assure compatibility, so will a mobile application need to be viewed on a wide variety of devices. The Burritt Library’s application was developed for the Android platform, making it usable on a wide range of smartphones as well as tablets. We tested the mobile website itself by using a combination of virtual emulators and borrowed devices. The use of a borrowed B&N Nook device allowed testing of an e-reader/tablet format. The mobile website coding held up well due to its simplicity and standards compliance. Usability testing of the mobile website and mobile application was much like usability testing for any website. The tricky part was finding individuals with mobile devices that could download the app and were willing to participate. After sending out an email call we received a good mix of students and faculty. Subjects were recorded being asked to perform a variety of tasks, from downloading the application and installing it, to looking up an item in the catalog and finding the hours the library was open. There was much positive feedback, and this kind of testing was vital as it helped us refine the application, work out bugs and most importantly gave us insight into our users’ expectations.

Conclusion

The promise of mobile applications in the library is quite large. Interactions with other technologies such as QR codes, RFID or GPS are just starting to be explored. Most libraries would benefit from understanding and pursuing the technologies available as users increasingly interact with library resources using mobile devices. There is still much variety in the landscape, including differences in hardware and in the way apps are approved in stores. A baseline of commonality is starting to develop in these devices and with maturity comes standardization. Now is a good time to build an app and get to know the standards that will undoubtedly continue to play a vital role in the years to come.

Resources on next page
**IGLESIAS and MEESANGNIL, continued**

**Resources Mentioned in the Article**


Designing Low-Cost Mobile Websites for Libraries
by Tiffini Travis and Aaron Tay

EDITOR’S SUMMARY
As smartphone ownership rises, usage patterns are expanding. Libraries face an increasing demand for online content delivered in a mobile compatible format while being constrained by financial and staffing limitations. Solutions are readily available through free and low-cost products to create mobile web pages and existing design models from which to draw inspiration. Platform-specific apps can easily support the kinds of content most commonly delivered on library mobile pages: basic contact information and outbound links to the catalog, databases, and other resources. Two software platforms for creating simple pages were tested, the free software from WordPress with mobile detection formatting enabled and LibGuides’ mobile friendly platform in a basic version, free for those with LibGuides accounts, and the more feature-rich MobileBuilder version. Each was found to have advantages and weaknesses. Whichever platform is chosen, usability testing is critical. The authors offer a “Heuristic Checklist for Library Mobile Design,” detailing aspects of interface design, user characteristics, and content delivery that should be assessed to determine how well the platform serves a library’s requirements for mobile usability.

KEYWORDS
mobile applications interfaces
libraries usability
design evaluation

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With the increase in smartphone ownership by students and faculty there is an expectation for libraries to have a mobile presence to support educational needs. Recent findings regarding use of mobile phones, access to information and information-seeking behavior bolster the argument for creating mobile access points to libraries.

Pew Research reports that 87% of blacks and Hispanics own cellphones and “take advantage of a much wider array of their phones’ data functions compared to white cellphone owners” [1, para 8]. With such a large population of mobile users relying on phones for Internet access, it is important for libraries to offer content in a mobile-friendly format. For teens, the numbers are an even more significant indication of this need with 65% of mobile users accessing the Internet and 40% watching videos on their phones. Both of these findings illustrate anecdotally that mobile users may be served well with access to library instruction and content for point-of-need use in addition to services.

The Library Journal recently conducted a survey of mobile sites and libraries [2]. Unsurprisingly, 65% of academic libraries said they had or planned to have a mobile web presence. What was surprising, conversely, was how few actually had a mobile site available. The reasons given for not currently offering mobile services included budget, priorities, skills and perceptions. These barriers ring true for many libraries, especially in the wake of severe budget cuts and staff overload.

To overcome the barriers associated with developing mobile sites from scratch, libraries can use low-cost or free products to create a page. Even after a library decides on the product, many do not know where to start on the actual design. Libraries develop their mobile sites in much the same way
they developed their home pages: find other library sites and emulate them. However, even in a mobile environment, what works for one library may not be suitable for another. Using a checklist and usability testing will enable libraries to make sure they are serving the needs of their users as well as making functional, well-designed mobile sites. This article provides an overview of basic design and content considerations, evaluation of two no/low-cost page options and finally a checklist for mobile sites to ensure you meet basic standards of usability.

If We Build It Will They Come? Basic Design Elements and Content Considerations for Library Mobile Pages

The two prevalent mobile design options include native apps specific to particular mobile platforms (typically iPhone, Android, Windows 7, Blackberry) or mobile web pages. The mobile web option is particularly attractive to libraries with few resources in terms of funding or coding expertise as it is relatively easy to exercise with basic or even no HTML knowledge.

Often, libraries create mobile versions of a limited subset of their full websites. There are a few surveys of mobile library sites [3, 4, 5], and in general they find that the following pages or information are typically offered:

- Opening Hours
- Contact Us
- Directions

These pages are essentially static html formatted for mobile usage and are easy to create. In addition, most mobile library pages also have outbound links to the following:

- catalog
- databases
- social media accounts (for example, Twitter, Facebook)
- guides, FAQs and news

It is important to note that while most of the targets of these links are usually (but not always) mobile friendly, they are typically independent of the library page itself and are naturally mobile. For example, library mobile pages that link to their Twitter and Facebook accounts take advantage of the fact that Twitter and Facebook will automatically detect mobile usage and serve up mobile versions.

Before 2010 very few libraries incorporated instruction and content into their mobile sites. Aldrich [3] found that less than four percent of library mobile sites had links to academic content. With the popularity of apps like Wikipedia, IMDB and various news outlets, there is definitely a proclivity for users to seek content via smartphones when an information need arises. The growth of databases and catalogs in a mobile-ready format make it much easier for libraries to link to content in addition to basic services.

The third class of functionality observed on library mobile sites is a lot less commonly seen. This includes functionality that allows

- checking availability of computers
- webcam views to check how busy lines are
- booking functions.

These features may be most desired by users [6], but they are more difficult to create for obvious reasons.

Low-cost Options for Libraries

While someone with a fair amount of HTML knowledge can create a mobile-friendly page, there are easier options that require little or no programming knowledge. In addition to the two sites explored below, there are several free mobile site builders available on the Internet [7, 8]. We will explore two options to which many libraries have access:

1. WordPress with mobile detection plugin enabled (free)
2. LibGuides platform (free if the library already subscribes to LibGuides)

The first option is the commercial (free) version of WordPress with the mobile detection formatting enabled. The beta version of the California State University, Long Beach (CSULB) library mobile site (http://mobilelib.wordpress.com/) was authored with the free version of WordPress [9]. Each link goes to a page within the blog. The content was copy-pasted from the full library site with very minimal html editing. The page shown in Figure 1 took about an hour to create, with only minor formatting. The page does not utilize plug-ins or advanced features.
A more advanced example using WordPress can be seen in the mobile efforts of the Nanyang Technological University (NTU) Library at http://blogs.ntu.edu.sg/mlibrary. As shown in Figure 2, the NTU Library uses a combination of WordPress and LibraryAnywhere (which offers a mobile catalog – not a free option) to generate mobile friendly pages.

The next platform tested was LibGuides (http://demo.libguides.com). As of July 2011 the Springshare website lists over 2000 libraries in the world using the LibGuides platform. One of the features of LibGuides is that it is mobile friendly. While it is not a free tool, a great many libraries subscribe to LibGuides and for them it can be a free mobile platform. What is ideal about using LibGuides to create pages is the ability it provides to use other features such as quiz questions and other interactive widgets to enhance the users’ experience in the mobile environment. Overall, if you have a current subscription, it is easy to create a mobile site with no additional cost other than the staffing time to add content.

Some libraries such as University of Notre Dame Australia (http://library.nd.edu.au/home), Cornerstone University (http://library.cornerstone.edu/) and Ocean City Public Library (http://home.oceancitylibrary.org/index) have already migrated their full normal websites to LibGuides. Of course, many links on pages on such sites will go to external pages that are not optimized for mobile devices.

The basic pages in both LibGuides and WordPress can be modified by, for example, by adding icons, resizing text for a better fit to mobile screens or creating buttons.

One example of a site using MobileBuilder is the College of North Atlantic-Qatar mobile site at http://cna-qatar.libguides.com/mobile shown in Figure 3.

In an effort to gain a larger market share of the mobile-page generating industry, Springshare recently launched a mobile-site builder that allows customers to create pages specifically for mobile with up to 10 secondary items in a second level hierarchy. Springshare will undoubtedly become the largest provider of mobile sites for libraries as it is a low-cost option that is offered as an inexpensive add-on to current service.

**Basic Usability and Testing Strategies**

Usability testing usually involves three phases: heuristic evaluation, paper tests and usability testing with users. There is extensive research published on usability and library website design. They reveal a pattern of issues libraries continue to struggle with, including ambiguous library jargon, navigation, too much text and confusing architecture. While the limited landscape of a mobile site alleviates some of these issues, there is still a need to test the chosen mobile layout as one template may not fit the needs of your users. Please note that this testing does not typically include any ADA compliance design considerations, which should be addressed in the coding of the page.

As with any other web-authoring tool, designers should verify compliance with federal requirements.

With studies describing the usability of many mobile sites as “miserable” [10], it is important that libraries with little experience in usability testing be provided guidance with
a detailed set of usability heuristics specifically tailored for library sites. Based upon an examination of published usability principles including library specific heuristics [11,12,13,14,15], the authors developed a mobile checklist specifically for use with library mobile sites – **Heuristic Checklist for Mobile Library Design** (See sidebar). The need for a simple checklist for library mobile usability is an important element missing from published literature. We tested six mobile library sites against this checklist to validate its ability to evaluate mobile websites. For the purpose of libraries planning or revising mobile sites, the authors synthesized the principles into three categories: interface design, user characteristics and content/purpose.

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**INTERFACE DESIGN**

- Full site and mobile site interaction
  - Link from home page
  - Auto-direct script to mobile site
  - Link to the full desktop version
- Screen Format fits multiple devices (176x220;128x160;320x480)
- Load Speed (W3C, 2008)
- Visual Display
  - Text and Background have sufficient contrast
  - Information conveyed with graphics is also described textually
  - Background image does not hinder readability
  - Logo works on multiple screen sizes
  - Links go to other mobile friendly pages
  - Intuitive labels on links
  - Graphics enhance label of link
- Navigation
  - Descriptive title page
  - Sufficient space between links to avoid "Fat finger problem"
  - Readable recognizable links
  - Horizontal and/or vertical navigation options provided on sub-pages
  - Minimal or no scrolling to see links
- Input of numbers and letters is easy (library catalogs, password, ID, search boxes etc)
- Pull down menu and other menu options are mobile friendly

**HEURISTIC CHECKLIST FOR LIBRARY MOBILE DESIGN**

- Effort (tasks are not overly complex)
- Efficiency (once the user has used the system, a high level of productivity is possible, low error rate)
- Ease of recognition of linked vs. unlinked text
- Error notification
  - Pop-up error message
  - Links to error message page
- Memorability (easy for the user to recall navigation and task navigation)
- Users are offered the ability to bookmark the site or download app with a visual cue
- Attitudes (users feel confident in task completion, would use this source more than one time)
- User can provide feedback/comments

**USER CHARACTERISTICS**

- Link labels contain jargon free terminology
- Links reflect user needs
  - Sites selected based on user feedback (surveys, focus groups etc)
  - Sites are selected based on analytics

**CONTENT**

- Sufficient Help (FAQS, navigation cues, prompts)
  - Staff contact information
  - What’s New/Events
- Contact with librarians provided via email, texting, IM
- Links to a variety of mobile friendly information sources are provided (databases, catalog, websites, guides, etc)
- Basic information provided
  - Hours
  - Directions
  - Phone numbers
- Mobile friendly reference services via mobile site
  - Librarians know if users are using mobile devices
  - Reference responses take into account mobile devices
Interface Design. This category encompasses the basic characteristics needed for users to navigate the site. Criteria include the ability to format for major mobile devices, acceptable load time, consistent design and ease of learning. For libraries, which are notorious for horrible site design, the lack of physical space on a mobile interface is a blessing. Very few pages we examined had too many links or text-to-space ratio problems.

User Characteristics. Another element of design is making sure your users can use the site. Intuitive labeling of links, learnability, predictability, use of clear and concise language and features that minimize user error are important. A high error rate during formal usability testing with users is a key indicator of the need to revise site design. The second phase of our research will explore this category in more detail when we test usability with students.

Content/Purpose. This last set of principles is extremely important for libraries as it directly relates to what we do: provide content. This part of the checklist will help determine what content libraries should include and is integral to a user-centered design model. User needs should be the driving force determining what links occupy the valuable landscape on a mobile page. Criteria include which links are selected and the usefulness of the information provided as well as how libraries define interaction between mobile users and librarians.

WordPress vs. LibGuides

The most obvious limitation for both options is the redundancy of maintaining two pages. Until databases and catalogs auto-detect mobile access, libraries have to maintain a separate page of mobile-only access points. The advantage of a LibGuides site over WordPress is its ability to be updated as the entire suite of guides is updated, thereby reducing workload. Any changes in WordPress, on the other hand, will require duplicating content from the library website.

Another disadvantage of the free version of WordPress is that it is not locally maintained. Using the paid version of WordPress allows the library to maintain the site as well as use plug-ins like MobilePress to create a truly mobile site.

Evaluated against our Heuristic Checklist for Library Mobile Design, both sample sites had disadvantages and advantages that were easy to determine:

- **Interface Design.** WordPress was more flexible in terms of coding and font size adjustment. The ability to adjust for font size meant less “fat finger syndrome” and easily allowed links to fit on the screen. WordPress, on the other hand, didn’t have intuitive vertical or horizontal navigation while LibGuides can easily fall prey to excessive scrolling. The mobile test page above had minimal scrolling; however, any research guide would probably have it, and the scrolling problems would increase as the mobile site contained more of the tabs on the full site. LibGuides had more formatting issues, as some of the boxes don’t allow you to change font size.

- **User Characteristics.** Many of the user characteristics in the checklist are best measured by usability testing and librarian knowledge of usability research. The titles selected in our evaluation of the two products fortunately used little library jargon, and the text copied into WordPress automatically hyperlinked previously linked text. LibGuides surprisingly did not have this feature. The hyperlinks of both sites were a different color than the unlinked text. Neither offered the ability to bookmark the sites. Because both sites contained very few links and links could be annotated, these sites should allow the user to recall task navigation. WordPress’s lack of intuitive horizontal or vertical navigation, mentioned above, may lead to user error.

- **Content/Purpose.** Again, this portion of the checklist is best evaluated by designers or analysis of full site statistics. Both sites included all of the content delineated by the principles.

Conclusion

Regardless of the type of site you use (low-cost or commercial) having a checklist can quickly ensure that you are designing a site that meets the needs of your users. It can be used as a first step in the cycle of usability. Using the checklist for any site planning will ensure that your free version meets mobile usability standards. To ensure that you continue to offer an optimal mobile site it is also important that you constantly monitor trends in mobile technology and monitor user behavior on your site.

Resources on next page
Resources Mentioned in the Article


Mobile Usability
by Jeff Wisniewski

It's a mobile world. Over the past several years there has been an impressive increase in the number of mobile devices, particularly smartphones and tablets, and mobile Internet use has skyrocketed accordingly. Libraries are aware of these trends and are making forays into the mobile landscape with apps and mobile sites. Libraries need to be mobile, but need to be mobile in the right way, in a way that's accessible, appropriate and user friendly. Most libraries have experience with desktop usability, but what about usability in the mobile context?

Before discussing usability in a mobile context, we need to clarify what exactly is “mobile”? A tablet, for example, is indeed mobile, but it has a screen that in some cases bests the size of some notebooks and netbooks. Is a smartphone that has a laptop dock, complete with keyboard and full size screen, mobile? A reasonable approach would be to categorize devices as either large screen or small screen. For the purposes of this discussion, the context is usability for the small screen.

Designing For Usability
The best way to ensure a usable mobile product is to design it well, with usability in mind through the entire process. Fortunately, there’s a lot of guidance available in the form of both platform-specific user interaction guidelines, as well as more general mobile usability guidelines from the World Wide Web Consortium. Apple, Android, Blackberry and other mobile OS makers make detailed user interface guidelines available that answer many of the questions a small screen designer might have.

Whether a user is physically on the move or stationary, immersed in the
device or working in a state of constant partial attention, the simple reality is that interacting with the small screen poses challenges that working with larger screens does not.

It goes without saying that mobile is not simply a minified version of the desktop. There are substantive differences that strongly influence the design and function of mobile that set it apart from the desktop environment.

There’s less real estate to work with, so an important consideration is that of distilling your site content and services to their essence. Indeed, there is discussion about a mobile first design philosophy, which advocates designing your site first for mobile, then for the desktop, as opposed to the way it usually happens. The point is to get designers and developers thinking about and aware of which information and services they offer are core and which are ancillary.

It is, for example, safe to say that most small screen users will neither need nor want to read the ins and outs of your full circulation policy. They will, however, most certainly want to be able to quickly look up a book title, see if the library is open or send you a question via text or instant messaging.

Top-level choices should be relatively few. Again, think of what is mission critical. A slim and deep architecture makes sense. For example, instead of a single page or panel listing all of your branches, the days of the week and their hours of operation, a better approach is to chunk this information down through several screens.

The New York Public Library does a great job here, by having the user first choose “visit a library,” then on the next screen choose location (borough), then branch on the next screen, then get the hours listing. They also get bonus points for offering a “today’s hours are...” statement. It’s more clicks than we’d perhaps use in a desktop environment, but in a mobile context it makes good sense. There are fewer top-level choices.

Because of the small screen and the ergonomics of holding the device, buttons and other actionable areas are somewhat oversized with more real estate per choice and designed with a drill-down architecture that makes both the choosing and the selecting mindless and easy to execute. If we do as Steve Krug implores us and design desktop sites that don’t make the user have to think, perhaps we can say that in the mobile context we don’t want users to have to think or have to look too closely or to even have to scroll. If a user can get lost in a mobile site or app then something is wrong.

Entering text on small screen devices is another challenge, so minimizing the need to do it improves the overall usability of the site or app. In some cases, for instance, where login is required, it’s unavoidable, but in general the need for text input should be limited. In addition, as is usually the case in the desktop environment, it pays to be conventional. The user interface guidelines put out by manufacturers like Apple exist to codify and promote best practices or conventions. That’s not to say that there’s no room for innovation or uniqueness, but in general adhering to user interface guidelines is good practice.

Testing and Evaluating

Most of us have experience with testing desktop site usability, and many of the same tools and techniques are useful in the mobile environment as well.

What to test? Functional and interaction (task) testing are equally important. Because of the massive variation in both mobile hardware (for example, keyboard or touch screen or scroll ball? portrait or landscape orientation?) and operating system (Blackberry OS, various versions of Android, iOS) as well as browser if we’re talking about a mobile site (Opera, Fennec, Safari, Dolphin and so forth), functional testing takes on heightened importance. Test your app or mobile site on as many of these platforms with as many different hardware configurations as possible. Have friends and colleagues test, too. Initial testing for a mobile site can be done using a User Agent Switcher add-on for Firefox (https://addons.mozilla.org/en-US/firefox/addon/59/); this add-on enables your desktop browser to identify itself as a mobile browser, to help with testing and debugging. In addition, there are a number of mobile browser and platform emulators and simulators that can be useful adjuncts to, but not substitutes for, testing on actual devices. Web-based services like DeviceAnwhere (www.deviceanywhere.com/mobile-application-testing-web.html) and BrowserCam (www.browsercam.com/) offer mobile emulation and testing and can also be useful tools in your mobile usability toolbox.
Interaction or task testing is also important, and, as in the desktop environment, this testing can and should begin before the site or app is even built. Paper prototypes work great here. A wireframe, built and tested on the desktop, can provide some useful insight as well. Once you have a working prototype, though, how do you test it?

**Testing**

There are two leading approaches to testing: testing in a controlled environment, like a usability lab, and testing in the wild, that is, going out and finding real users where they are and testing on the spot. The usability literature is not clear about which approach is better. Testing in the lab introduces some artificial stability that can affect results. Someone testing in a lab is not, as they might be in the real world, doing three things at once—walking down the street, trying, for example, to see if the library is open. On the other hand, testing in the wild can be a hit or miss affair, and while the context is more real, finding an appropriately representative sample of users and devices can be a challenge to say the least.

Lab testing probably makes the most sense. In the desktop world, despite its limitation, it has proven to be useful and reliable. Testing in the lab can be as low tech or as high tech as you want it to be. Some mobile usability lab environments use sleds, which are cradles to keep the device stationary, and cameras to record interactions for analysis. Some use cameras and no sleds, and some use neither cameras nor sleds. While the desire to have good quality video to analyze is reasonable, fixing a device to a surface is an added layer of artificiality in what is already a fairly constructed environment. A combination of observation and the “think aloud” protocol, where users are encouraged to verbalize what they’re doing and why, can provide a great deal of insight and lead to a far more usable product in the end. That it’s both cheap and easy is icing on the cake.

Whether we’re building for the desktop, small screen mobile or large screen mobile, usability needs to be present from the conceptual stage straight through to deployment and after implementation. Build well, test and retest, and continuously improve to ensure a mobile web experience that both satisfies and delights users.
Information Overload, Information Architecture and Digital Literacy
by Tibor Koltay

EDITOR’S SUMMARY
Efforts to address the chronic challenge of information overload in the digital world have focused on content filtering facilitated by information architecture (IA). Information professionals traditionally served as gatekeepers using formal information organization structures, systems and tools. The exploding quantity of contributed content on social media has magnified information overload and left content control and management largely up to users, who need to be educated in digital literacy (DLi) in order to assume this role. Thus, DLi’s interface with IO is relatively clear. DLi also has a twofold role in the related field of IA. By default, information architects should be digitally literate themselves. Secondly, the users of information have to be aware of the importance of structures and architecture. This awareness can be achieved by educating them to IA as part of DLi education. The proper balance between formal and informal approaches to organizing information in the Web 2.0 environment is not yet clear.

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Information Overload, Information Architecture and Digital Literacy
by Tibor Koltay

n a recent paper published in the Bulletin of the American Society for Information Science and Technology, Nathaniel Davis examines the economic and social impact of information overload (IO) [1]. Davis states that IO is mainly a social condition, propagated by people and points out that it can be regarded in part as a consequence of the lack of filters or failure to apply them appropriately.

We have to add to his arguments that the concept of IO is not new nor is there a single generally accepted definition of the term. Nonetheless, we can define it as an impediment to efficiently using information due to the amount of relevant and potentially useful information available [2].

All these characteristic features give us foundation to draw the following conclusions:

- Literacies have their place in treating IO;
- IO can be of particular interest to information architecture (IA);
- The extensive use of Web 2.0 is also responsible for IO.

The above-mentioned filtering can and has to be learned through literacies. The close relationship between IA and literacies can be seen, if we accept that labeling and folksonomies are an important component of IA by their virtue in enabling both personal information management and community use [3, 4]. The fact that most web users express themselves in mediated spaces offered by Web 2.0 tools instead of communicating face-to-face, causes overabundance of information.

What Do Literacies Have to Do with Information Overload?
To answer this question, it is useful to offer a short review of literacies. We have to recognize many literacies, because they depend on the varying social contexts and the varying social conditions of reading and writing. Consequently, they change in time, according to purposes and circumstances
and to the people and tools involved. [5] Among the influencing factors we obviously find Web 2.0.

The best known type of literacy, information literacy (IL), pre-dates the appearance of Web 2.0. It is not necessary to repeat its definition, but we can point out that it refers to the process of recognizing information need, finding, evaluating and using information to acquire or extend knowledge [6]. IL education emphasizes, among other factors, critical thinking and the necessity to recognize message quality. IL has strong positions among literacies despite some (well-founded) skepticism, highlighting that this concept – and especially the lack of information literacy – has always seemed to be of more importance to academic librarians than to any other players of the information and education arena. [2]

Digital literacy (DLi), which links together other relevant literacies, including information literacy and the use of information and communication technologies, may be more promising in this regard. It includes publishing and communicating in contrast to the more traditional definitions of IL [7]. Digital literacy’s interface with IO is relatively clear. With the apparent loss of gatekeepers, like reviewers, editors, librarians and others, readers themselves have to become the gatekeepers [8]. This change causes IO and requires the application of DLi.

**What Do Literacies Have to Do with Information Architecture?**

Gatekeeping, however, is not entirely lost. While amateur content is highly popular on Web 2.0, professional content remains important and the two are still different. Information architecture applied to “traditional,” professional subjects requires the presence of digital literacy because it emphasizes consciousness and critical approaches toward information.

DLi’s role in IA is twofold. By default, information architects should be digitally literate themselves. Secondly, the users of information have to be aware of the importance of structures and architecture. This awareness can be achieved by educating them to IA as part of DLi education.

When thinking about folksonomies and similar user-generated knowledge organization, we can see that professional goals would most probably require not only the use of these unsophisticated tools, but also classification and subject indexing that employ classification schemes, top-down hierarchical taxonomies, thesauri and other formal structures. At least, the latter would have to be taken into consideration to a greater extent. Folksonomies can be successful if the goals of a given website or information system and the goals and motivations of users are similar [9]. The question is, however, whether a system’s users themselves are qualified to achieve that goal. It is true that users are able to contribute their knowledge to a given folksonomy, and with these contributions they can represent the collective knowledge of the users [4]. This result may happen in a number of cases. We have to be aware, nonetheless, that the usefulness of user-contributed content can be overemphasized due to the “trendy” nature of such interactions. This trendiness is also the source of the uncritical approach characterizing the Web 2.0 environment, which raises a number of complex questions [10].

Both IA and DLi have an interface to media ecology, which provides a flexible and human-centered perceptual framework for understanding and designing emerging new media, regardless of the spaces where they occur. There are different levels of media ecology ranging from the small, like a graphical user interface, to the large, like the “information age” [11]. The IA and DLi interfaces pertain to an intermediate level, as they do not reach the magnitude of the information society as a whole, even though they are close to it.

When interpreting McLuhan’s well-known aphorism “the medium is the message,” we can state that a medium shapes content in ways that are advantageous to the biases of that medium, as all media have biases. These biases influence not only the content but also the experience of the user. Reacting to the biases also requires the use of a reflective language and refined perceptions in design, as the reactions to these biases are usually unconscious. Even though Web 2.0 is not one single medium, it shows common biases that characterize it as a whole. In our opinion the biases of the Web 2.0 environment are inherent to a lesser degree [11]. They are produced artificially by reinforcing the constructed nature of media since media are both constructed by and construct reality [12].

The Web 2.0 environment is also characterized by rapidly changing
contexts due to the simplicity and ease of use of tools that can be applied by users to do most of the organizing and structuring for themselves [13]. This self-sufficiency obviously raises the question whether expert structuring through the application of IA is needed.

Although related to each other, it would be difficult to establish a whole-to-part relationship between DLI and IA, and it would cause controversies. It would be false to say that DLI is part of IA, but the reverse argument, that IA is part of DLI, would not be correct either. What is certain is that the role of IA in DLI has not been acknowledged by literacy specialists. We can also state that the requirement that digitally literate persons be critical toward information leads to an awareness of information quality, which is one of the critical aspects of IA [14].

There seems to be both a need for a deeper understanding of the nature of human information behavior and for promoting DLI, which can be an important tool to avoid IO. IA that contributes to the appropriate structuring of the information space can play a substantial role in preventing IO, be it real or perceived. This circle closes with the need for IA professionals to be equipped with DLI skills.

Resources Mentioned in the Article


As we all know too well, the world has entered an age of superabundant information — with devices spewing out masses of text and data ranging from consumer shopping patterns to life-saving laboratory results, weather and flight patterns and more mundane data like Facebook updates about friends and acquaintances. As the amount of information generated globally increases exponentially, we become ever more dependent on computers and information systems to make sense of it. In no area of human endeavor is this sense-making more vital than in the area of human health. A key challenge related to sense-making in human health has to do with conquering the physical and intellectual divide between clinical data and information (related to a single patient — intervention) and public health data and information (related to groups of patients, communities and populations) in support of prevention. This latter area of intellectual endeavor I have named “prevention” informatics. In this paper I will outline a number of opportunities for information scientists to contribute fresh approaches to bridging the data and disciplinary gaps that impede progress in prevention informatics today.

Why is prevention important? Over the past 100 years a health system has developed in the United States that dramatically reduces death rates —
this system includes improved environmental health (water and sanitation systems), use of antibiotics, development and widespread application of vaccines. (Figure 1).

How did medical care or clinical interventions do in comparison during the 20th century? Not so well! The greatest health gains for populations have derived from initiatives that had little to do with the treatment of illness (Table 1).

In addition to the vital goals of saving lives and preventing illness and injury, what are the economics of prevention versus intervention? The United States spends much more on health care than countries with similar kinds of economies, and although Americans have excellent access to high-tech diagnostic tools and to surgical procedures like angioplasties, Americans do not live longer, healthier lives. And Americans’ cancer survival rates are not markedly better than those of other developed countries [1]. Consensus opinion is that the United States lags in basic preventive care.

The economics of intervention versus prevention information systems are similar. There is a great deal of investment in electronic medical records systems, which track the interventions that the patient has experienced, but limited investments in the informatics of prevention. This limited investment continues in spite of ever-increasing threats of infectious disease and environmental health issues such as water and food safety resulting from the speed at which infectious agents can now disseminate around the world.

The unprecedented volume and speed of human mobility are perhaps the most conspicuous manifestations of the present era of globalization. This has been called the “Global Express” – “the system that connects us across oceans, continents, national boundaries, cultures, languages, groups, ethnicity and trade systems” [2, p. xvii]. A century and a half ago, it took about 365 days to circumnavigate the globe by ship; today, with air travel, it takes less than 36 hours. Thus the incubation period of many infectious diseases is now longer than the time it takes the infected to travel from one

**TABLE 1. Role of medical care in 20th century public health achievements [Unpublished].**

<table>
<thead>
<tr>
<th>Public Health Achievement</th>
<th>Due to Medical Care?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccination</td>
<td>Indirect</td>
</tr>
<tr>
<td>Motor-vehicle safety</td>
<td>No</td>
</tr>
<tr>
<td>Safer workplaces</td>
<td>No</td>
</tr>
<tr>
<td>Control of infectious diseases</td>
<td>+/-</td>
</tr>
<tr>
<td>Coronary heart disease/stroke deaths</td>
<td>+/-</td>
</tr>
<tr>
<td>Safer and healthier foods</td>
<td>No</td>
</tr>
<tr>
<td>Healthier mothers and babies</td>
<td>+/-</td>
</tr>
<tr>
<td>Family planning</td>
<td>No</td>
</tr>
<tr>
<td>Safer drinking water</td>
<td>No</td>
</tr>
<tr>
<td>Recognition of tobacco as health hazard</td>
<td>No</td>
</tr>
</tbody>
</table>
location to another. In the past, infectious disease outbreaks were readily
detected on ships as they pulled into port, and the ships were quarantined
until the diseases had burned themselves out. Now, should a local outbreak
spread silently and globally via an infected traveler or tourist, cases will
likely start emerging only days or weeks later in clinics and communities
worldwide. The surveillance of mobile populations is only one of several
types of surveillance urgently in need of development or improvement. In
addition, as the transcontinental movement of food and commodities has
increased, so, too, has the need for improved trade- and food-related
surveillance [3]. Strategic information systems that can, in real time,
assemble disparate information and data regarding trade and human
movements (for example, flight records) along with weather patterns and
on-the-ground surveillance for disease outbreaks are urgently needed.

Definitions: Intervention Informatics and Prevention Informatics

For most of the last 30 years the development of medical information
systems has focused primarily on the electronic medical record and
information systems that support clinical care such as pharmacy, laboratory
and radiology information systems – that is, systems that are intervention
oriented. The concept of “intervention informatics” has a particular focus on
the individual, the patient with injury, disease or abnormal condition. The
electronic medical record is used to track diagnoses, actions, procedures,
therapies, diagnostic tests and so forth, based on episodes of care. The
electronic medical record tends to be reactive – recording actions taken after
the health problem occurs. It also typically lacks context related to the
patient’s environment, that is, home/community (urban/rural/inner city),
family members/relationships, travel or hobbies and related activities, all of
which can have a direct bearing on the patient’s health.

In contrast, the concept of “prevention informatics” offers a view of the
individual in context, including family, relationships and community, in
support of promoting the health and well-being of the individual and
populations. Aggregate information extracted from medical records can, of
course, be useful for community disease prevention and response, but
prevention informatics supports a view of health information systems
beyond the electronic medical record, including hospital information systems
that prevent medical errors and hospital-acquired infections, tracking and
rapid communication approaches to respond to food contamination threats,
water quality issues and the like, as well as rapid detection and response to
global disease and health threats. A hallmark of prevention informatics is
that it is proactive. It is highly interactive, data-intensive and data-driven,
linking disparate data, resources, tools and technologies in real time.

Neither the concept of intervention informatics nor prevention
informatics is in common use in the informatics community. However, they
provide a useful paradigm for thinking about how one might re-design and
enhance existing information systems and, indeed, create entirely new
information systems and resources, to drive prevention at the individual,
community and population level.

The following examples of potential prevention informatics strategies
are drawn from a number of domains: classification, knowledge
management and disease outbreak prevention systems.

Classification

What do these three activities have in common?

- Listing causes of death (in a 17th-century mortality table) that include
  “fainted in a bath,” “frighted” and “itch”
- Assigning subject headings to books in a library
- Separating machine-washable clothes from hand-washables?

All, of course, are examples of classification – upon which information
systems of all types are built [4]. William Farr, in 1837 said

The advantages of a uniform statistical nomenclature, however imperfect,
are so obvious, that it is surprising no attention has been paid to its
enforcement in Bills of Mortality. Each disease has, in many instances, been
denoted by three or four terms, and each term has been applied to as many
different diseases: vague, inconvenient names have been employed, or
complications have been registered instead of primary diseases… The
nomenclature is of as much importance in this department of inquiry as
weights and measures in the physical sciences, and should be settled
without delay. (Quoted in [5].)
Criticism of disease classification systems sounds eerily familiar in this quote from Dr. Jim Cimino, an expert on medical classification, 160 years later: inconsistency, lack of concept permanence, disregard for context, slow adaptation to new/emerging disease terminology – and so on [6]. To this list should be added “prevention-oriented terminology.” There are entire vocabularies devoted to

- Diseases (International Classification of Diseases - http://apps.who.int/classifications/apps/icd/icd10online/)
- Laboratory procedures (LOINC – Logical Observations, Identifiers, Names and Codes http://loinc.org/)
- Drugs (http://www.micromedex.com/index.html).

However, prevention-oriented terminology is not addressed in any systematic way. The Unified Medical Language System (UMLS) Terminology Services (www.nlm.nih.gov/research/umls/), a powerful set of vocabulary resources of the National Library of Medicine, provides, through its metathesaurus browser, a view of prevention-related terminology across hundreds of vocabularies with approximate 1100 concepts related to prevention (see Figure 2). Nonetheless, a systematic, controlled vocabulary of prevention-oriented concepts and terminology could be a useful component of clinical and public health information systems to drive the generation of alerts and reminders and to compile critical data from disparate information systems and resources for reducing disease and improving health outcomes.

**Knowledge Management**

The challenge: Neither the creation nor the distribution of information resources (data of all types, guidelines, research findings, maps, policies, laws, evaluation metrics, teaching materials, etc.) upon which public health practitioners depend is managed or presented in any systematic or comprehensive way at the present time. The key role of public health professionals is prevention. In fact, prevention is in the official name of the Centers for Disease Control (and Prevention). The need for rapid access to information to support critical decisions in public health cannot be disputed; however, information systems of public health professionals lag far behind those of their clinical counterparts and tend to be siloed, single-purpose systems. Examples include immunization reporting systems, which are typically not tied to medical record systems; disease reporting systems (individual diseases disconnected from each other and from clinical information systems); and stand-alone environmental health and data. A knowledge management system, developed at the University of Washington, Center for Public Health Informatics, is aimed at providing a role-driven knowledge management environment for public health officials (www.myph.org). The goal of the research is to identify approaches to removing uncertainty in public health decision making by promoting the collective sharing of information with a knowledge repository, codifying knowledge assets so they can be easily found and providing an interface which bridges information and data silos [7]. Further research in the knowledge management challenges of public health professionals is urgently needed.
Improved Approaches to Data Collection, Mining and Visualization

The classic problem is too much data and not enough information upon which to make decisions. One of the most important developments in prevention is the ability to map and visualize data across districts, nations, regions and the world, and across time – a great step forward from the ground-breaking work of Dr. John Snow in identifying the sources of the London cholera epidemic in 1854 [8]. GIS mapping and visualization, coupled with the explosive use of the Internet and mobile phones for data collection and communications, provide a rich environment for developing strategies for building information systems to anticipate and prevent global health threats. Such systems can bring together in new ways a variety of types of data not only to detect health challenges, but also to prevent their occurrence. Such data include satellite data, airline data, non-prescription drug purchases, news media, published reports from local newspapers and Internet activity, including Google concept searches and citizen-contributed information and data.

In many parts of the world, the lack of reliable infrastructure (including computing and communications) and the lack of skilled workers have made accurate and reliable data collection difficult. However, the exponential growth of cellphone infrastructure and availability is rapidly transforming data collection and management in remote areas throughout the world. A variety of types of data – from text to photos, location, blood samples, audio, barcode scans and video can rapidly be collected as well as transmitted to public health settings across the country or across the globe.

Open Data Kit (ODK) is a suite of open source tools developed by computer scientists and engineers at the University of Washington and around the world. These tools are proving to be faster and more accurate than paper-based forms for data collection and analysis and less expensive than alternative computing technologies. By using existing cellular networks, ODK’s developers are freeing the users from the traditional computer networking and related infrastructure constraints in developing countries and beyond. Features including GPS, video and photos provide a contextually richer set of data than is possible using typical paper forms, and the information can be compiled, shared and analyzed much faster. Medical workers in Kenya conduct house-to-house visits doing HIV counseling and testing using ODK-equipped smartphones to track patients’ medical histories (accessed by using the phone to scan a bar code on a patient’s ID card) and upload geo-coded information directly to the health information system [9].

A variety of new data mining and visualization tools and technologies are being developed to provide enhanced views of large sets of aggregate data [10]. A promising new approach to real-time data collection for research and response involves mining streams of data as they are generated on the Internet. Several tools have been developed to gather distributed data via the web (or alternative data streams) and visualize it in real-time. InStedd’s Riff tool is an interactive decision-support environment that combines the power of virtual teams of human experts and advanced analytic, machine-learning and visualization services to allow its users to collaborate around streams of information in order to detect, characterize and respond rapidly to emerging events. During the H1N1 pandemic, Riff was used to mine Google searches related to flu symptoms, identify where those searches were coming from in the United States and map the locations, resulting in accurate prediction of actual outbreaks as they were developing and opportunity to develop prevention responses such as school closures [11].

Ushahidi, similar in purpose to Riff, supports gathering of distributed data from the web and other data streams. Developers throughout Africa and beyond are using Ushahidi to extract and map a variety of types of data including crisis response and recovery (Chile, Haiti) and medical and pharmaceutical stockouts (Kenya, Uganda, Malawi, Zambia) [12].

EpiVue, developed by the Center for Public Health Informatics, University of Washington, integrates open-source technologies to provide a geospatial visualization framework for public health data. Users can upload data sets in a variety of formats and visualize the data via Google map [13].

Zook et al. [14] outline the ways in which a variety of information technologies including crowdsourcing for online mapping were used in the Haiti relief effort. They demonstrate the potential of crowd-sourced online mapping and the potential for new avenues of interaction among physically distant places to plan prevention strategies.
Conclusion

Prevention informatics offers a useful paradigm for re-imagining health information systems and for harnessing the vast array of data, tools, technologies and systems to respond pro-actively to health challenges across the globe. Research opportunities for information scientists in prevention informatics abound. Critically needed are methods to optimize timely data exchange of information between (to and from) clinical and public health information systems in order to improve speed of prevention response for individual and community health. Citizen-generated information offers new means to detect disease threats and respond to disasters as well as offering communities of practice to support prevention response in resource-constrained environments. At the same time, with the availability of instant communications, we need to understand how to recognize and prepare for unexpected crowd reactions to threats. Improved vocabularies, thesauri and ontologies of concepts, coupled with visualization tools and GIS mapping, can provide new insights across disparate information resources and databases from information and data sources across the globe.

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A special thank you to my public health mentors, Rear Admiral Dr. Patrick O’Carroll, Region 10 Health Administrator, Public Health Services, whose lectures on public health and the importance of prevention inspired me to think more broadly about health information systems design; to Dr. Mark Oberle who provided a comprehensive grounding in the vital work that public health professionals do even when they are on vacation; and to Drs. Roddy Stusser and Walter Curioso who contributed their perspectives on global issues in prevention informatics.

Resources Mentioned in the Article

One of my students recently sent me an old blog post announcing that the term information architecture is dead. The article questions the need for the label and claims that the term emphasizes data rather than humans. The author believes practitioners spend too much time questioning the label and has decided to stick with designer.

I wasn’t terribly impressed with the writer’s arguments. Richard Saul Wurman coined the term information architect (IA) 35 years ago because he saw limits in the meaning of the word designer. Wurman suggested communicators could focus on making the complex clear and offered the label as a better choice.

I also don’t feel bothered when people avoid the label information architect. It makes sense to speak your client’s language, so I use labels such as teacher and communications consultant more than I use the label IA. But I am frequently reminded why the world needs folks who practice IA. I experienced such an example this week.

I was chatting with a friend who typically does not travel for work. The organization asked him to log into its company-wide travel system and book a hotel room and a car. My friend spent four hours trying to make his reservations. “Four hours!” he cried. “It took me half the day to understand how the travel system worked. Do you know what I could have done with this time? I don’t know why they build systems so bad.”

Hmmm…. What do you think? Why do organizations build and maintain systems that people can’t use?

Could it be a disregard for the people who use the systems? Or possibly (more charitably), could it be a lack of understanding? Do system developers have a limited view of people who use electronic communication systems? Do executives look at systematic solutions as an expense rather than an opportunity?

I’d respond, “Yes.” Working with organizations for (muffled sound) years, I have encountered all these situations. Sometimes they overlap.

I’m reminded of some work helping personnel in state offices for a large association. Our audience consisted of hard-working people managing programs, running the office, recruiting and supporting volunteers and balancing resources. Hard job.

To do their jobs, they relied on electronic systems – payroll, scheduling, finance, operations, purchasing (and sadly, the list goes on). Naturally, they liked some products more than others. One, they detested.

So when it came time to introduce a new system to the office, what model did the technical team use to create a system? You know the answer: The system people detested. Why? Developers could use available code.

Did they want feedback on how to make the system more user-friendly? No. Did they care that the system took longer for state office people to use? No. Did this cost the organization more money in the long run? Probably.

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KEYWORDS
information architecture
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effectiveness

EDITOR’S SUMMARY
A blogger’s assertion that information architecture is dead prompts consideration of the usefulness of the term and the value of the practice. Anecdotes of time wasted reveal the results of poor website design, built with little regard for actual end users. Too often, user feedback and productivity are ignored, undermining the goal of improving performance. Information architects listen to users’ needs, analyze the information environment, make information workable, test results and optimize the function of websites. In the scenarios described, an information architect’s skills could save thousands of hours and dollars. Information architecture is alive and well, and the focus should not be on debating the term and practice but on educating others on its critical importance for organizational productivity.
I was intrigued by a definition Scott Abel (www.thecontentwrangler.com) used to frame his thinking about content strategy. He said, “We need to strategically explore how we can use organizational resources directed toward a common goal so they accomplish the goal.” [1] This dictum holds true for those who frame their work as information architects, too.

At the end of the day, an organization’s job is “improving performance.” Employees need to perform their jobs to support their clients. Information architects are on the front lines when it comes to improving performance. We know how to listen to what users want from a system; we know how to analyze what we learn so we can determine what to put in and what to leave out; we know how to cluster information into smaller usable chunks that support information processing and decision-making; and we know how to test our assumptions and optimize a system so it is directed toward a common goal.

Useful skills? I’d argue, “Yes.” Remember my friend who spent four hours using a travel system? He’s a senior staff member, so if you consider his salary and benefits, he spent more than a thousand dollars trying to get his job done. And when he returned to the corporate travel system later to check on his reservations, they weren’t there. Why? He has no clue. In the end, he had to call someone else for help.

Instead of spending time decrying the death of information architecture, let us instead spend our energy informing others that information structure matters. Envision 100 workers spending 1,000 lost hours in corporate systems. You are looking at $100,000 – enough to spend money on a seasoned information architect. Even in a bad economy.

User experience champion Eric Reiss commented on information architecture’s apparent passing in last fall’s *Journal of Information Architecture*. He wrote, “Is information architecture dead? No way! It ain’t even sick.” [2].

I agree.