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Making the case for a fully mobile library web site: from floor maps to the catalog

Laurie Bridges
Oregon State University, Corvallis, Oregon, USA
Hannah Gascho Rempel
Oregon State University, Corvallis, Oregon, USA
Kimberly Griggs
Oregon State University, Corvallis, Oregon, USA

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Laurie Bridges, Hannah Gascho Rempel and Kimberly Griggs
Oregon State University, Corvallis, Oregon, USA

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Abstract

Purpose – The purpose of this paper is to provide an overview of the current state of worldwide mobile usage; mobile technologies; libraries' use of mobile technologies including a review of library mobile catalog options, both vendor-supplied and in-house created; perspectives from current library leaders and innovators on the importance of incorporating the libraries' resources into the mobile environment; and future directions for mobile library services.

Design/methodology/approach – A range of recently published literature (2008-2010), which aims to provide practical statistics and resources for libraries wishing to mobilize their web site, is summarized in order to provide the reader with tools for creating a mobile library proposal. The sources are sorted into sections: mobile phone popularity, smartphones/web-enabled phones, mobile phone use, library mobile web sites and catalogs, and what library leaders have to say.

Findings – The paper provides an evaluative summary of mobile statistics and resources, indicating the salient points and how to find more information for libraries wishing to draft a mobile library proposal.

Practical implications – The paper presents a useful source of information for both libraries wishing to create a proposal for a mobile library site, and for libraries that simply want an overview of the current state of mobile use and technologies.

Originality/value – The paper includes up-to-date data about worldwide mobile phone penetration rates and mobile phone use, and is the first to argue for proposing the development of both a mobile library web site and a mobile catalog.

Keywords Worldwide web, Mobile communication systems, Academic libraries, United States of America

Paper type Research paper

Introduction

Is it time for your library to develop a fully mobile web site? The answer: unequivocally yes. But, where do you begin? The Oregon State University Libraries began in December 2008 by appointing a three-member team (the authors of this article) to investigate mobile library trends. We started the process by writing a proposal intended to gain widespread support from our libraries' administration, faculty, and staff. The proposal included timely information about mobile technologies, mobile device trends, and mobile technology users. The proposal was accepted, the project was implemented in stages, and the OSU Libraries' mobile web site is up and running (http://m.library.oregonstate.edu). This article includes all the information needed to begin the proposal process, including up-to-date information about mobile devices and their adoption; research and data about young adults and mobile devices; a review of library mobile catalog options including those provided by Innovative Interfaces, Inc (III) and OCLC; future directions for mobile libraries; and insights from

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current library leaders and innovators about the importance of incorporating the libraries' resources into the mobile environment.

Mobile phone popularity

The number of mobile phone users has increased at a head-spinning pace over the past several years and mobile phones are now used in most regions throughout the world. Astoundingly, mobile phones have gone from a 5 percent worldwide penetration rate ten years ago to an estimated 61 percent penetration rate in 2008 (International Telecommunication Union (ITU), 2009a). Currently there are more mobile phone subscriptions, which are estimated at 4 billion, than landlines, which are estimated at 1.3 billion (ITU, 2009a). According to the report "Information Society Statistical Profiles 2009: Americas", mobile phone subscriptions in North, Central, and South America have skyrocketed in the last five years, going from 300 million in 2003 to approximately 750 million in 2008 (ITU, 2009b). It is interesting to note that many countries in the region outpace the USA and Canada in mobile phone penetration, including El Salvador, Venezuela, Guatemala, and Panama; as well as several countries outside of this region, such as South Africa, Gabon, Armenia, Russia, Malaysia, and Thailand (ITU 2009b, c, d, e). A closer look at this phenomenon reveals mobile phone technology has allowed developing countries and remote regions to leapfrog over the complicated steps of creating a landline infrastructure, all the while providing people what they want – quick and easy access to one another and information.

The USA is estimated to have a mobile phone penetration rate of 85-88 percent with 71 percent of teens age 12-17 owning a mobile phone (ITU, 2009b; Pew Research Center, 2009). More specific information about how this age group and Generation Y use their phones is provided in later sections of this article. To further illustrate how popular mobile phones are, consider that in 2008 the US had 158 million landlines compared with 271 million mobile phone subscriptions (ITU, 2009b). As the number of mobile phone subscriptions has grown over the past five years, landlines have decreased by approximately 24 million (ITU, 2009b). These statistics reflect Americans' reliance on their mobile phones with 42 percent of users saying they "cannot live without" them and 82 percent saying they never leave home without their phone (Synovate, 2009).

Smartphones/web-enabled phones

When considering the implementation of a mobile library site, it is not sufficient to simply recognize that a large percentage of library patrons use mobile phones. The particular types of devices they use and the degree to which they are web-enabled must also be considered. The range of devices available can greatly impact the way you develop your mobile library site. Paying attention to the types of devices your users have can also help you to design mobile services that best meet their needs. The two main devices described here are "smartphones" and "feature phones" (see Table I).

Although the term smartphone is commonly used to refer to several brands of phones including the Blackberry, iPhone, and the Palm Treo, it is important to further explain the differences between the "smartphone" and a "dummy" or feature phone before launching into a discussion about web-enabled phones and their users. Although the term smartphone is commonplace, there is not an industry-standard

Smartphone	Feature phone
Larger screen	Smaller screen
Synchronizes with computer	Cannot synchronize with computer
May have full (miniature) typewriter keyboards, also referred to as QWERTY keypads	Does not have QWERTY keypad
May have touch-screen capabilities	Does not have touch-screen capabilities
May run on an open operating system (example: the Android phone by Google runs on Linux OS)	Runs on a propriety operating system
Applications/software can be downloaded	Applications/software cannot be downloaded
Full web browser (able to access any web site)	May have propriety browser with limited capabilities
Often uses 3G networks for faster connectivity	Does not use 3G networks
More powerful processors	Less powerful processors

Table I.
Comparison of smartphones and feature phones

definition; therefore, we have compiled a list of comparisons of what makes the smartphone different from a feature phone.

Statistics about smartphone use vary, because there is not an industry-standard definition of these phones. Measuring the number of smartphones sold can be misleading, because some users do not subscribe to the data services, and many users do not use the services they subscribe to because they do not know how to use them or are afraid they will be billed for additional charges (*Mintel Market Research Reports*, 2009). However, reviewing statistics from market research companies can provide a general estimate of the current popularity of smartphones. Synovate, a marketing research company, surveyed 8,000 mobile phone users in the USA and found 21 percent owned smartphones (Synovate, 2009). Another market research company, the NPD Group (The NPD Group, 2009), found that 28 percent of mobile phone users in the USA bought smartphones in the second quarter of 2009; a 47 percent increase over the previous year.

A study released by the EDUCAUSE Center for Applied Research (ECAR) in October 2009 found 51 percent of undergraduate respondents owned a web-enabled phone and another 12 percent planned to purchase one in the next 12 months; 74 percent of the students who had web-enabled phones expected their use of the internet from their phone to increase within the next three years (EDUCAUSE Center for Applied Research, 2009, p. 7).

The popularity of the smartphone has grown, in large part, because of 3G technology; 3G is an acronym for third generation mobile technology, which allows high-speed broadband access to data services, such as the web and e-mail, via mobile devices. Before 3G systems, mobile phones could not handle both voice and data over the networks. To get a better understanding of the difference between 2G and 3G, imagine downloading a song to a mobile phone; a basic 2G phone downloads the song at 144 kilobits per second, which requires several minutes, while the 3G phone can download over 2,000 kilobits per second, making it faster and more efficient (Gaylord, 2009). Or, to put it another way, it is similar to the difference between a dial-up and broadband connection from a desktop computer. Although the term 4G is being used in mobile phone advertisements for Sprint™, it has not yet been clearly defined, and at this point simply means "faster than 3G," but in the near future 4G phones will emerge

that are 10 to 50 times faster than a 3G phone (Gaylord, 2009). Mobile data traffic is expected to increase by 66 times from 2008-2013 (Cisco, 2009). More than 80 percent of mobile traffic in the year 2013 is expected to come from mobile devices using 4G speeds and above (Cisco, 2009). As speeds for data access increase, so will smartphone use. Sales of smartphones are expected to outpace the sale of personal computers in 2009 and revenue from the sale of smartphones is forecasted to be higher than portable personal computer's by the year 2012 (Gartner, Inc., 2009). As smartphones become ubiquitous, libraries will want to be prepared with mobile web sites that are optimized for smaller screens, otherwise, students will find alternative mobile-friendly web sites to conduct their research.

Mobile phone use

We have established the fact that mobile phone usage extends to the majority of the world's population, and that it is poised to grow at a rapid rate, but what do we know about how people use the web on their mobile phones? This question is of particular interest to libraries planning on launching a mobile web site. Who will be using the library's site and what type of information will users be looking for when they go there?

According to *Mintel Market Research Reports* (2009), 34 percent of "online adults who own a cell phone have used it to browse the web." In addition, comScore, a research company that tracks digital trends, reported the number of people in the US using their phones to access the web daily doubled from January 2008 to January 2009, going from 11 million users to 22 million (comScore, 2009).

ECAR undertook a large study of undergraduates and technology in 2009, with 30,616 respondents from 115 schools. Over 25 percent of the students used their mobile phones to access the internet weekly, and approximately 10 percent used their phones to access the web monthly. Of the students who used their mobile phones to access the web, 77 percent used their phones to get information including news, facts, and weather; 75 percent used them to access e-mail; 63 percent logged onto social networking sites; and 59 percent used their phones to read maps and get directions (EDUCAUSE Center for Applied Research, 2009, pp. 18-19).

Harris Interactive released a report on teenagers and mobile phone use in 2008 (Harris Interactive, 2008). A total 2,089 teens between the ages of 13 and 19 were surveyed and asked about their phone usage, attitudes, and behaviors. Harris found 28 percent of teens browse the web on their phone. The top four types of information they browsed for were e-mail, social networking sites, weather, and driving directions. A total 57 percent of the teens reported owning a mobile phone "has improved the quality of my life," and 18 percent said the mobile phone had "influenced my education positively." Of the teens using smartphones, 59 percent said "It's an indicator of my personal style," 49 percent said, "It's my personal entertainment center," and 17 percent said "It's my gaming console while on the go."

This data has significant implications for libraries planning to implement a mobile web site. A substantial number of traditional college-age students regularly use web-enabled mobile devices. Members of this age group use their phones to access a wide variety of information, such as maps and weather. Libraries will need to promote the informational benefits of their mobile web sites in order to ensure these sites are used to their fullest advantage.

Library mobile web sites and catalogs

When considering the current, non-mobile version of a library web site, it is sometimes easy to forget the distinction between the different types of information the library web site offers. The library web site provides access to the catalog, databases, information about events and programs within the library, directory and location information, and directions on how to ask for help. A patron might think they are simply going to the library web site to look for a book title, rather than process the fact that they are navigating to the library's web site, which contains access to the catalog. To effectively plan a mobile library site, librarians need to be aware of the different components that make up the library web site to create a strategy for making the different pieces mobile compatible. Some parts of the library web site, such as library hours or programming information are much easier to add to a mobile site than other parts like the catalog. Not all parts of the library web site should be made mobile; instead, consider what content makes sense for the mobile user, build on existing web services that offer time-sensitive and location-based services, and focus on adding elements that are fun, fast, and easy to implement. We will offer examples of libraries that have a range of different library web components on their mobile site. However, it may be helpful to think of these components as different phases of the mobilization project that could be incorporated sequentially from simple to more complex.

In the past several years, both public and academic libraries have begun implementing mobile versions of at least some elements of their web sites including catalogs. In 2006 a case study was published about the development of the mobile web site at Ball State University (BSU) Libraries (West *et al.*, 2006). According to the article, the BSU Libraries' mobile site offers library patrons a catalog and journal search, videos about the libraries, information about collections, services such as ILL and course reserves, and quick links to mobile reference web sites. The study found, "(1) library web sites can be adapted to the limited power, memory, small screen size, and bandwidth of mobile devices, and (2) small screen mobile devices are acceptable for showing web services that are easy to read, easy to navigate, and that provide timely information." The information provided by BSU's research is a timely reminder that while library sites often contain large amounts of information, librarians can still effectively communicate their content in a mobile context.

Further evidence of the ability of library sites to make the transition to a mobile platform was given in a report by Ellyssa Kroski in 2008 (Kroski, 2008). In *Library Technology Report, "On the move with the mobile web: libraries and mobile technologies"* she summarized the functionality of several university libraries' mobile web sites. The report illustrates that there are a wide array of services that can be made available via a library's mobile web site. The services provided should reflect the needs of the library's particular user base. Libraries serving large undergraduate populations may want to target reference assistance, technology services, and basic searching features. For example, the University of Richmond Library offers a catalog search, real-time laptop and PC availability information, and ask-a-librarian services by e-mail, SMS, or IM. Another example comes from the University of Virginia Libraries' mobile web site, which provides news and events, information about library exhibitions, directions, library hours, and a text-only version of their entire web site. New York University Libraries, with the Arch mobile portal, chose to focus on their electronically-available resources, and allows searching of their electronic resources

by title, subject, or format, as well as including basic library information. On the other hand, a specialized library may make different types of information available. For example, Boston University Center Medical Library made mobile versions of their subject guides, and made their e-books, e-journals, databases, and library site searchable.

To help inform our decisions about what to include on our mobile site, we evaluated usage statistics from the desktop web site, solicited stakeholder feedback from all of the library departments, received feedback from users by conducting a poll asking which features users wanted, and researched best mobile practices. We developed the mobile site in stages, beginning with location-based information (library hours, library address, floor maps, and contact information), and later expanded our site to include additional features, such as the ability to search the catalog with the option to text or email call numbers, the option to view computer availability in the Learning Commons, and a staff directory.

Other mobile library web sites include Harvard University, University of Illinois at Urbana Champaign, and The District of Columbia Public Library. For a more complete list of mobile library web sites, visit the M-Libraries page on the "Library success: a best practices Wiki," at: www.libsuccess.org/index.php?title = M-Libraries (Library success: a best practices wiki, n.d.). Gleaning ideas from the range of services that can be offered in a mobile library environment will help add weight to a mobile library proposal. In addition, providing examples from these sites will help the proposal's audience develop an understanding for what you hope to achieve by implementing a mobile library web site and what parts of a mobile site you could phase in over time.

Mobile catalog

Although there are many libraries with mobile web sites, and even though we have provided examples of libraries with mobile web sites both with and without catalogs, libraries with mobile catalogs are less common due to the added expense of either implementing a vendor-supplied version of a mobile catalog or because of the technological expertise needed to program a non-vendor catalog solution. Both Innovative Interfaces, Inc (III) and OCLC have developed a mobile search application that can be used by libraries wanting to provide a mobile catalog experience. III's catalog application is the AirPAC, which is a module designed for wireless mobile devices. The AirPAC module allows users to browse the library catalog, check due dates, request materials, and view their patron records with their mobile devices. An increasing number of libraries, both public and academic, are using the AirPAC mobile search module. Several examples of these libraries include the University of San Diego in California, the Multnomah County Public Library in Oregon, Auckland City Libraries in New Zealand, The Hong Kong Polytechnic University Pao Yue-Kong Library, and the University of Sydney Library in Australia. In addition, OCLC is currently offering a mobile search application pilot, WorldCat Mobile, (www.worldcat.org/mobile/) and an iPhone search app (www.oclc.org/news/announcements/announcement353.htm).

While the currently available vendor solutions may be the simplest route to providing a mobile catalog for most libraries, there are some technological issues to be aware of with these mobile catalog options. The shared problem with AirPAC and WorldCat Mobile search solutions is the lack of customization and feature enhancement. OCLC's WorldCat Mobile was created by teaming up with a service

called Boopsie (www.boopsie.com/home/). WorldCat Mobile is still in beta and has some issues that need to be fixed such as a non-intuitive interface and slow response times. In addition, WorldCat Mobile does not currently offer customized views for WorldCat Local, it is only compatible with a small set of smartphones, and some mobile users need to download two applications to their mobile devices: WorldCat Mobile and Boopsie. However, the search application does offer some useful features such as citations for every record in a variety of formats (APA, Chicago, Harvard, MLA, and Turabian) and mapping directions to the nearest WorldCat library – although the user receives no information about call numbers or availability of the material at the nearest library, and features such as map zooming, panning, and direction finding were only sporadically functional at the time we tested it.

The AirPac module, which adds a mobile interface to the III catalog, has taken a different route than OCLC's WorldCat Mobile. Instead of optimizing for smartphones, the AirPac search interface is designed to work on feature phones and therefore works on a wider range of mobile devices. However, the search interface is just a smaller version of the desktop interface and does not take into account the mobile context or provide any additional features. For example, in the AirPac interface the user must click through four screens before locating the call number for a book; in addition the results are text heavy and hard to read on most mobile devices. The interface does not include any mobile features such as text messaging, directions, or auto-dialing. However, it does provide access to user accounts, which enables users to request a hold on a book. Both WorldCat Mobile and AirPac are new services and both are working on making their products better through customer feedback.

Many libraries may find either vendor-supplied mobile catalog option is adequate to suit their current needs. However, some libraries like OSUL, have developed their mobile catalogs in-house due to the limitations of the existing vendor-provided options. OSUL is fortunate enough to have in-house programming capabilities, and as a result was able to create a catalog solution that matches our needs and incorporates the features we wanted (Griggs *et al.*, 2009). OSUL's mobile catalog offers searching by keyword, title, subject, ISBN, and course reserves by instructor or subject. The search can be filtered by location, and results can be limited to one, five, or ten results. Results include call numbers, availability, and floor location for one-click access to the most pertinent data. The item records include title, author, description or table of contents if available, and a link to the shelf-view of the item. Patrons can also email or text the call-numbers to their mobile phones.

Whether your library decides to purchase the AirPac module, enroll in the WorldCat Mobile pilot project, or create a customized site, adding a mobile search to the catalog should be a high priority when considering how to plan for phasing in your mobile site. Stretching the library's mobile interface to include a mobile catalog search option will become more important as students "increasingly expect anytime, anywhere access to data and services that not very long ago were only available while sitting in front of a computer linked to the network via a cable" (Johnson *et al.*, 2010). While providing access to the library's hours, staff contact information, and directions to the library is an important first step, what users typically want from a library is direct access to research materials. Offering a truly mobile catalog interface with links to mobile-friendly catalog records will make the library's resources actually usable for mobile users.

What library leaders have to say

There are a handful of leaders in library and information science who frequently speak and write on a national and international level about the future of libraries. These leaders are at the forefront of library and technology innovation. Their opinions are valued and sought after by administrators and librarians.

One such leader, Joan Lippincott, is the Associate Executive Director for the Coalition for Networked Information. In a 2008 ARL publication she wrote this about mobile library services, "As with most technology developments, this one is fast-moving. This is not a time to sit on the sidelines as other campus units are developing services for mobile users and licensing content for mobile devices. Academic libraries should make conscious choices about what they want to offer in this arena and act accordingly" (Lippincott, 2008).

In February 2008, Stephen Abram, SirsiDynix's Vice President of Innovation, made several predictions about the future of mobile computing, on his popular blog, "Stephen's Lighthouse" (Abram, 2008). His predictions included, "Voice will not be the dominant form of electronically mediated communication in the future. It will stay static as new forms – even beyond texting and SMS take over ... Mobile devices will be most individuals' primary electronic device used for their calendar, voice and e-mail, small scale video, learning, surfing, search, GIS, etc – basically most everything. This moves the virtual world from home or office-based computing to truly personal computing ... OPACs will develop GIS sensitivity and be able to communicate with users through their mobiles for holds, fines, late notices, alerts, etc."

Lorcan Dempsey, Vice President and Chief Strategist at OCLC, encourages the development of mobile library sites in his First Monday article, *Always on: Libraries in a World of Permanent Connectivity*, when he states, "Students are results – oriented and value convenience. This emphasis coupled with the design constraints on some devices promotes a need to get to relevance quickly. Socialization, personalization and location awareness become very important" (Dempsey, 2009).

The District of Columbia (DC) Public Library was the first to unveil an iPhone app for their catalog. The DC Public Library Digital Initiatives Librarian, Aaron Schmidt, is a frequent speaker at Computers in Libraries, the Internet Librarian, and other technology-related conferences. In an e-mail exchange Mr Schmidt wrote, "Many people in DC are glued to their mobile devices and process information on the go. We want to be available in this space to ensure the library is as convenient as possible."

Promotion and assessment

Part of a good proposal should include information about the promotion of the mobile site and an assessment plan for determining its effectiveness. At Oregon State University Libraries, we promoted the mobile web site on our library homepage, posted information on the libraries' Facebook fan page, and disseminated a press release through the University's media relations office (http://ir.library.oregonstate.edu/jspui/handle/1957/13399), which resulted in a mention on the local evening news and an article in the student newspaper. Our assessment plan includes tracking online usage stats (which is currently averaging 100 unique visitors per day), an online survey attached to the mobile web site, focus groups, and user testing.

Tracking usage can also provide data about the types of mobile devices accessing your mobile site and the most viewed content. By knowing what types of devices your

patrons are using and the content they are viewing, you can decide on features to add and content areas in which to expand. User testing should be part of any web application development plan. You can apply the same types of evaluation techniques used in non-mobile applications to ensure a usable interface. In addition, focus groups can help make the case for features your patrons truly want.

OSU Libraries' proposal process

As part of OSU Libraries commitment to innovation, the Mobile Library Team was charged with investigating mobile library trends in December 2008. A proposal for a fully-mobile library web site was crafted and delivered to library administration in January 2009. The proposal included an executive summary, a literature review with references, a problem statement and proposed solution including a project plan with resources, milestones and timelines, screen-shots of the full web site on mobile devices, and examples of existing mobile sites.

Once the library administration approved the proposal it was shared with all the library faculty and staff for further input. Quickly thereafter our computer analyst and a student programmer designed and implemented the web site in consultation with the two other library members of the Mobile Library Team. The first phase of the mobile web site was released in March 2009 and included library hours, contact information, frequently asked questions, and directions. After assessing the mobile site use stats and feedback, we planned and implemented the next stage of the mobile site, which was rolled out in September 2009 and included the library catalog, staff directory, and a computer availability map (Griggs *et al.*, 2009).

The mobile site was developed using technologies and practices that OSU Libraries' programmers were familiar with. This enabled a fast and agile development cycle with each stage going from the planning phase to release in three to four months. To support such a fast turn-around time we used standard web technologies such as XHTML, CSS, and non-essential javascript for the static content in the first stage. We built the catalog and other dynamic content with Ruby, a server side scripting language. We recommend choosing a combination of technologies your IT team supports and using existing web services to quickly add new services. It is interesting to note that the library's mobile web site was the first at Oregon State University optimized for mobile devices. In late December 2009 the University released their limited mobile web site, which borrowed heavily from the design of the library web site.

As of February 2010 the OSUL's mobile web site had an average 100 unique daily users. The most visited pages (in order) are computer availability, catalog, and hours.

Conclusion

After libraries begin providing mobile catalog access, the next logical step will be the availability of mobile versions of online databases. Few database and e-resource providers currently offer mobile versions of their search interfaces. This group includes EBSCO Mobile, Summon from Serial solution, IEEE Xplore Mobile, and PubMed. Unfortunately, the electronic versions of the articles retrieved via mobile database interfaces are not necessarily readable on all mobile devices. However, several journals are working on making sure their content is mobile friendly, for

example Nature, the Journal of Renewable and Sustainable Energy, and the table of contents from the Journal of the American Chemical Society.

Of course, libraries are about more than just search interfaces. Mobile options your library may want to explore in the near future include access to e-books, government documents, archived images and institutional repositories; text alerts sent directly from the library to patrons updating them about library services, hours, and events; and text messaging for reference.

In the near future, mobile versions of a library's web site will be as common and as expected as the library's current desktop site is today. Developing your library's mobile web site should start by crafting a successful proposal that effectively communicates the importance of mobile web accessibility to administrators, faculty, and staff within your library. "Ubiquitous handheld access is more prominent thanks to digital lifestyle devices such as smart phones and iPods, yet libraries still focus on digital content for typical desktop PCs" (McDonald and Thomas, 2006, p. 5). Gathering the data that backs up the growing assumption that mobile phones are omnipresent in your community or on your campus will help build a more convincing argument. Exploring examples of mobile library sites will provide timely ideas and inspiration for your library mobile site. In addition, understanding your particular user base and how they make use of mobile devices, whether they are primarily members of Generation Y or members of another demographic, will help design a site that is heavily trafficked by your users. There will be many opportunities for offering library services in a mobile environment in the near future. Making a strong argument for which of these services works best for your library will keep your library relevant and meaningful in a time of constant technological change.

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About the authors

Laurie Bridges is the Business and Economics Librarian at Oregon State University. She holds an MLIS from the University of Washington and an MS from Oregon State University in College Student Services Administration. She frequently writes and speaks about topics relating to undergraduate student engagement with library services. Laurie Bridges is the corresponding author and can be contacted at: Laurie.Bridges@oregonstate.edu

Hannah Gascho Rempel is the Biosciences Librarian and Graduate Student Services Coordinator at Oregon State University. She holds an MLIS from the University of Washington and an MS from Oregon State University in Horticulture. She frequently writes and speaks about topics relating to graduate student services and new ways to engage users with library services.

Kimberly Griggs is the Programmer/Analyst at Oregon State University Libraries. She holds a BS in Computer Science and an MS in Human-Computer Interaction from University of Oregon. She frequently writes and speaks on technology projects and trends.