Environmental Scan 2013

By the ACRL Research Planning and Review Committee

April 2013

Introduction and Methodology

The 2013 environmental scan of academic libraries is the product of a two-year effort by ACRL's Research Planning and Review Committee. This has been a two-phase project, with the first phase being the development of the "Top Ten Trends in Academic Libraries," published in *College and Research Libraries News* (ACRL Research Planning and Review Committee 2012) . This document represents the second phase of that effort. The document is a scan of the environment and is not intended to be an exhaustive examination of every aspect of librarianship. It identifies current and emerging factors that impact academic libraries; describes the broader context in which these libraries operate; and outlines related implications for library resources, services, and personnel. It is intended to support the planning and positioning of academic libraries for the future.

Trends in Higher Education

Shifts in the higher education environment continue to have an impact on libraries in terms of collection/content development, access to and curation of new and legacy resources, and services for extended audiences. As parent institutions redefine themselves, libraries must evolve and continue to demonstrate value in terms of contributions to the effectiveness of their parent institution. In this environment, the watchword is still cost: higher education institutions continue to struggle to keep expenses under control, while demonstrating value. Trends to watch for: the increased use of online instruction, with campuses experimenting with a mix of providers, globalization, and an increased skepticism of the "return on investment" in a college degree. Another area for librarians to watch is digital humanities (DH) or digital liberal arts—will DH emerge as a discipline or continue to struggle to find its identity?

The Unbundling of Higher Education

The higher education marketplace can be compared to a supermarket: students can shop around for the best prices; they can attend different institutions as well as combine hybrid educational models such as person-to-person, online, synchronous and asynchronous, etc.; and they can experiment with recent newcomers such as badging and credentialing. All of this challenges the traditional model of offering a degree from one institution, one place (Bell 2012). For librarians, issues related to information literacy programs and meeting the needs of students both physically and virtually as higher education institutions navigate the new marketplace will demand attention.

Implications
- Librarians will be challenged to provide services in a variety of formats, for a variety of students who are attending their institution (and others).

The Imminent Demographic Change in Higher Education

The assumption of an 18–24-year-old age group as the traditional student will soon be a thing of the past. Research indicates that the most growth in population within the United States in the next ten years will be among Hispanics and African Americans (El Nasser and Overburg 2011). Those colleges and universities that continue to cater to the traditional student will find

significant challenges and difficulties with recruitment, retention, and revenue generation if they do not adapt and change. Academic librarians will need to find ways to assist their institutions with student recruitment and retention, as well as adapt their instruction and service models for more underprepared students entering the academy.

Implications
- Academic librarians and libraries will need to engage and redirect their services and agendas towards assisting their institution in the recruitment and retention of students.
- Higher education will be challenged with more underprepared students entering the academy, and librarians need to be prepared to offer innovative services to help these students succeed.

The Rise of MOOCs

The cost of a college education continues to outpace inflation. As a result, institutions are under fire to find a way to deliver a high-quality education while reining in costs. A recent study from the Harvard Graduate School of Education found that only 56 percent of undergraduates who begin at a four-year institution finish within a six-year period—meaning that the United States now leads the world in terms of college dropout rates. The report from the study also cites a "skills gap," saying that American universities are not necessarily equipping students with the tools they will need to be successful in the workplace; in many cases, what is needed is specialized training or credentialing, and not a four-year liberal arts degree (Symonds, Schwartz, and Ferguson 2011). A 2011 Pew Research Center survey reflected skepticism regarding the price of college and the value returned: 75percent of those surveyed reported that a college education is too expensive for most to afford; additionally, 57 percent said that US higher education does not provide students with good value for the money spent (Anderson, Boyles, and Rainie 2012).

With higher education institutions under pressure to deliver value, online and distance education are viewed as approaches to scaling to meet the skills gap while also addressing cost. This year, online education in the form of MOOCs (massive open online courses) is dominating the headlines in academia. In the last year, MOOCs have exploded, from a handful of early innovators to dozens of elite institutions becoming partners with MOOC providers, with players in both the nonprofit and for-profit sectors. In 2012, numerous institutions jumped on board the MOOC bandwagon; in September venture-capital-funded Coursera more than doubled the number of institutions affiliated with it, going from 14 to 33 institutions. In December, the nonprofit edX jumped from four to six institutions. And December also saw the launch of FutureLearn, a venture of the Open University in the United Kingdom, which entered the field with a respectable twelve institutions. The *New York Times* labeled 2012 "The Year of the MOOC" (Pappano 2012). In early 2013, educational partnerships with MOOC providers continued; in January San Jose State University signed a deal with Udacity, one of the lead venture capital players in this space, to offer three classes in remedial and college-level algebra and statistics, classes that are needed by many in the student population and that can prolong the increasingly expensive residential student experience. Each course will cost $150, far less than more traditional course offerings. Likewise, Coursera received a boost from the American Council on Education (ACE), which announced the approval of four online courses for transferable college credit. (While these courses have been approved by ACE, institutions will

need to decide if students will be able to transfer credits.) Online education has its detractors, but look for experimentation in online education to continue into 2013 and beyond.

So how are libraries engaging with MOOCs? Due to the "open" nature of course offerings, some libraries are engaged in clearing copyrighted materials for use in classes, sometimes because universities have partnerships with commercial entities, but also because the courses are being offered to a geographically distributed audience, thus challenging fair use practices. Part of the ethos of MOOC providers is to have everything required for course completion made freely available during the duration of the class; this means that textbooks, articles, and any required reading must be cleared for use. An open question: will continued use of MOOCs create opportunities for advancing the conversation on open access with faculty and underscoring the importance of creating both publications and learning objects that are available under open-access licenses? Other ways libraries are getting engaged are exploring or at least thinking about how library resources and research skills fit into MOOCs.

Implications
- Although instruction may be changing on campus, MOOCs as they are currently delivered are not fully developed. While it may be too soon to develop best practices in this environment, libraries should remain involved in the development and delivery of MOOCs.
- One of the touted benefits of teaching courses online is the ability to test what is successful and what is not by evaluating the copious data that the providers can generate and analyze. What can librarians learn from this data? Are there opportunities to improve library instruction? As knowledge about pedagogy shifts, how can libraries support an enhanced teaching environment? And, as members of a community of education professionals, how can librarians engage in a larger conversation about the future of higher education and the library's role?

Digital Humanities/Liberal Arts (DH)

There's nothing new about DH—scholars have been using computers to process text and data since 1949, when Father Robert Busa used an IBM mainframe to produce a concordance of the works of Thomas Aquinas. DH is simultaneously on the margins at many institutions, with young scholars finding that nontraditional scholarship and means of dissemination have not been considered appropriate for tenure review, and on the upswing, with more positions on campus for those in "Alt-ac" (alternative academic careers for those in the humanities), an explosion of DH centers, an increase of grant funding available for DH work, and an increase in the number of conference sessions focusing on DH. For example, at the 2013 MLA conference, 66 (or 8 percent) of conference sessions focused on DH, an increase from 27 sessions in 2010. In the coming year we can expect the conversation regarding DH to continue, and for the trend of "Alt" careers on campuses to increase (Pannapacker 2013, Alvarado 2012).

Implications
- As librarians focus on supporting scholars in DH, they stand to gain new understandings about evolving scholarly practices in this area; however, this focus may come at the expense of other fields of scholarship, which are likewise changing and evolving. The question for libraries is: are we appropriately supporting both new and old forms of scholarship on campus?

- With the emerging "Alt" professions, the challenge will be to understand the relationship between what librarians offer and what new support is being offered by other colleagues and support units on campus. Are there opportunities for the library to offer new forms of support for scholars, and/or is this a time to review existing services, which might be better placed elsewhere on campus?

The Future of the Profession

"Our jobs are shifting from doing what we've always done very well, to always being on the outlook for new opportunities to serve an unmet need which will advance teaching, learning, service and research," says Brian Mathews (2012a, 2). To be prepared for the future and be ready for new opportunities, many librarians and information professionals will re-envision their roles and define new opportunities. Anticipating and preparing for new roles and how these roles can expand and evolve over time will be key to an enduring, engaged, and thriving profession in the future.

Internal Disruption Needed

To meet the challenge to transform and reinvent our profession, librarians should start thinking of their organizations as a startup venture, says Mathews. Fostering entrepreneurs from among the ranks, finding better ways to reward innovation, supporting creativity and building on (rather than shrinking from) failure are all part of that mindset. This rapid prototyping approach also "fails smarter" or builds failure into the process and tests and attempts many projects, not just the few perfectly developed ones (Mathews 2012a). This requires examining any assumptions about the existing infrastructure or the present service paradigm and looking for ways to do what librarians do well, but in new domains or environments, even environments that will continue to change radically. Embracing a startup mentality frees the profession to think beyond the existing service model for libraries, without the restraints of tradition, in order to "build something that doesn't exist and to create something that wasn't there before that is now absolutely essential" (Mathews 2012a, 11).

Mathews also points to the profession's need to rethink assessment, which has been tied to incremental improvements in library operations. Assessment has tended to support continuous innovation that focuses on what is sustainable, rather than searching out what is new and revolutionary. Continuous innovation is traditional, predictable, and contrary to the disruptive concept of *dis*continuous innovation:

> Continuous innovation is incremental and takes place within existing infrastructures. It builds on existing knowledge and existing services without challenging underlying strategies or assumptions.
>
> Discontinuous innovation brings forth new knowledge and new conditions that result in development of new products, services, or operating models. (Miller and Morris 1998, 4–7, as quoted in Mathews 2012b, 3)

Discontinuous innovation is "not about making our services incrementally better, but about developing completely new services and service models" (Mathews 2012a, 8). Assessment

should be used as the discovery tool that helps the library move from continuous improvement to discontinuous innovation, to do more than measure the current state of things.

There is no mistaking that this is a pivotal time for the profession, that the opportunities pursued, the pioneering and the innovative services offered, will impact the profession's roles in the future.

> The decisions we make over the next several years will set us down a new a path and result in the establishment of a new identity. R&D practices are critical to this future because we need processes and philosophies geared toward converting new knowledge into new roles, new services, and new applications. (Mathews 2012b, 11)

Implications
- Academic libraries should re-evaluate their assessment activities and decision-making processes to insure they are gathering data and making decisions that will innovate services and avoid simply maintaining the status quo.
- Academic libraries should critically evaluate the level of innovation associated with their new initiatives, services, and resources.
- Academic libraries should take risks and be tolerant of failure in implementing new service models.

Research Data Services

There will likely be a substantial role for librarians in curating, managing, and preserving data. Many predict that professional opportunities will increasingly be centered in this area through the retraining, reorganizing, and repositioning of staff.

Citing the demands for more advanced skills in searching, data visualization, and data mining and analysis, an international group of science library directors and research administrators recently recognized that the position of science librarian has evolved into a role more appropriately titled "science informationist." Science informationists build systems through their collaboration with those creating knowledge and their "work with publishers to improve standards, platforms and publication models" (Pollack 2012). They also increase access to knowledge by developing vocabularies, improving search interfaces, and improving access to "their institutions' intellectual output by building networked repositories." Noting the "increasing volume and complexity of knowledge," Pollock predicts that the demand for this skill set will increase and will offer opportunities for academic librarians to respond.

The data-intensive nature of research and the growing demand for data management as well as the requirements by funding agencies for data management planning were cited as the reasons for a 2012 survey by Tenopir, Birch, and Allard of a cross section of members of the Association of College and Research Libraries in the United States and Canada. The survey, which creates a "baseline assessment of the current state of and future plans for research data services" (Tenopir, Birch, and Allard 2012, 3) in academic libraries, defines research data services (RDS) as

> services that a library offers to researchers in relation to managing data and can include informational services (e.g., consulting with faculty, staff, or students on data management plans or metadata standards; providing reference support for

finding and citing data sets; or providing web guides and finding aids for data or data sets), as well as technical services (e.g., providing technical support for data repositories, preparing data sets for a repository, deaccessioning or deselecting data sets from a repository, or creating metadata for data sets). (Tenopir, Birch, and Allard 2012, 7)

The survey indicates that, despite the demand, "only a small minority of academic libraries" (Tenopir, Birch, and Allard 2012, 3) offer their constituents RDS, though some of the libraries reported having plans to introduce RDS in the future. Offering RDS would make the academic library a visible and vital partner in the research process on campus, expand the role of the library in the academic pursuits of the faculty and students, and offer vital support for the institution's knowledge-creation process and grant funding interests.

This situation presents a unique opportunity for academic libraries to play an even more active role in the research process in several ways. First, academic libraries can provide consulting services related to research data management and curation. Second, academic libraries can provide the infrastructure, or at least the front end, for data storage and curation. Third, academic libraries can support librarians becoming active members on research and grant proposal teams as data curation consultants. (Tenopir, Birch, and Allard 2012, 41)

Implementing RDS gives academic libraries the chance to expand their role and, at the same time, support the future of the profession by helping their librarians assume new roles in creating, curating, and managing data. The survey indicates that of the minority of libraries that have staff involved in offering RDS, most have "reassigned or plan to reassign existing staff" (Tenopir, Birch, and Allard 2012, 29) and a few are providing training opportunities to develop the skill sets that would be required for these new assignments. Reassigning and retraining existing staff for RDS will meet a present and future need in the research process, enhance the profile of the library on campus, and create or redefine opportunities for future librarians.

The *ARL 2030 Scenarios* describe four possible futures for the research landscape and explore the dynamics and interaction of "many critical uncertainties" in those scenarios and how they might play out over the next 20 years. The four scenarios presented together "tell widely divergent stories which explore a broad range of possible developments over time" (ARL and Stratus, Inc. 2010, 8); however, all four scenarios presented, save one, describe futures that are supported by the creation, management, and sharing of new data; the management of data repositories; and the use of data visualization tools. Though there are major distinctions between the four possible outcomes, based on who has access to and regulates the data and the source of funding—the public, private industry, governments, or the specific disciplines—the scenarios suggest expanding opportunities in the continued creation of new data or the management of existing data. One role consistently identified for librarians in all of these diverse potential environments of the future involves developing and offering data repository, data management, and data visualization services to the institutions, groups, or clients they serve.

Implications
- There will be a growing demand for library professionals with data curation, data mining, and analysis skills.

- Academic library administration should gauge the demand for research data services on their campuses and initiate programs offering these services to their communities.
- Academic library administration should consider the reallocation of resources and reorganization of staff in order to initiate research data services on their campuses.
- Academic library administration should promote professional development opportunities that encourage the development of data curation and data mining skills.

Creating Content

Some specific indicators about the future of the profession suggest that librarians will also be called on to take a greater role in producing all types of content: publications, applications, and intellectual output. Librarians already have a foothold in some areas of content creation—digitizing and organizing the cultural record, creating Internet applications, and developing institutional repositories (J 2012; Bonfeld 2012). But there are other opportunities to explore.

One exciting initiative is the Library Publishing Coalition. Working in collaboration with the Educopia Institute, over 50 academic libraries have joined to advance the field of library publishing (Educopia Institute 2013). New roles and changing visions for academic libraries to enter into the field of online publishing and create content using open-access models appear to gaining momentum (Herther 2013). It will be interesting to watch this development in the next few years.

As open peer review and open access are expected to build momentum as models for publishing and scholarly communication, those seeking to stay ahead of these issues know that it means speculating on the direction of the movement (Staley and Malefant 2010) as well as taking risks and venturing into projects that redefine a working role for the academic library and for librarians. One such project, described as a new "economic model" for libraries, was recently announced by Amherst College.

Under the leadership of the College Librarian Bryn Geffert, Amherst will relaunch its university press in 2013. The plan is initially to publish fifteen peer-reviewed, edited titles in the liberal arts, offered exclusively in freely accessible digital formats,. The press will employ two professionals whose positions were created via the reallocation of vacant current positions. As Geffert describes, the project suggests a model that significantly alters the role of libraries in the information economy:

> If other libraries followed Amherst's lead and created their own presses to produce high-quality digital scholarship, more work would be available at lower costs for those who use college libraries. And the best new scholarship would be available to all. . . . My grand dream—quixotic though may be—is that if enough libraries begin doing what we're doing, at some point there is going to be a critical mass of freely available scholarly literature—literature that libraries don't have to purchase. And if they use those savings to publish more material, you reach a tipping point. (quoted in Jaschik 2012)

Implications
- Academic libraries should experiment with new models for publication, for content and resource creation, models that promote the scholarly communication process.

- Library administration should explore opportunities to develop and disseminate digital scholarship, including, but not limited to, partnerships with their university presses.

Creating and Managing Collaborative Spaces

David Lankes (2012) disparages what some have already accepted as the "book museum" model for the library of the future—a model which includes local unique holdings, popular collections, and librarians serving as maintainers, or perhaps specialized researchers, or "mere clerks who guard dead paper" (Gobin 2011). Lankes suggests librarians and information professionals should take the lead in heading off this narrow view of the future library and begin creating and managing effective work spaces for collaboration, problem solving, and idea incubation. Lankes describes a vital and assertive role for present and succeeding generations of librarians in order to stem what is occurring now with the dissolution and dissipation of library resources and space. Librarians should be creating collaboration or solutions development spaces now and preemptively bringing together the tools, resources, and physical (or virtual) space needed to solve problems within their communities (Bell 2011a, Bell 2011b).

Implications
- Academic libraries should actively experiment with programs and initiatives offering collaborative or problem-solving spaces.
- Academic libraries should continue to look for opportunities to partner with departments and groups on campus to create collaborative spaces.
- Academic libraries should proactively engage with their users in order to determine space needs and desires.

Library Science Education

LIS programs continue to face monumental challenges in preparing librarians and information professionals for the future. The demand remains constant for librarians (either practitioners or new graduates) to educate, collaborate, and innovate (Booth 2012). Michael Stephens, reemphasizing the traditional professional values and skills, also calls for library graduates with "new skills along with foundational expertise," for creative, inventive, and risk-taking librarians. Stephens advocates for more partnerships between LIS programs and their university libraries to help provide on-the-job training for graduates entering the profession (Stephens 2011). LIS graduates should be better prepared to enter the field ready to remake and reinvent their work environments and processes and to embrace a field that will be constantly in transition.

The discussion about the training and preparation of library and information professionals continues to include concerns about filling positions by drawing from professionals or academics without MLS degrees. Sometimes this option is considered when the demands of the position have evolved to require different or additional credentials or skills, such as human resources or computer programming (Neal 2006). Sometimes the PhD holder as a subject specialist is considered by the hiring authority to be a better fit for the needs of the academic community. Passing over MLS graduates and hiring PhD candidates without the MLS is predicted to be "an unavoidable consequence of a future in which library deans will be looking to incorporate new skill sets into their organizations" (Bell 2011b).

Some additional insight into the dilemma for LIS education has been offered by Luanne Freund, whose surveys of LIS students point to a need for graduates with entrepreneurial leadership

skills. Freund reports that LIS students are less likely to feel they are leaders or innovators at the time of graduation than they did when entering their programs. To develop entrepreneurial leaders, Freund suggests "rebooting" the LIS curriculum so it is "rooted in an understanding of people, community and society . . . not just libraries and books." Further, she suggests an emphasis on a "curriculum of practice" where "orientation toward professional knowledge results from thinking and reflecting on [one's] experience." Finally, she calls for an LIS school environment that is a place for exploration and experimentation, a place to try out "wild ideas that fail" as part of the process necessary for developing graduates with the confidence to hit the ground running, ready to truly innovate their workplace (Freund 2012).

Implications
- There will be ongoing curriculum challenges for LIS education to foster innovation, creativity, and the entrepreneurial leadership skills that graduates will need, skills that will be critical in helping libraries remain relevant to the communities they serve.
- Thriving MLS programs will be those which emphasize and invest in offering opportunities for their students to gain extensive and meaningful on-the-job experience.
- Library employers will fill positions from broader talent pools of individuals holding a variety of credentials that meet the job specifications, with more concern for meeting the requirements of the position and with less concern for filling traditionally librarian-held positions with MLS degree holders.

Scholarly Communication

Scholarly communication topics remain pivotal issues in the higher education and library communities. The term is used with great frequency but with no common definition. Characterizations of scholarly communication range from simplistic to grandiose but generally all contain the same four elements (Roosendaal and Geurts 1997): awareness (discovery and dissemination of scholarship), registration (recording and documenting scholarship), certification (peer review), and archiving (preserving scholarship).

Research into values, concerns, and needs related to all facets of scholarly communication was conducted from 2007 to 2010 with faculty in seven disciplines at 45 research institutions. The final report describes faculty behaviors associated with scholarly communication processes including career advancement, collaboration, formal and informal publication, and information and data generation (Harley et al. 2010). The report identifies five key areas of concern: nuanced tenure and promotion practices that move beyond citation counts from "brand-name" journal titles; refined mechanisms of peer review; access to affordable, quality journals with sustainable business models; publications that support embedded media formats; and institutional support for managing, distributing, and accessing nontextual research (Harley et al. 2010).

Searching Behaviors and Expectations
Current research in scholarly end-user searching behavior indicates that techniques or approaches have not changed appreciably since the mid-1990s (Connaway and Dickey 2010); however, in 2012 inquiry into faculty information-search behaviors revealed established scholars are beginning to take advantage of emerging technologies related to discovery and access that were previously associated with student use (Bauder and Emanuel 2012). A project exploring

social networking site use at several Israeli universities and colleges disclosed that Facebook and Twitter activity may be useful in the information assimilation stage, but the authors are careful to note that this process has not yet been fully integrated into the faculty research process (Forkosh-Baruch and Hershkovitz 2012). A study of engineering faculty emphasized the long-understood importance of immediate, online access to current and archived scholarship (Engel, Robbins, and Kulp 2011). Convenience and ready access remain important factors in scholarly uptake and use of materials (Tenopir, Volentine, and King 2012). Demands on faculty time plus perceptions of information overload combine to create researcher demand for information tools that are adequate but not necessarily ideal by librarian standards (Kroll and Forsman 2010). A multiyear study conducted by Connaway, Dickey, and Radford (2011) showed that convenience in access is critical and frequently the primary factor in determining the utility of available materials and resources. Some researchers have theorized that expanded access to information through electronic collections and discovery tools has resulted in papers that cite more topically relevant material, reference older material that is now available online, and link to articles from less well-known authors (Wu, Huang, and Chen 2012). This research appears to support previous conclusions that wider access to more online materials has resulted in more superficial reading (Ollé and Borrego 2010). Although abundant digital resources and ready access to online scholarship remain essential, researchers have found that personal connections are the foundation of scholarly productivity (Kroll and Forsman 2010).

Electronic journal collections provide access to scholarly articles that remain essential to academic work. Book-reading behaviors of researchers have not been studied as thoroughly. A new study by Tenopir, Volentine, and King (2012) revealed that book-reading habits vary greatly by individual and personal preference but indicated that books often come from personal rather than library collections. Additional research denoted that book reading and citation patterns do vary by discipline.

The rapid uptake of smart communication devices places a heavy demand on libraries and library vendors to provide successful discovery and access applications to meet the requirements of evolving information-seeking behaviors (Evans 2011). Emerging technologies, analysis tools, and methods of information organization are gradually altering the landscape of scholarly discourse, communication, and dissemination. Support in the use of these tools may not be apparent or available on campuses and may provide opportunities for further librarian-researcher engagement.

New Publication Formats, Curation, and Dissemination

Using new publication formats and communication tools to make scholarship more widely available extends audiences and helps scholars develop new ideas (Rutner and Schonfeld 2012). The database-type modularity of online resources creates new opportunities for connections among individual objects. New scholarship that remixes, reuses, recombines, and creates from textual and nontextual objects located in digital repositories results in new types of intellectual projects (Fitzpatrick 2011). The 2012 Ithaka S+R Report underscores the current uncertainty of how research institutions relate digital scholarship to promotion and tenure-track behaviors. Under current practice, the focus remains on monographs and scholarly articles, but researchers in history are beginning to push the boundaries as to what is acceptable as tenure-track digital scholarship (Rutner and Schonfeld 2012).

Concerns related to preserving this new body of digital scholarship, particularly that unique to an institution, region, or discipline, are gaining attention as well. Demands for digitally accessible information are well documented, but preserving it for future generations of scholars is becoming of paramount interest. Actual methods and technologies for providing such digital preservation are still undeveloped and limited (Ross 2012). The implications for the longevity and sustainability of unique digital resources are obvious.

In addition to ready access to scholarly materials, researchers now expect access to supporting data collections. Data produced from publicly funded research has been central to multiple legal debates. The Research Works Act (RWA) was introduced in Congress in December 2011 and would have prohibited federal agencies from requiring open access to research data, even when the data was financed by taxpayers (House of Representatives 2011). Furor over RWA, which was ultimately defeated in Congress, catapulted the Federal Research Public Access Act (FRPAA), introduced in 2006, 2010, and 2012 and allowing access to data, back into the public sphere (House of Representatives 2012). FRPAA has received opposition from the Association of American Publishers' Professional and Scholarly Publishing Division, but it continues to be of vital importance to libraries (Stebbins 2013).

Challenges related to the collection, dissemination, and reuse of data continue to emerge. Libraries and universities are expanding their services to include data curation experts as well as collaborating with research faculty to locate, design, and create appropriate repositories for both storage and access. Studies to gather data regarding researcher awareness, behaviors, and practices related to the management, organization, and curation of data are of increasing importance to support this growing area of library services (Scaramozzino, Ramírez, and McGaughey 2012). Librarians will play a pivotal role in the description, management, storage, access, and reuse of data (Heidorn 2011).

Discussions regarding the dissemination of new scholarship converge in two areas: copyright and intellectual property, and traditional and emerging publication methods. Ongoing court cases related to electronic reserves and the Google Book digitization project were (partially) resolved in 2012. Google settled with a coalition of major book publishers in October. The court has ruled that libraries that have allowed their collections to be scanned by Google are protected by fair use provisions under copyright law (Miller 2012).

A ruling in the court case against Georgia State University concerning electronic reserves was handed down in May 2012. The case hinged on whether the copyrights of Cambridge, Oxford, and SAGE publishers were abridged based on Georgia State's reserves policy. According to the Association of Research Libraries, the ruling allows some latitude for libraries providing access to content under fair use (Butler 2012). The publishers have appealed the ruling.

Open Access
While all topics related to scholarly communication remain active areas of research, academic debate and inquiry currently focus on the areas of dissemination and archiving, making scholarship available to the broadest possible populations of users. The open access (OA) movement is energetically discussed in the literature, within libraries, and on college and university campuses; much of the scholarly communication debate currently swirls around it. The lure of using OA to alleviate the rising costs of traditional journal subscriptions has moved

beyond the scholarly literature and into the mainstream press, as evidenced by an article on Harvard Library's concerns regarding escalating journal publication prices and the costs associated with making research available to its community in a *Time* magazine article in April 2012 (Wagstaff 2012).

OA is emerging as a strong alternative to traditional commercial and society publications. Proponents of OA view it as a means of providing no-cost access to scholarly information while reducing the huge financial burden caused by journal price escalation on strained library budgets (Suber 2012a). According to its core precepts, OA is digital and online, accessible to libraries and researchers without financial cost, and unencumbered by arcane copyright restrictions (Suber 2012b). It is important to note that OA is about no-cost access; it is not a license or a specific type of content.

The library finds itself in a unique role of mediating among producers and end users in the process of connecting researchers with pertinent resources. The separation of researcher from producer (traditional journal publisher) creates barriers, which obfuscate the high financial costs associated with journal subscriptions as well as some implications of copyright restrictions from the actual end user (Navin and Vandever 2011).

Described as a "disruptive innovation," OA could become the predominant publication model for the dissemination of scholarly information within the next ten to fifteen years (Lewis 2012). Based on the theories of Christensen, Horn, and Johnson (2008), disruptive innovations allow new services and products to become available to those who previously had no access to them. Lewis (2012) suggests that OA will ultimately become a "new value proposition for the academic market."

OA is typically described as green or gold, although hybrid varieties do exist (Suber 2012b). Green OA is made available to researchers through institutional and subject repositories. Scholarly materials are placed in the repositories without peer review but generally with an expectation of long-term preservation. Green OA repositories may contain pre- or post-prints, theses and dissertations, data collections, unique materials from special collections, etc. Articles published in journals with copyright restrictions may also be placed in repositories after appropriate embargo periods as allowed by some publisher agreements. According to Suber (2012b), many publishers do allow for green OA, but authors must take the responsibility to make that content available. SHERPA/RoMEO is a searchable database of publishers' policies related to copyright and self-archiving of articles on Web pages and in OA repositories (University of Nottingham and JISC 2012).

Gold OA refers to actual journal publications. Proponents of gold OA present it as a compelling model of scholarly communication and interchange. Gold OA signifies that information is freely available to anyone who can access it. The situation may be more complicated for authors in terms of who pays for the actual publication (institution, grant, self), but the promise of OA is that a researcher's scholarly output is a click away to anyone who might be searching for it (Suber 2012a).

Faculty objections to publishing in OA journals often revolve around the misconception that OA journals are not subject to the same rigorous peer-review process as traditional journals. Since publication is the method by which scholars contribute to their discipline's canon and gain

prestige for their work, promotion and tenure are inexplicably intertwined with the notion of publishing in established, "brand name" journal titles (Nosek and Bar-Anan 2012). Those identities are then used by scholars as a gauge of importance, impact, and topical information published within the title (Nosek and Bar-Anan 2012). Switching to OA titles, which may not have accumulated the stature associated with older, more established titles, will be a hurdle for scholars to overcome when deciding where to publish, particularly for those in the initial stage of their career. Communicating the lack of scholarly risk associated with publishing in OA journals may provide opportunities for librarian-research collaboration. OA is compatible with peer review and relies on the peer-review process to disseminate material of scholarly excellence. The process of peer review is not dependent on the method of publication; it is a result of the rigor and integrity of the publishers of the information, whether OA or traditional subscription model. Some incipient methods of peer review actually rely on OA for rigorous evaluation of scholarly work; in those cases, articles are expected to have been through a preliminary review process by the research community prior to being submitted for publication (Suber 2012a).

The Coalition of Open Access Policy Institutions (COAPI), a SPARC initiative, represents North American research institutions with documented OA policies. Established in 2011 with 21 participating members, COAPI has now grown to 46 member institutions. COAPI supports faculty-led OA endeavors, supports national and international OA initiatives, and is a venue for the exchange of best practices, documentation, and evolution of OA implementation at academic institutions (SPARC 2012). While OA is an important area of outreach for librarians, the role university administration plays in moving researchers towards OA as well as exchanging information on the changing nature of scholarly communication is absolutely vital (Vandegrift and Colvin 2012).

OA and traditional journal subscriptions compete in two areas: access and scholarly value (Lewis 2012). Although OA articles are available at no charge to the reader, the high cost of subscription-based access may not be readily apparent to most researchers; however, access restrictions make themselves apparent in other ways; copyright restrictions on subscription-based materials may require proxy or VPN intermediation. OA materials are freely available to anyone with an Internet connection. Because of copyright restrictions, subscription-based articles are more difficult to share with students, colleagues, and other researchers (Lewis 2012).

An interesting and unintended potential consequence of gold OA is that journals may become disaggregated into component articles. OA allows for immediate access to information at the article level, and the implication is that in the future those articles may be published in a loose concatenation around a discipline-specific topic or theme but not be associated with a specific title (Lewis 2012).

The impact of gold OA on society publishing may carry more serious consequences. Many scholarly society publishers use the revenue from journal title subscriptions to fund other society projects. Negotiating a balance between the free exchanges of information for its constituent members against established revenues from traditional subscriptions will be a challenge for many of these societies to overcome. It will require the membership of the societies to speak up in support of OA and to direct future publishing initiatives of their scholarly associations (Nosek and Bar-Anan 2012).

eLife, a new open-access journal in life sciences and biomedicine, is an initiative designed to rapidly disseminate research results and support born-digital publications. A joint project of public and private research funders, *eLife*'s "primary motivation is to serve the interests of science" by recognizing that "communicating research results is as important as the experiments themselves." More than just a publishing venture, *eLife* seeks to influence the communication of scholarly information in the following areas: provide a more efficient publishing model; encourage and use digital media formats for broad dissemination of information; offer options that encourage OA; and encourage new research innovations ("*eLife*" 2013).

Some libraries are taking a proactive approach to changing the landscape of scholarly communication by creating new publishing venues for researchers and promoting more venues for formal and informal communication (Park and Shim 2011). In 2012, Pacific University (Oregon) launched the *Journal of Librarianship and Scholarly Communication* (JLSC), a peer-reviewed, open-access publication to provide a forum to communicate "strategies, partnerships and impact of library-led digital projects, online publishing and scholarly communication initiatives" (JLSC 2012).

Implications
- Precise definitions and terminology need to be developed and agreed upon to identify the myriad topics and ideas associated with the larger theme of scholarly communication.
- There may be implications resulting from the Georgia State University court case on electronic reserves for supplying educational materials to MOOCs and large, virtually delivered classes.
- Embedding media formats and technologies in journal and book publications will impact discovery, access, delivery, and integration of research scholarship into the curriculum.
- Library staff needs to be well informed to better communicate to faculty the issues surrounding OA publication, including potential impacts on researchers' careers, prestige, etc. OA publication initiatives, best practices, and implementation processes create natural partnerships for librarians and library administrators.
- Sustainable OA publication venues will pervade the academic market, but libraries will need to provide assistance to researchers in avoiding predatory OA publishers.
- Funder-researcher collaborations (e.g., *eLife*) will begin to establish niche publication venues.
- Methods for providing discovery, access, delivery, and preservation of nontext scholarship (cell lines, data sets, etc.) will continue to change the landscape of scholarly communication.
- Reliable information and continued investigation into researcher data requirements, data curation practices, and attitudes toward managing data are necessary to identify and craft appropriate library services that support outreach and teaching.
- With the enactment of the Federal Research Public Access Act (FRPAA), there will be increased pressure on libraries, academic institutions, and scholarly societies to provide accessible, discoverable, and preserved data repositories for future generations of scholars.
- Evaluation, tenure, and promotion processes will begin to alter as the peer-review process is separated from the traditional publishing paradigms; new models, media, and metrics will change the landscape of evaluating scholarly contributions and prestige.

- Library vendors will expand and develop techniques for device pairing, which will allow researchers to use smartphones, tablets, and other devices to easily connect to information databases while away from their campus networks.
- Discovery environments will adapt to changing methods of formal and informal scholarly communication methods and developing technologies. These new discovery interfaces will require collaboration among scholars, librarians, and technical experts to visualize, communicate, and distribute information.
- Techniques, methodologies, software development, and educated library staff will be in demand to help institutions preserve digital scholarship.

Radical Collaboration

Librarians have long recognized the need to develop new and creative strategies for library collaboration. In 2008, a series of essays entitled *No Brief Candle* that championed increased collaboration and risk taking was issued by the Council on Library and Information Resources (CLIR 2008). In 2009, a peer-reviewed, open-access journal, *Collaborative Librarianship*, was born with a clearly defined mission to extol and build on library collaboration, to essentially embrace the challenges of the future with innovation (Gaetz 2009). Yet the enormous challenge facing academic libraries is breaking through rigid traditions as "libraries tend to be risk-averse organizations; to remain relevant they must be willing to experiment and innovate" (CLIR 2008, 9).

The challenge to rethink and retool traditional methods of collaboration is resonating in academic libraries. This bold charge has come to be known as *radical collaboration,* and it challenges libraries to go beyond standard library collaborative initiatives; to experiment and be daring. James Neal at Columbia University has been the most outspoken advocate of radical collaboration. In a series of presentations and webcasts, Neal notes key problems and issues that include wasteful library operations, outmoded collection endeavors, and shifting user behaviors (Neal 2010a, 2011a, 2011c). Neal observes that academic libraries must overcome several complicated hurdles as they face heightened accountability and assessment from government and university administrators (Neal 2011b). Neal believes that the only viable path for libraries to succeed is through radical collaboration: "The two things we must advance are primal innovation, a basic commitment to risk and experimentation, and radical collaboration, deep and unprecedented partnerships. Renovation is grossly inadequate. Deconstruction is totally essential" (Neal 2010c, 1).

Another leader in the call for pushing the envelope of traditional library collaboration is Anne Kenney, university librarian at Cornell University. The libraries at Cornell University and Columbia University are undertaking a collaborative venture called "2CUL" (a combining of the two universities' acronyms) initially funded by a Mellon Foundation grant with Neal and Kenney as spokespersons. As far back as 2009, Kenney made several "bold assertions" that highlighted her view on redundant operations and collections in academic libraries. Her views parallel Neal's on radical collaboration as she points out incentives and barriers for collaboration in libraries, and areas that are most appropriate to launch radical collaborative efforts. Kinney says that "collective collections" (collaborative collection building) and "backroom functions" (sharing technical services workflows) are areas ripe for radical collaboration (Kenney 2009).

Beyond Neal's and Kenney's inspired body of work on radical collaboration, the term has now come to be applied to any collaboration that advances beyond mainstream and traditional efforts (Butler 2012; OCLC and *Library Journal* 2012). Endeavors for radical collaboration in academic libraries can be sorted into three main areas of activities: (1) merging technical services; (2) collection building and resource sharing; and (3) continual growth of large regional print repositories.

Radical Collaboration of Technical Services

Much of the ongoing radical collaboration focuses on merging technical services operations, but actualized results of these collaborations are modest to date. Large library consortia, such as Orbis Cascade (Orbis Cascade Alliance 2012) and OhioLINK (Strauss, Maurer, and Gedeon 2012), have taken significant steps in studying and pinpointing various areas of library operations that would benefit from merger. Despite a 2009 announcement that the "Five Colleges" in Massachusetts were to consolidate technical services, the merger never happened; however, the colleges' libraries continue to collaborate on numerous projects and services OhioLINK (Strauss, Maurer, and Gedeon 2012). Despite not fully merging technical operations in these library consortia, it is recognized that centralizing activities such as cataloging, acquisitions, and digitization of collections are areas for future ventures and radical collaboration (Lugg, Tucker, and Sugnet 2010).

Next Generation Technical Services

The University of California (UC) system's Next-Generation Technical Services (NGTS) initiative was developed in part "as an outgrowth" from a report issued by a UC bibliographic task force that advocated creating a single cataloging interface for all UC, standardizing cataloging activities, and centralizing services and data to improve the user experience (Bibliographic Services Task Force 2005). NGTS, working with and reporting to the Systemwide Operations and Planning Advisory Group (SOPAG) and the NGTS executive and steering committees, has taken significant strides in developing strategic plans and reports (UC Libraries 2012a). Membership of the NGTS and all UC committees represent libraries across the UC system, and one of NGTS's prevalent charges is to reexamine technical service functions as *radically new approaches* to these operations are called for to ensure they are maximally efficient and transformationally effective (UC Libraries 2009). Reports from several working groups involved in phase projects led the NGTS executive committee to issue a series of recommendations for the UC libraries to improve efficiencies through merging financial infrastructures for purchasing, develop strategies for cooperative cataloging, and revision collection development for the 21st century (NGTS Executive Team 2010).

Despite several years of notable efforts by many librarians and administrators to radically transform collaboration within technical services, digitization, and collection development across the UC system, the results and reports to date have focused far more on review and recommendations than actualization. "Most library technical services operations, and even Net Gen initiatives, have so far only actually moved to the transitional phase: that is, continuing fairly traditional operations but doing them differently" (Hruska 2010). Yet the Next Gen project continues, and future steps to transform collaboration have defined two phases of analyses and studies are now slated to result in action. The focus will be on implementation and action versus more study (Hruska 2011). Updates and progress notes made by NGTS and newly formed

lightening teams and Power of Three groups on specific initiatives can be found on the NGTS's log (UC Libraries 2012b).

2CUL (Cornell University + Columbia University)

2CUL began as a venture between the libraries of Cornell and Columbia Universities. Neal lays out four directions for radical collaboration between the libraries of Cornell and Columbia Universities: (1) merging workflows in technical service operations to create regional distribution centers; (2) building centers of excellence for specialization of collections and services; (3) developing technologies for digital ingestion and delivery; and (4) launching new initiatives that share investment and experimentation (Neal 2010b). For this *radical partnership* to succeed, Kenney stresses the development of personal ties and trust is critical, while Neal believes 2CUL will have to find ways to redirect resources and be very innovative together (Howard 2009). Wicks and Wolven (2010) point out the many challenges in implementing 2CUL: the two libraries have differences in organizational structure, levels of staffing, and assorted workflows and are geographically apart. One lesson they learned during staff discussions is that it is more productive to focus on activities that are new to both parties.

Implications
- Academic libraries and library consortia will continue to follow the 2CUL and UC models of radical collaboration, particularly in merging and centralizing technical services operations.
- With restrictive budgets and less staff, academic libraries and library consortia will investigate innovative options and take more risks in technical service collaborations.

Radical Collaboration in Collection Building and Resource Sharing

Libraries are collaborating to share, store, and build collections in new, enterprising ways. Momentous growth continues in the vast number of digitized books, journals, manuscripts, and other print-based materials being shared and archived by nonprofit groups; membership consists of dozens of academic and public libraries (see HathiTrust) or companies with research libraries as members pursuing altruistic goals (Google Books). Collaborating with these organizations has become a standard venue for partner academic libraries to digitize and archive thousands of documents from their holdings, all while providing users online access to materials previously available only in print and native formats. While a majority of the collaborative efforts are geared towards sharing digitized or born-digital collections, recent endeavors towards developing fast, unmediated interlibrary loan (ILL) of materials between libraries is also underway. Other ground-breaking collaborations in collection building and access can be witnessed with a few academic libraries partnering to develop shared patron-driven acquisitions (PDA) plans that allow e-books to be accessed by users from multiple libraries.

HathiTrust

HathiTrust is a large-scale initiative to digitize and share access to thousands of print holdings of partner research libraries from across the world. Begun in 2008 by the University of Michigan Libraries and the Committee on Institutional Cooperation (CIC), HathiTrust has emerged to become an important component in the push to centrally house digitized collections from multiple academic libraries. Currently over sixty research libraries participate, and together the group has digitized over five million books (HathiTrust Digital Library 2012). Users are the

main beneficiaries, with shared access to this enormous digitized collection (over ten million total volumes), but it also offers participating libraries opportunities to revise collection-building strategies. HathiTrust Digital Library is emerging as a premier example of massively scaled information access brought about through acts of radical collaboration (Butler 2012).

Internet Archive

Since 1996, the nonprofit Internet Archive has been archiving and offering open access to millions of digitized images, video clips, even archived web pages themselves (Internet Archive 2012). Internet Archive also offers free access to over 800,000 e-books, many of the books having been digitized by staff at the Internet Archive from the collections of partnering academic and public libraries. Brewster Kahle, founder of Internet Archive, sees current and future partnerships with academic libraries as mutually beneficial as they increase open access to large research collections (Rae 2011).

Fast, Unmediated ILL

Interlibrary loan has long been a service offered by libraries to their users through state, regional, or national consortia, but the new trend is for faster turnaround and collaborative collection sharing. BorrowDirect, offered by the Ivy League (and MIT) libraries, allows direct borrowing of materials but also has an agreement to collaboratively purchase music scores, with plans to expand these shared purchases (Banush 2012). The largest library consortium in the state of Florida has launched an unmediated ILL program through the central catalog that promises users a 24-hour turnaround on most requests (Florida Virtual Campus 2012). The Center for Research Libraries and the Linda Hall Library of Science, Engineering and Technology (LHL) have partnered to offer interlibrary loans of LHL's holdings to members of CRL using RapidILL and its 24-hour turnaround (CSU Libraries 2012).

Shared Patron-Driven Acquisition Plans

In 2010, ACRL's Research Planning and Review Committee cited "patron demand" as an emerging trend in collection building facilitated by customized patron-driven acquisitions (PDA) plans (ACRL Research Planning and Review Committee 2010, 286). In 2012, ACRL's Research Planning and Review Committee again cited PDA, now also known as demand-driven acquisitions (DDA), as a top ten trend "poised to become the norm" (ACRL Research Planning and Review Committee 2012, 314). Building on the success of PDAs run by individual libraries, the shared PDA plan is budding into a radical new tool for collection building and was a program topic at the American Library Association 2012 Annual Conference (ALA 2012). The shared PDA model is expanding as libraries across North America are collaborating to share costs and access to resources. The 37-member Orbis Cascade Alliance and the nine-member Colorado Alliance of Research Libraries both launched e-book DDAs that provide access and shared purchases for the libraries participating in each consortium (Kelley 2012). In Canada, the 21 university libraries that are part of the Ontario Council of University Libraries participated in an e-books PDA pilot that resulted in positive responses from participating institutions (Davis et al. 2012). In Illinois, the state academic library consortium has run two successful shared PDA projects, one for print monographs and the other for e-books, with plans underway for another shared print-based PDA to start in 2012 (Wiley and Clarage 2012).

Implications
- Academic libraries will expand digitization and sharing of collections using third-party vendors, such as HathiTrust and Internet Archive.
- Patron-driven acquisitions plans, particularly for e-books, will continue as partner libraries and library consortia continue to share costs and access to resources.
- RapidILL and other fast, unmediated ILL initiatives will become increasingly mainstream as libraries and library consortia look for ways to reduce print book purchasing while at the same time expanding access to resources.

Radical Collaboration in Large Regional Print Repositories

Growing collaboration to build and archive print holdings across state and regional levels is observed, many being conducted by library consortia. The Center for Research Libraries lists several wide-scale print journal consolidation projects launched by the Five Colleges, the Orbis-Cascade Alliance, the Pennsylvania Academic Library Consortium, the Triangle Research Libraries Network, and the Greater Western Library Alliance (CRL 2012b). The Maine Shared Collections Strategy (MSCS) project has brought eight of the state's largest libraries and state library consortia together to create strategies on consolidating and sharing print collections that will includes books as well as journals (MSCS 2011).

With these and many more journal consolidation projects ongoing or in early planning stages, a report issued by Ithaka S+R was published to assist libraries in determining what print journals can be withdrawn responsibly. The report discusses such issues as minimum time period retention, number of print copies to keep on hand, risk profiles, and preservation recommendations, while also warning about retaining certain print materials to ensure access (Schonfeld and Housewright 2009).

OCLC Research has fostered numerous reports on issues involving print books. One report determined that libraries can realize save significant library space and cost if print books are deliberately and systematically outsourced for digitization to HathiTrust or parallel service provider (Malpas 2011). Another OCLC Research report looks at the implications and feasibility of forming "Mega-Regions" to consolidate print book in regional repositories across the United States (Lavoie, Malpas, and Shipengrover 2012).

WEST

The Western Regional Storage Trust (WEST) is a collaborative print repository that went through a planning phase to organize and archive holdings from many of the largest research libraries in the western region of the United States. Much of the print archives are held by participating libraries, but by consolidating and sharing print archives, all WEST libraries can maintain access to print editions while withdrawing duplicate copies to optimize space (CDL 2012). WEST is expanding with a Mellon grant to include many more academic libraries during implementation and has developed a system of designating risk profiles during consolidation. There are plans underway to build similar repositories in the northeast and southeast United States, with CRL planning to coordinate and develop journal aggregation software (Howard 2011). The first phase of the initiative focused on consolidating retrospective print journals, and through August 2012, WEST archived more than 6,100 journal titles (over 160,000 volumes) at various levels of validation. WEST archiving commitments are recorded in WorldCat and the

Center for Research Libraries (CRL) using Print Archives Metadata Guidelines developed in conjunction with an OCLC pilot project for improved standardization (WEST 2012).

Center for Research Libraries (CRL)

CRL, a global library consortium with over 260 members, has been active since 1949, with a primary mission to promote research and teaching by providing access through interlibrary loan or electronic delivery. Most of the five million print documents in CRL's collection are from non-US regions, and many are rare, hard-to-find primary source documents. CRL prides itself in being in the forefront of coordinating collaborative efforts in preserving scholarly print materials and is assisting consortia and regional libraries in initiatives to consolidate journal holdings (CRL 2012a). CRL has developed a print archives registry (PAPR) database that assists libraries in making informed decisions on print retention by providing a searchable tool for print holdings and large-scale serial consolidation projects ongoing across the country. For each print archive project, PAPR includes a narrative description and specific characteristics, such as Format Archived and Retention Period, with a link to the host institution for more information. CRL also provides the Global Resources Forum and the Print Archiving Community Forum for libraries to share information and boost communication (CRL 2012c). Additional programs seeing collaborative innovation include digital collections, cooperative digitization, and ambitious goals such as providing end-to-end (historic to current) news coverage for participating CRL members.

Implications
- Print repositories with holdings from multiple state and regional academic libraries will become more essential to academic libraries as they reduce print holdings to optimize space in campus buildings.
- Large state and regional repositories will grow and coordinate with other repositories to coordinate holdings from participating academic libraries across the United States and Canada.

Technology

Laptops, Tablets and Smartphones

The last two years have seen a substantial change in market diversity of personal computing devices. The environment is constantly evolving, and students and faculty are adapting the new technologies in considerable numbers with an increased use of personal computing devices for academic work. This section will discuss usage patterns, the growing marketplace, mobile apps, and the resulting need for greater considerations of device neutrality and mobile-friendly resources.

Usage Patterns of Personal Computing Devices in a Growing Marketplace

Smartphones continue to gain market share among mobile devices. In September 2012, the Pew Internet and American Life Project found 45 percent of all adults have smartphones (a 10 percent increase from 2011), including 66 percent of those aged 18–29 (Rainie 2012a). "Gartner predicts that by 2013 mobile phones will overtake PCs as the most common web access device worldwide and that by 2012 over 80 percent of handsets sold to mature markets will be smartphones" (Gartner 2012). Beyond the 45 percent of adults who own smartphones, 85 percent

of adults own a cell phone and are not just making calls: 82 percent take pictures, 80 percent text, 56 percent access the Internet and 50 percent e-mail (Duggan and Rainie 2012). Dahlstrom (2012) reports that 62 percent of students say they own a smartphone, and 67 percent of those who do "reported using their smartphone for academic purposes," a staggering 30 percent rise since 2011 (14).

Up from 4 percent in 2010, the Pew Internet and American Life Project found 25 percent of American adults own tablets (Rainie 2012b), and Gartner predicts that "by 2015 media tablets will reach around 50 percent of laptop shipments" (Gartner 2012). This will certainly be aided by a substantially diversified marketplace. The Amazon-backed Kindle Fire and Barnes and Noble's Nook Color, as well as numerous Android devices like the Samsung Galaxy and the Google Nexus, all appeared in the last two years. Meanwhile, the Apple iPad went from having a near monopoly in the tablet marketplace to losing market share. In November 2012, Mashable reported Apple dropping from 59.7 percent of tablet market share in Q3 of 2011 to 50.4 percent in 2012 (Schroeder 2012). This expanding marketplace offers more variety in device size and a much wider range of price points than ever, starting with the $199 Kindle Fire in late 2011.

The New Media Consortium (Johnson et al. 2013) placed tablet adoption in higher education at one year or less, noting the ease of portability, feature-rich app environment, potential use for fieldwork, and growing prevalence of one-to-one programs, among other advantages. Tablets are increasingly pervasive, and the possibilities for them seemingly endless, but laptops are still the most heavily used personal computing device by students, with "9 out 10 students owning [a laptop]" (Dahlstrom 2012, 13). Still, it is key to note that "ninety-six percent of students who own a tablet also own a laptop, indicating that tablets don't supplant laptop ownership and instead are an additive value to the repertoire of devices undergraduate students own" (Dahlstrom 2012, 24–25). Intrinsically related is the concept of Bring Your Own Device (BYOD), in which students bringing their devices to campus expect them to work seamlessly. Some institutions are even enacting Bring Your Own Device policies, which when well supported can have many advantages in the classroom. Whether to meet expectations or policies, the demands of BYOD fall heavy on network administrators to provide necessary bandwidth and access points, while maintaining network security (CDW-G 2012). Supporting the BYOD trend is a Top-Ten IT Issue for 2012 (Grajeck and Pirani 2012).

Mobile Apps, Device Neutrality, and Compatibility
Mobile apps changed the way we think about software, are cost-effective, and "a recent study by Distimo predicted 44 billion apps will have been downloaded by 2016" (Johnson, Adams, and Cummins 2012, 10). The 2012 Campus Computing Survey found institutions are moving forward with mobile apps in droves: "Three-fifths (60.2 percent) of the campuses participating in this year's survey have activated mobile apps as of fall 2012 or will do so in the coming academic year, compared to two-fifths (41.5 percent) in fall 2011 and 23.1 percent in fall 2010" (Campus Computing Project 2012). Though new mobile architectures, namely HTML5, will eventually drive a "long term shift away from native apps to web apps," Gartner predicts native apps are not going anywhere and "will always offer the best user experiences and most sophisticated features" (Gartner 2012).

Whether the majority of these institutions are making the most of their app initiatives remains to be seen, but the New Media Consortium (Johnson, Adams, and Cummins 2012) notes, "The best

apps are tightly integrated with the capabilities of the device itself, using location data, motion detection, gestures, access to social networks, and web search, to seamlessly create a full-featured experience" (10). Mobile apps have great potential for teaching, learning, and inquiry with "annotation tools, applications for creation and composition, and social networking tools," not to mention the possibilities from GPS, motion sensors, and a full suite of multimedia tools (Johnson, Adams, and Cummins 2012, 11). Beyond the mobile apps institutions create for themselves, the options and promise of external apps is seemingly endless. As one distinct opportunity, the 2013 *Horizon Report* emphasizes that the app environment allows students to create their own "personalized learning environment" on their device, tablets specifically (Johnson et al. 2013, 15).

As demonstrated in the previous section, the wide variety of personal computing devices and technologies students are using means it is nearly impossible to design for and support every platform or brand. Institutions must "develop mobile IT strategies that allow for cross-platform compatibility, such as generic mobile apps and hybrid apps" and "prioritize the development or improvement of mobile friendly resources and activities students say are important" (Dahlstrom 2012, 31). Some web design experts argue an ultimate movement away from mobile sites and app culture towards responsive design, in which the design of the site automatically adapts to the size of the screen. However, the purpose of the site and factors such as user needs, budget, and frequency of updates can help inform institutions' decisions between mobile sites, native apps, and responsive design (Arora 2013). Though institutions must choose the best strategy for their scenario, there is no doubt of the urgency. The ECAR Study of Undergraduate Students and Information Technology for 2012 found that students "believe technology benefits them, especially with regard to achieving their academic outcomes and preparing for future plans" (Dahlstrom 2012, 19) and that the three most important things to them are progress information, course materials, and learning management systems.

Implications
- Though laptops still dominate the undergraduate student market share, tablets are making strides. There is increasing feasibility of tablets to eventually take over in classroom settings. The New Media Consortium (Johnson et al. 2013, 17) argues, "Transitioning to tablets is relatively painless for students as they already use them or very similar devices outside of the classroom to download apps, connect to their social networks, and surf the web. To maximize the potential of tablets in higher education, faculty members are also exploring creative ways to incorporate them into coursework."
- The Bring Your Own Device movement brings both great potential and challenges. Institutions, including libraries, must prepare networks accordingly and accept the necessity to help support any device, as well as adapt to their use in the classroom.
- The potential of mobile apps is already felt widely. Universities and libraries that do not embrace the potential for multimedia production, project management, and university services (Johnson, Adams, and Cummins 2012) could quickly fall behind the curve.
- In order to have a significant mobile presence, Breeding (2012) expresses that libraries have traditionally struggled in this area but that "2013 will see a great surge of activity in the mobile arena, where libraries realize a sense of urgency to respond to the dramatic shift in the way that patrons expect to access library services."
- The growing variety of devices necessitates the possible use of responsive design and considerations of device neutrality in app development. It is no longer enough to design

only for smartphones, as the landscape of screen sizes and operating systems continues to diversify.

- The consideration of mobile functionality is becoming an imperative option in selecting library resources and products.

Cloud Reliance and the Internet of Things

Both institutions and individuals are increasingly relying on the Cloud, which is intrinsically connected to the Internet of Things. These influences are already reflected in higher education, with growing numbers of Cloud-based services and IT reliance on the Cloud.

Cloud-Based Services and IT Reliance

The Cloud is pervasive outside of higher education, from Facebook to Google to Amazon and beyond, but it is just beginning to gain traction in academia. The 2012 Campus Computing Survey found the largest migrations to Cloud-based learning management systems and customer relationship management applications, with percentages at 38.1 percent and 16.6 percent respectively, up 10.3 percent and 5.7 percent from the previous year. Still, less than 10 percent of universities are using the Cloud for administrative, storage, or high-performance computing activities, primarily due to lack of trust (Campus Computing Project 2012).

Some argue the potential is great, however: "Colleges that can leverage three key cloud-based technologies—identity management, dynamic social networks, and real-time data mining—will be more innovative and productive, educate more effectively, and develop students with a far greater stake in their own education" (Freedman 2012). Further, "cloud computing primarily [is] an opportunity to become more agile and to benefit from scale," and "sourcing strategies allow an institution to leverage staff expertise that it might not have the budget to hire internally" (Corn, Hubbs, and Nichols 2011, 46). Grajeck and Pirani (2012) of EDUCAUSE identified "developing an institution-wide cloud strategy" as one of the top ten IT Issues for 2012 and note, "A successful strategy is not focused on technologies but, rather, is focused on issues such as architecture, business models and requirements, procurement and contract management, contingency planning, security, privacy, and compliance."

Many libraries see the possibilities and are already well established in the Cloud, moving from traditional integrated library systems to typically Cloud-based library services platforms. Initially entering the market in 2010, these platforms are now available or in the works from nearly every major vendor (Ex Libris, OCLC, Innovative and Serials Solutions), and 2013 "will be [a year] of intense activity for these new library services platforms" (Breeding 2012).

Personal Clouds and the Internet of Things

Cloud computing is not just for massive Internet companies and institutions looking to be more effective; individuals are increasingly transitioning their lives and data to the Cloud. Linthicum (2012) defines the personal cloud as "consumer-oriented cloud services, such as Box.net, Dropbox, iCloud, and Evernote, targeted at individual users. They typically provide simple services, such as file, picture, notes, and content sharing, between devices." Gartner (2012) argues this "personal cloud will gradually replace the PC as the location where individuals keep their personal content, access their services and personal preferences and center their digital lives." As Cloud-based storage continues to gain acceptance, there is a trend of shifting expectations. "It does not matter where our work is stored; what matters is that our information is

accessible no matter where we are or what device we choose to use" (Johnson, Adams, and Cummins 2012, 4).

As more people connect to the Cloud, so does their data, not to mention things. Today we are entering an Internet of Things (IoT) and "as more things, people, and data become connected, the power of the Internet (essentially a network of networks) grows exponentially" (Evans 2012). Gartner (2012) indicates that "smartphones and other intelligent devices don't just use the cellular network, they communicate via NFC, Bluetooth, LE and Wi-Fi to a wide range of devices and peripherals, such as wristwatch displays, healthcare sensors, smart posters, and home entertainment systems. The IoT will enable a wide range of new applications and services while raising many new challenges." The New Media Consortium (Johnson, Adams, and Cummins 2012) still sees the IoT as "more concept than reality" and places it four to five years out for impact, but notes the necessary technology ("smart sensors") is "well understood, easily mass-produced, and inexpensive" (30). In the now, RFID tags are used at Northern Arizona University to track attendance via student cards, by marine biology researchers to "track marine animals' behavior" and at El Paso Health Sciences Center to keeps tabs on "the location of science lab equipment and resources" (Johnson, Adams, and Cummins 2012).

Implications
- Cloud computing has many advantages, but thorough security assessment and risk analysis must be completed before outsourcing moves are made (Corn, Hubbs, and Nichols 2011).
- As library services platforms continue to flood the market, increasing numbers of libraries seeking more effective ways to holistically manage their "collections and operations" may look to these Cloud-based platforms instead of traditional integrated library systems (Breeding 2012).
- Libraries need to consider how their patrons are using the personal Cloud and what this means for their relationship with library services and resources.
- As patrons move their data to the personal Cloud, libraries have an opportunity to educate about privacy.

Big Data and Learning Analytics

A primary result of increased reliance on the Cloud is the proliferation of Big Data. The full impact of Big Data will not be seen for some time, but the potential and implications are already well under consideration in higher education.

Potentials of Big Data

As institutions and individuals increasingly rely on the Cloud, the doors are opening with possibilities for Big Data. Freedman (2012) notes, "Cloud-based systems learn about their users very quickly. Such systems can mine data about users because each log-in and keystroke is analyzed in order to synthesize that data, feed it back, and share it with researchers and other users and systems." More than half of digital stakeholders surveyed by the Pew Internet and American Life Project agree that by the year 2020, "human and machine analysis of large data sets will improve social, political, and economic intelligence" and will ultimately be "a huge positive for society in nearly all respects" (Anderson and Rainie 2012, 3). At the same time, there is still much debate about whether or not the positives of Big Data will outweigh potential

negatives, such as the inability "to analyze Big Data accurately and efficiently," the threat of potential "power agendas," and concern of "negatively [impacting] the lives of those who are already disadvantaged" (Anderson and Rainie 2012, 28, 33, 35).

In higher education, "data diggers hope to improve an education system in which professors often fly blind" (Parry 2012b). Freedman (2012) argues that "colleges can use data to help students and faculty members monitor learning and teaching, and take adaptive actions in nearly real time," but notes the challenges of academic systems being siloed for different functions. Grajeck and Pirani (2012) include "using analytics to support critical institutional outcomes" as a top ten IT issue for 2012, pointing out, "Institutions are under continued pressure from accreditors and public funding sources to demonstrate that student outcomes are improving and that institutions are being run efficiently. Students and parents are beginning to clamor for more direct and 'real-time' feedback by gaining access to the data that institutions collect about student performance."

Examples of institutions taking the lead include Purdue University's Course Signals, a "system designed to track academic progress and warn students in real time if they need to work on certain areas" and Austin Peay State University's "Degree Compass, a course-recommendation tool inspired by similar systems at Netflix, Amazon, and Pandora" (Waters 2012). A pioneer in the use of data analytics is Arizona State University, which provides faculty with data dashboards pulling from their "LMS, as well as from web logs, swipe cards, and social media," but is beginning to consider what vendors have to offer (Waters 2012). For libraries, big data helps facilitate more personalized services such as "beginning to share data to build tools for recommending and discovering books" (Parry 2012a).

Learning Analytics
One specific element of Big Data analytics in higher education is the significant possibilities for use of data in teaching via learning analytics. Learning analytics is "the collection and analysis of data about learners" in order "to enable decision making" and is either generated by the learner through course participation or is data "about the learner, such as previous coursework, demographics, and other data that might exist in the student information system" (Diaz and Brown 2012, 2). In their 2012 *Horizon Report*, Johnson, Adams, and Cummins state, "Learning analytics promises to harness the power of advances in data mining, interpretation, and modeling to improve understandings of teaching and learning, and to tailor education to individual students more effectively" (22). Despite great promise and traction in some areas already, large-scale use of learning analytics is likely still a few years out. The New Media Consortium places learning analytics on the mid-term horizon as it "has only recently gained wide support among data scientists and education professionals" (Johnson et al. 2013, 26). Impediments include overemphasis in education on inputs instead of outputs, the necessity of "data sharing networks," inconsistency in data formatting and lack of understanding of data's value (West 2012).

Looking to the future, wide-ranging possibilities for learning analytics identified at an EDUCAUSE Learning Initiative focus session included: informing course design, improving student success and retention, fostering faculty development, and facilitating predictive modeling (Diaz and Brown 2012). For a slightly more specific example: "Armed with statistical information compiled from various digital systems, a number of schools have developed dashboard software and data warehouses that allow them to monitor learning, performance, and

behavioral issues for individual students as well as the school as a whole" (West 2012, 6). Most naturally, integration into learning management systems is the pioneering center of learning analytics, but researchers argue that "analytics must include more than LMS data," as there are other "equally important indicators of the overall quality of student performance" (Johnson, Adams, and Cummins 2012, 22–23). All things considered, the New Media Consortium expects that "in the coming years, outcomes of learning analytics will have significant impact on the evolution and refinement of higher education, especially in the design of personalized and online learning environments" (Johnson et al. 2013, 26).

Implications

- There is great potential in Big Data analysis, but universities must determine whether or not to invest time and talent or look to vendor outsourcing.
- Associated technology and analysis of Big Data raise new questions and tensions about the role of a professor in an environment of algorithms and the implications of predicting student failure (Parry 2012a, Parry 2012b).
- Big Data and data sharing immediately implicate privacy concerns, particularly for libraries, that must be considered prior to implementing services. "When should data be used? When should the information be shielded? One option is to use systems that allow patrons to opt in to libraries' tracking such activities as their previous checkouts" (Parry 2012a).
- The use of learning analytics and beyond "creates a strong incentive for institutions to develop policies about data-collection and intervention" that must "reflect each campus's culture, goals, and aspirations" (Diaz and Brown 2012, 9).

Assessment and Accountability

Assessment and accountability continue to figure prominently in higher education and the academic library environment. At the federal level, higher education reform is a continued focus, particularly as Congress takes on the renewal of the Higher Education Act in 2013. Issues related to the cost of a college education and higher education data reporting were brought forward by the House Higher Education Committee in 2012, and the Senate HELP committee held a hearing on college costs (CHEA 2012).

Higher education is continually responsive to demands for more accountability and assessment demonstrating student learning outcomes and impact. One key action in seeking the impact of the undergraduate student experience is the College Portrait, a web reporting template developed by the Voluntary System of Accountability (VSA) in 2007. Four years later, at the request of VSA, the National Institute for Learning Outcomes (NILOA) evaluated the College Portrait tool for Learning Outcomes Assessment. There were two key findings for the NILOA evaluation. First, while a majority of public universities participate in VSA, one third of that population does not participate in the College Portrait, and over one half of the VSA participants have not met the VSA stated expected outcomes section for the student learning outcomes. Additionally, the student learning outcomes portion of the College Portrait was not being viewed. The second finding was that the VSA-approved standardized tests included in the pilot to determine student learning lacked credibility within a major portion of the higher education community and

subverted the efforts of individual institution willingness to participate in the VSA. As a result of the analysis and stakeholder input, NILOA made four recommendations (Jankowski et al. 2012):

- to continue the College Portrait web reporting template in the VSA
- to retool the College Portrait web reporting site to be a more consumer-friendly communication tool for prospective students and their families as well as other audiences interested in student learning outcomes at an institutional level
- to expand the number of accepted student assessment tools in VSA
- to develop additional assessment tools and measures for inclusion in the VSA

Colleges and universities maintain that their missions make documenting value complex and daunting. A recent report authored by the National Research Council, *Improving Measurement of Productivity in Higher Education,* acknowledges the complexity of the factors that must be taken into account to begin to answer the call for more accountability in higher education. The authors of the report chose to focus their efforts on developing metrics and measures that target instructional productivity with the realization that there needs to be a more comprehensive understanding of faculty research allocation to fully develop effective metrics and statistics to demonstrate college and university value (Sullivan et al. 2012).

Internally, academic libraries are using assessment to identify service improvements, making evidence-based decisions and informing the marketing and promotion of library services. The focus of assessment and accountability is now on identifying the value of libraries based on impacts to research productivity and student learning outcomes at their institutions. "For academic libraries the trend toward aligning metrics with organizational mission and goals is being driven by changes in accreditation and the use of metric-driven allocations" (Hiller 2012).

There is a proliferation of assessment literature in the library profession. Jon Hufford (2013) did an excellent job of capturing a snapshot of the assessment literature between 2005 and 2011 in his article "A Review of the Literature on Assessment in Academic and Research Libraries, 2005 to August 2011." In his introduction, Hufford discusses the "ambiguity" of the terms *assessment* and *evaluation* and uses those terms interchangeably throughout the article. This is an important work for academic libraries seeking to gain a better understanding of the current state of assessment practices. Incorporating the research and successful practices of future scholarship demonstrates value to student learning at academic institutions. Peter Hernon and Candy Swartz assert in their 2012 editorial discussion that assessment is a "craze" that has replaced evaluation. They further state that most academic librarians are under misconceptions about what constitutes effective assessment and evaluation, and that these misconceptions should be corrected (Hernon and Swartz 2012).

At the forefront of educating academic librarians and identifying and providing meaningful ways for academic libraries to measure and demonstrate their impact on student learning is The Association of College and Research Libraries with its IMLS-funded ACRL Value of Libraries Initiative (http://www.acrl.ala.org/value). Building upon Megan Oakleaf's 2010 publication *The Value of Academic Libraries: A Comprehensive Research Review Report,* ACRL, APLU, and the Council of Independent Colleges sponsored two national summits at the end of 2011. The summits brought together senior librarians, chief academic administrators, and institutional researchers to collaborate on the creation of a developmental program to build librarians' capacity to document, demonstrate, and communicate library value in advancing the mission and

goals of their colleges and universities. The summits themselves raised awareness of common organizational assessment challenges that librarians, campus administrators, and accreditation agencies shared, as well as an emphasis on individual cultural frameworks that each institution operates within. The summit resulted in five recommendations:

- Increase librarians' understanding of library value and impact in relation to various dimensions of student learning and success.
- Articulate and promote the importance of assessment competencies necessary for documenting and communicating library impact on student learning and success.
- Create professional development opportunities for librarians to learn how to initiate and design assessment that demonstrates the library's contributions to advancing institutional mission and strategic goals.
- Expand partnerships for assessment activities with higher education constituent groups and related stakeholders.
- Integrate the use of existing ACRL resources with library value initiatives.

The recommendations include two themes. The first is increasing the knowledge of the individual librarian in relation to the value that libraries bring to student learning. The recommendations include creating and articulating assessment competencies, providing professional development opportunities, and encouraging utilization of the tools and resources ACRL has and is developing for the ACRL Value of Libraries Initiative. The second focus of the recommendations is centered on developing partnerships with internal and external stakeholders who share a common interest in demonstrating impact on student learning and success (Brown and Malenfant 2012).

In January 2013, ACRL announced that it was seeking applications from all types of higher education institutions for 75 teams to participate in the first cohort of "Assessment in Action: Academic Libraries and Student Success (AiA)." Librarians will each lead a campus team in developing and implementing an action learning project that examines the impact of the library on student success and contributes to assessment activities on campus. They will be supported in this work by a professional development program with sequenced learning events and activities at key junctures. The AiA program will employ a blended learning environment and a peer-to-peer network over the course of the 14-month-long program, which will run from April 2013 to June 2014 (ACRL Assessment in Action 2012).

Another promising project that may help libraries further establish their value in relation to student learning is the 2010 JISC-funded Library Data Impact Project. The project was based on research previously done by the University of Huddersfield resulting in a correlation between library usage and student achievement. Under the University of Huddersfield, seven institutions of higher education came together to test the hypothesis "There is a statistically significant correlation across a number of universities between library activity data and student attainment." The study analyzed e-resource usage, library circulation statistics, and library gate count entries for the eight participating UK institutions and then measured them against the final degree awards for 33,074 undergraduate students. The six-month analysis of the research successfully demonstrated a statistically significant relationship between library resource use and the level of degree, particularly in the area of e-book usage and library book checkout; however, the analysis was unable to determine direct causation between library use and level of student degree

attainment. As a result, the eight participating institutions were approached by JISC in 2011 to apply for funding for second phase of the project to gather more information and refine the results that may help academic libraries define their value to students and researchers (Stone and Ramsden 2012).

Researchers at the University of Wollongong demonstrated a correlation between students' grades and the use of library resources through the development of a tool linking student performance data sets with library resource use data. Preliminary research results show that students who access library resources more frequently perform better academically. The tool, Library Cube, standardized library use data, such as subscription databases, e-resources, and links for the learning management system to the university's student demographics and academic performance data sets. Data in the Library Cube is easily manipulated and filtered to produce customized reports. Cox and Jantti (2012) outline the development of the research tool and research results derived through use of the tool. Additionally they address the ethical issues of user privacy that were carefully considered when building Library Box. All data derived from Library Cube reports is aggregated and access to the tool is restricted.

As academic libraries continue to identify tools and methods to demonstrate their value in student learning, learning analytics may be an area in which academic libraries can partner with other academic units seeking to define their value. Learning analytics are defined in the 2011 *Horizon Report* as "the interpretation of a wide range of data produced by and gathered on behalf of students in order to assess academic progress, predict future performance, and spot potential issues" (Johnson et al. 2011, 28). Learning analytics are in the early stages of development and have primarily been used by academic success support units to identify at-risk learners and develop interventions that focused on learner success. Long and Siemens (2011) present a compelling argument and framework for the use of learning analytics for "analyzing the relationship between learner, content, [and] institution" (35–36) and address the call for higher education reform and accountability; however, as with any tool, careful consideration and application need to be employed so that the tool is being used appropriately and measuring what is intended. Melanie Booth (2012) presents an example of integrating the term *learning analytics* into the American Association for Higher Education's assessment forum, "9 Principles of Good Practice for Assessing Student Learning." She proposes that educational technologists who seek to use learning analytics should look to previous work done on assessment and learning outcomes so that as measures are developed, we are focused on what measuring what really matters.

Demonstrating the impact of the academic library is of vital importance, not just nationally, but also globally, and there is considerable research and funding to support research in this area. ARL has been a leader in academic library assessment. It has developed assessment models and tools that include benchmarking assessment tools LibQUAL+, SAILS, and promoted assessment models including Return on Investment and the value-added framework. Heather Lewin and Sarah Passonneau (2012) conducted an analysis of ARL Libraries 126 websites to determine "if ARL's focus on assessment would be evident on member websites." The authors found evidence of assessment models that are validated by the profession, LibQUAL+ ROI, value-added, and SAILS, with the greatest amount of participation in LibQUAL and SAILS. Overall, there was little analysis and application of the LibQUAL and SAILS data. Additionally, the authors found that throughout the ARL websites, there was little evidence indicating the ARL assessment

results were mapped to key organizational documents, mission statements, annual reports, and strategic plans. They maintain the purpose of assessment is providing direction for academic libraries so the libraries can support the unique teaching and scholarship activities at their institutions. If academic libraries do not promote their value by utilizing, documenting, and communicating assessment data affirming their value to their academic institutions, the institution will not place a high value on the academic library. The authors identify three ARL academic library websites that can be used as models for other academic libraries to emulate: the University of Virginia Library, the University of Washington Library, and the Cornell University Library.

Implications
- In an environment of an uncertain economy, rising tuition costs, employers calling for more skilled workers, and competition from for-profit education providers, higher education will continue to face demands for more transparent accountability and assessment measures that demonstrate the value of a college degree.
- Higher education and accrediting bodies will continue to scrutinize university and college degree programs and services and ask for demonstrated measures of impact on student learning.
- It will be prudent for academic libraries to collaborate with and form partnerships with other campus entities in order to combine library usage data with student data already being collected to develop meaningful measures of impacts on student learning.
- Academic libraries will need to embrace professional development and develop staff expertise in the assessment of student learning.
- It is imperative that academic libraries build upon current research in assessment of student learning impacts to develop reliable measures of impact on student learning that can be standardized across the profession.
- Learning analytics will become more robust and sophisticated. With the advent of mobile devices, academic libraries will be able to track real-time student learning activities.
- Academic libraries will need to develop partnerships that allow them to make sense of "Big Data" and utilize that data to develop robust measures of academic library impact on student learning.
- Academic libraries are collecting vast amounts of assessment data and need to become more transparent within the profession and their institutions regarding how they use their assessment data to make evidenced-based decisions and demonstrate their impact on student learning.

Appendix A: ACRL Research Planning and Review Committee 2012–2013

Bradford Lee Eden, Chair
Dean of Library Services
Valparaiso University

Cheryl Middleton, Vice-Chair
Associate University Librarian, Learning and Engagement
Oregon State University

Beth Blanton-Kent, Member
Librarian for Physical Sciences
Brown Science and Engineering Library
University of Virginia

Steven B. Carrico, Member
Acquisitions Librarian
University of Florida

Barbara S. Petersohn, Member
Associate Professor/Liaison Librarian
Library Technology Center
University of North Georgia

Heidi M. Steiner, Member
Head of Digital and Distance Education Services
Norwich University

Lisabeth A Chabot, ACRL Board Liaison
College Librarian
Ithaca College

Mary Jane Petrowski, ACRL Staff Liaison

References

Introduction and Methodology

ACRL Research Planning and Review Committee. 2012. "2012 Top Ten Trends in Academic Libraries: A Review of the Trends and Issues Affecting Academic Libraries in Higher Education." *College and Research Libraries News* 73, no. 6 (June): 311–320. http://crln.acrl.org/content/73/6/311.full.

Trends in Higher Education

Alvarado, Rafael. 2013. "Start Calling It Digital Liberal Arts." *The Transducer* (blog), February 19. http://transducer.ontoligent.com/?p=1013.

Anderson, Janna, Jan Lauren Boyles, and Lee Rainie. 2012. *The Future of Higher Education.* The Future of the Internet series. Washington, DC: Pew Internet and American Life Project. http://www.pewinternet.org/Reports/2012/Future-of-Higher-Education.aspx.

Bell, Steven. 2012. "Unbundling Higher Education." From the Bell Tower, *Library Journal*, February 23. http://lj.libraryjournal.com/2012/02/opinion/unbundling-higher-education-from-the-bell-tower.

El Nasser, Haya, and Paul Overburg. 2011. "Census Tracks 20 Years of Sweeping Change." *USA Today*, April 10. http://usatoday30.usatoday.com/news/nation/census/2011-08-10-census-20-years-change_n.htm.

Pannapacker, William. 2013. "Stop Calling It 'Digital Humanities': And 9 Other Strategies to Help Liberal-Arts Colleges Join the Movement." *Advice* (blog), *Chronicle of Higher Education*, February 18. http://chronicle.com/article/Stop-Calling-It-Digital/137325/?cid=at&utm_source=at&utm_medium=en.

Pappano, Laura. 2012. "The Year of the MOOC." *New York Times,* November 2.

Symonds, William C., Robert B. Schwartz, and Ronald Ferguson. 2011. *Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century.* Pathways to Prosperity Project. Cambridge, MA: Harvard Graduate School of Education, February. http://www.gse.harvard.edu/news_events/features/2011/Pathways_to_Prosperity_Feb2011.pdf.

Additional Readings

Gold, Matthew K, ed. 2012. *Debates in the Digital Humanities*. Minneapolis: University of Minnesota Press. Also available as an experimental and interactive online publication, http://dhdebates.gc.cuny.edu/debates.

Liu, Alan. 2012."The State of the Digital Humanities: A Report and a Critique." *Arts and Humanities in Higher Education* 11, no. 1–2 (February/April): 8–41. http://ahh.sagepub.com/content/11/1-2/8.

Future of the Profession

ARL (Association of Research Libraries) and Stratus, Inc. 2010. *The ARL 2030 Scenarios: A User's Guide for Research Libraries*. Washington, DC: Association of Research Libraries, October. http://www.arl.org/bm~doc/arl-2030-scenarios-users-guide.pdf.

Bell, Stephen. 2011a. "Be a Solutions Provider Not Just an Ingredients Supplier." *Designing Better Libraries* (blog), December. http://dbl.lishost.org/blog/2011/12/19/be-a-solutions-provider-not-just-an-ingredients-supplier/#.UUIeD1eFkbs.

———. 2011b. "Why All the Fuss over PhD Academic Librarians?" *ACRLog* (blog), April 13. http://acrlog.org/2011/04/13/why-all-the-fuss-over-phd-academic-librarians/

Bonfeld, Brett. 2012. "Libraries: The Next Hundred Years." *In the Library with the Lead Pipe* (blog), November 14. http://www.inthelibrarywiththeleadpipe.org/2012/libraries-the-next-hundred-years/.

Booth, Char. 2010. "Librarians as _____: Shapeshifting at the Periphery." *In the Library with the Lead Pipe* (blog), July 21. http://www.inthelibrarywiththeleadpipe.org/2010/librarians-as-_____-shapeshifting-at-the-periphery/.

Educopia Institute. 2013. "Library Publishing Coalition." Accessed April 4. http://www.educopia.org/programs/lpc.

Freund, Luanne. 2012. "Pecha Kucha: Innovation and Library Leadership." Presentation, Changing Times, Inspiring Libraries Summit, December 6–7, in Vancouver, BC. YouTube video, uploaded December 17. http://www.youtube.com/watch?v=1BN8DSfsOcA&feature=youtu.be.

Gobin, Seth. 2011. "The Future of the Library." *Seth's Blog,* May 6. http://sethgodin.typepad.com/seths_blog/2011/05/the-future-of-the-library.html.

Herther, Nancy. 2013. "Library Publishing Coalition: A Milestone in Evolution of Scholarly Publishing." ITI Newslink, March 7. http://newsbreaks.infotoday.com/NewsBreaks/Library-Publishing-CoalitionA-Milestone-in-Evolution-of-Scholarly-Publishing-88253.asp.

J. 2012. "SLA: Closing Conversation about the Future." *J's Scratchpad* (blog), July 18. https://blogs.law.harvard.edu/jkbaumga/2012/07/18/sla-618-closing-conversation-about-the-future/.

Jaschik, Scott. 2012. "A New (Kind of) Scholarly Press." Inside Higher Ed, December 6. http://www.insidehighered.com/news/2012/12/06/amherst-college-launches-open-access-scholarly-press.

Lankes, R. David. 2012. "Mid York Quick Talk." *Virtual Dave . . . Real Blog,* October 5. http://quartz.syr.edu/blog/?p=1760. Audio: http://quartz.syr.edu/rdlankes/pod/2012/2012Screen.mp3.

Mathews, Brian. 2012a. *Think Like a Startup: A White Paper to Inspire Library Entrepreneurialism*. Virginia Tech University Libraries, posted April 3. http://hdl.handle.net/10919/18649.

———. 2012b. "Too Much Assessment Not Enough Innovation: R&D Models and Mindsets for Academic Libraries." Presentation, Library Assessment Conference, October, Charlottesville, VA. http://hdl.handle.net/10919/19047.

Miller, William, and Langdon Morris. 1998. *Fourth Generation R&D: Managing Knowledge, Technology, and Innovation.* New York: Wiley.

Neal, James G. 2006. "Raised by Wolves: Integrating the New Generation of Feral Professionals into the Academic Library." *Library Journal* 131, no. 3 (February 15). http://www.libraryjournal.com/article/CA6304405.html.

Pollock, Ludmila. 2012. "Data Management: Librarians or Science Informationists?" *Nature* 490: 343 (October 18). doi:10.1038/490343d.

Staley, David J., and Kara J. Malenfant. 2010. *Futures Thinking for Academic Librarians: Higher Education in 2025*. Chicago: Association of College and Research Libraries, June. http://www.ala.org/ala/mgrps/divs/acrl/issues/value/futures2025.pdf.

Stephens, Michael. 2011. "Transforming Library Science Education: Heretical Thoughts." Presentation, The Future of the Academic Library: A Symposium, Burlington, Ontario, May 17. YouTube video, uploaded October 14. http://www.youtube.com/watch?v=TunmzP_2Ebg.

Tenopir, Carol, Ben Birch, and Suzie Allard. 2012. *Academic Libraries and Research Data Services: Current Practices and Plans for the Future.* ACRL white paper. Chicago: Association of College and Research Libraries, June. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/Tenopir_Birch_Allard.pdf.

Scholarly Communication

Bauder, Julia, and Jenny Emanuel. 2012. "Being Where Our Faculty Are: Emerging Technology Use and Faculty Information-Seeking Workflows." *Internet Reference Services Quarterly* 17, no. 2: 65–82.

Butler, Brandon C. 2012. *GSU Fair Use Decision Recap and Implications*. Washington, DC: Association of Research Libraries.

Christensen, Clayton M., Michael B. Horn, and Curtis W. Johnson. 2008. *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*. New York: McGraw-Hill.

Connaway, Lynn Sillipigni, and Timothy J. Dickey. 2010. *The Digital Information Seeker: Report of Findings from Selected OCLC, RIN, and JISC User Behavior Projects*. United Kingdom: JISC.

Connaway, Lynn Sillipigni, Timothy J. Dickey, and Marie L. Radford. 2011. "'If It Is Too Inconvenient I'm Not Going after It': Convenience as a Critical Factor in Information-Seeking Behaviors." *Library and Information Science Research* 33, no. 3 (July): 179–190.

"*eLife*." 2013. *eLife* Sciences Publications. Accessed March 8. http://elife.elifesciences.org/home.

Engel, Debra, Sarah Robbins, and Christina Kulp. 2011. "The Information-Seeking Habits of Engineering Faculty." *College and Research Libraries* 72, no. 6 (November): 548–567.

Evans, Baker. 2011. "The Ubiquity of Mobile Devices in Universities: Usage and Expectations." *Serials* 24, supplement 3 (November): S11–S16.

Fitzpatrick, Kathleen. 2011. *Planned Obsolescence: Publishing, Technology, and the Future of the Academy*. New York: New York University Press.

Forkosh-Baruch, Alona, and Arnon Hershkovitz. 2012. "A Case Study of Israeli Higher-Education Institutes Sharing Scholarly Information with the Community via Social Networks." *Internet and Higher Education* 15, no. 1 (January): 58–68.

Harley, Diane, Sophia Krzys Acord, Sarah Earl-Novell, Shannon Lawrence, and C. Judson King. 2010. *Assessing the Future Landscape of Scholarly Communication: An Exploration of Faculty Values and Needs in Seven Disciplines*. Berkeley, CA: UC Berkeley, Center for Studies in Higher Education.

Heidorn, P. B. 2011. "The Emerging Role of Libraries in Data Curation and E-Science." *Journal of Library Administration* 51, no. 7–8: 662–672.

House of Representatives. 2011. Research Works Act. H.R. 3699. 112th Cong.

———. 2012. Federal Research Public Access Act. H.R. 4004. 112th Cong.

JLSC. 2012. "About JLSC." *Journal of Librarianship and Scholarly Communication* website. Accessed December 14. http://jlsc-pub.org/jlsc/about.html.

Kroll, Susan, and Rick Forsman. 2010. *A Slice of Research Life: Information Support for Research in the United States*. Dublin, OH: OCLC, June.

Lewis, David W. 2012. "The Inevitability of Open Access." *College and Research Libraries* 73, no. 5 (September): 493–506.

Miller, Claire Cain. 2012. "Google Deal Gives Publishers a Choice: Digitize or Not." *New York Times*, October 4.

Navin, John C., and Jennifer M. Vandever. 2011. "The Market for Scholarly Communication." *Journal of Library Administration* 51, no. 5: 455–463.

Nosek, Brian A., and Yoav Bar-Anan. 2012. "Scientific Utopia: I. Opening Scientific Communication." *Psychological Inquiry* 23, no. 3: 217–243.

Ollé, Candela, and Ángel Borrego. 2010. "A Qualitative Study of the Impact of Electronic Journals on Scholarly Information Behavior." *Library and Information Science Research* 32, no. 3: 221–228.

Park, Ji-Hong, and Jiyoung Shim. 2011. "Exploring How Library Publishing Services Facilitate Scholarly Communication." *Journal of Scholarly Publishing* 43, no. 1: 76–89.

Roosendaal, Hans E., and Peter A. Th. M. Geurts. 1997. "Forces and Functions in Scientific Communication: An Analysis of Their Interplay." Presentation, conference on Co-operative Research in Information Systems in Physics, University of Oldenburg, Germany, September 1–3.

Ross, Seamus. 2012. "Digital Preservation, Archival Science and Methodological Foundations for Digital Libraries." *New Review of Information Networking* 17, no. 1: 43–68.

Rutner, Jennifer, and R. C. Schonfeld. 2012. *Supporting the Changing Research Practices of Historians*. New York: Ithaka S+R.

Scaramozzino, Jeanine Marie, Marisa L. Ramírez, and Karen J. McGaughey. 2012. "A Study of Faculty Data Curation Behaviors and Attitudes at a Teaching-Centered University." *College and Research Libraries* 73, no. 4 (July): 349–365.

SPARC. 2012. "Coalition of Open Access Policy Institutions (COAPI)." SPARC website. Accessed December 14. http://www.arl.org/sparc/about/COAPI/.

Stebbins, Michael. 2013. "Expanding Public Access to the Results of Federally Funded Research." White House Office of Science and Technology Policy blog, February 22. http://www.whitehouse.gov/blog/2013/02/22/expanding-public-access-results-federally-funded-research.

Suber, Peter. 2012a. *Open Access*. MIT Press Essential Knowledge Series. Cambridge, MA: MIT Press.

———. 2012b. "Open Access Overview." Earlham College website. First posted June 21, 2004. Accessed December 14. www.earlham.edu/~peters/fos/overview.htm.

Tenopir, Carol, Rachel Volentine, and Donald W. King. 2012. "Article and Book Reading Patterns of Scholars: Findings for Publishers." *Learned Publishing* 25, no. 4: 279–291.

University of Nottingham and JISC. 2012. "SHERPA/RoMEO." University of Nottingham website. Accessed December 14. http://www.sherpa.ac.uk/romeo.

Vandegrift, Micah, and Gloria Colvin. 2012. "Relational Communications." *College and Research Libraries News* 73, no. 7 (July 1): 386–389.

Wagstaff, Keith. 2012. "If Harvard Can't Afford Academic Journal Subscriptions, Maybe It's Time for an Open Access Model." *Time,* April 26.

Wu, Ling-Ling, Mu-Hsuan Huang, and Ching-Yi Chen. 2012. "Citation Patterns of the Pre-Web and Web-Prevalent Environments: The Moderating Effects of Domain Knowledge."

Journal of the American Society for Information Science and Technology 63, no. 11: 2182–2194.

Radical Collaboration

ACRL Research Planning and Review Committee. 2012. "2012 Top Ten Trends in Academic Libraries: A Review of the Trends and Issues Affecting Academic Libraries in Higher Education." *College and Research Libraries News* 73, no. 6 (June): 311–320. http://crln.acrl.org/content/73/6/311.full.

ALA (American Library Association). 2012. "Patron-Driven Acquisitions in Consortia." Panel discussion, ALA Annual Conference, Anaheim, CA, June 23. http://ala12.scheduler.ala.org/node/917.

Banush, David. 2012. "Hoarders and Those Who Enable Them." *Technicalities* 32, no. 1 (January/February): 7–9.

Bibliographic Services Task Force. 2005. *Rethinking How We Provide Bibliographic Services for the University of California.* Final report. University of California Libraries, December. http://libraries.universityofcalifornia.edu/sopag/BSTF/Final.pdf.

Butler, John. 2012. "Radical Acts of Collaboration." *Continuum* 10. http://blog.lib.umn.edu/continuum/hathitrust.html.

CDL (California Digital Library). 2012. "WEST: Western Regional Storage Trust." Last updated December 14. CDL website. http://www.cdlib.org/services/west/.

CLIR (Council on Library and Information Resources). 2008. *No Brief Candle: Reconceiving Research Libraries for the 21st Century*. CLIR Publication No. 142. Washington, DC: CLIR, August. http://www.clir.org/pubs/reports/pub142/pub142.pdf.

CRL (Center for Research Libraries). 2012a. "About CRL." http://www.crl.edu/about.

———. 2012b. "Other Print Archives." http://www.crl.edu/archiving-preservation/print-archives/papr/database.

———. 2012c. "Print Archives." http://www.crl.edu/print-archives.

CSU (Colorado State University) Libraries. 2012. RapidILL home page. http://rapidill.org/Default.aspx.

Davis, Kate, Lei Jin, Colleen Neely, and Harriet Rykse. 2012. "Shared Patron-Driven Acquisitions with a Consortium: The OCUL PDA Pilot." *Serials Review*, 38 , no. 3 (September): 183–187. doi:10.1016/j.serrev.2012.08.002.

Florida Virtual Campus. 2012. UBorrow web page. http://fclaweb.fcla.edu/uborrow.

Gaetz, Ivan. 2009. "Collaborative Librarianship: New Light on a Brilliant Concept." *Collaborative Librarianship* 1, no. 1: 1–12.

HathiTrust Digital Library. 2012. HathiTrust "About" page. http://www.hathitrust.org/about.

Howard, Jennifer. 2009. "Columbia and Cornell Libraries Announce 'Radical' Partnership." *Wired Campus* blog, *Chronicle of Higher Education,* October 28. http://chronicle.com/blogs/wiredcampus/columbiacornell-libraries-announce-radical-partnership/8627.

———. 2011. "Building a Large-Scale Print-Journal Repository." *Wired Campus* blog. *Chronicle of Higher Education,* February 8. http://chronicle.com/blogs/wiredcampus/building-a-large-scale-print-journal-repository/29558.

Hruska, Martha. 2010. "Library Technical Services as Service-Oriented Architecture? Or Confessions of a Next Gen Technical Services Promoter." *Technicalities* 30, no. 4 (July/August).

———. 2011. "Is It the Next Generation Yet?" *Technicalities* 31, no. 4 (July/August).

Internet Archive. 2012. "About the Internet Archive." http://archive.org/about/.

Kelley, Michael. 2012. "Two Consortial Ebook Projects Move Deeper into Demand-Driven Acquisitions." *The Digital Shift* (blog). *Library Journal*, June 20. http://www.thedigitalshift.com/2012/06/ebooks/two-consortial-ebook-projects-moving-deeper-into-data-driven-acquisitions/.

Kenney, Anne R. 2009. "Approaching an Entity Crisis: Reconceiving Research Libraries in a Multi-institutional Context." Part of the OCLC Distinguished Seminar Series. Webcast, September 23. http://staffweb.library.cornell.edu/system/files/OCLC_EntityCrisis_Oct2009.pdf.

Lavoie, Brian, Constance Malpas, and J. D. Shipengrover. 2012. *Print Management at "Mega-scale": A Regional Perspective on Print Book Collections in North America*. Dublin, OH: OCLC Research. http://www.oclc.org/research/publications/library/2012/2012-05r.html.

Lugg, Rick, Cory Tucker, and Chris Sugnet. 2010. "Library Collaboration and the Changing Environment: An Interview with Rick Lugg, R2 Consulting." *Collaborative Librarianship* 2, no. 1: 19–21. http://collaborativelibrarianship.org/index.php/jocl/article/view/62/41.

Malpas, Constance. 2011. *Cloud-Sourcing Research Collections: Managing Print in the Mass-Digitized Library Environment*. Dublin, OH: OCLC Research, January. http://www.oclc.org/research/publications/library/2011/2011-01.pdf.

MSCS (Maine Shared Collections Strategy). 2011. MSCS website. http://www.maineinfonet.net/mscs/.

Neal, James G. 2010a. "Advancing from Kumbaya to Radical Collaboration in the Academic Library." Presentation, World Library and Information Congress, Gothenburg, Sweden, August 14. http://conference.ifla.org/past/ifla76/131-neal-en.pdf.

———. 2010b. "Advancing from Kumbaya to Radical Collaboration: Redefining the Future Research Library." *Journal of Library Administration* 51, no. 1: 66–76.

———. 2010c. "The Future Academic Research Library: Hope/Power/Action through Primal Innovation and Radical Collaboration." Neal-Schuman website. http://www.neal-schuman.com/academic/Neal2010.pdf.

———. 2011a. "Library Collections in the 21st Century." OCLCVideo on YouTube. Uploaded December 5. http://www.youtube.com/watch?v=6ofpsEciiQ.

———. 2011b. "Prospects for Systemic Change across Academic Libraries," *EDUCAUSE Review Online,* April 7. http://www.educause.edu/ero/article/prospects-systemic-change-across-academic-libraries.

———. 2011c. "Radical Collaboration and the Future of the Academic Library: The 2CUL Project as Case Study." Presentation, Interlending and Document Supply Conference, Chicago, September 20. http://ilds2011.org/presentations/Neal_RadicalCollaboration_ILDS2011_2011-09-20.pdf.

NGTS Executive Team. 2010. "Next Generation Technical Services: Next Steps." University of California Libraries memo, February 16, revised and endorsed by University Librarians February 24. http://libraries.universityofcalifornia.edu/about/uls/ngts/docs/NGTSNextSteps100216rev100224.pdf.

OCLC and *Library Journal.* 2012. "Your Library at Webscale: How Radical Collaboration Is Redefining Library Management Services." Webinar. February 21. https://event.on24.com/eventRegistration/EventLobbyServlet?target=registration.jsp&eventid=394823&sessionid=1&key=395ACD6C45C3B8E3D6EAA98A2F416C78&partnerref=ljspsoclc02212012&sourcepage=register.

Orbis Cascade Alliance. 2012. Collaborative Technical Services Team (2010). Last updated October 1. http://www.orbiscascade.org/index/ctst.

Rae, Tushar. 2011. "Collaboration Seeks to Provide Easier Access to E-books." *Wired Campus* blog, *Chronicle of Higher Education,* February 28. https://chronicle.com/blogs/wiredcampus/collaboration-seeks-to-provide-easier-access-to-e-books/30054.

Schonfeld, Roger C., and Ross Housewright. 2009. *What to Withdraw: Print Collections Management in the Wake of Digitization*. New York: Ithaka S + R. http://www.sr.ithaka.org/research-publications/what-withdraw-print-collections-management-wake-digitization.

Strauss, Barbara J., Margaret Maurer, and Julie Gedeon. 2012. *If You Build It, Will They Come? Building the Collaborative Infrastructure and the OhioLINK Collaborates Toolbox.* Library Faculty Publications, Paper 8. Cleveland, OH: EngagedScholarship@CSU. http://engagedscholarship.csuohio.edu/cgi/viewcontent.cgi?article=1007&context=msl_facpub.

UC (University of California) Libraries. 2009. "Next-Generation Technical Services: Changing How We Provide Technical Services for the University of California Libraries (Scope Statement)." University of California Libraries, April 10. http://libraries.universityofcalifornia.edu/about/uls/ngts/docs/NGTS_scope_10april2009.pdf.

———. 2012a. "Next-Generation Technical Services (NGTS)." http://libraries.universityofcalifornia.edu/ngts.

———. 2012b. UC Libraries Next-Generation Technical Services Tumblr page. http://ucngts.tumblr.com/.

WEST (Western Regional Storage Trust). 2012. "Western Regional Storage Trust (WEST) Announces Print Archiving Milestone." News release, August. http://www.cdlib.org/services/west/docs/WEST%20press%20release%202012%2008%2027.docx.

Wicks, Scott, and Robert Wolven. 2010. "Techno-Anthropological Factors in Bi-institutional Macro-integration Or, Is 2CUL Really Hot?" *Technicalities* 30, no. 55 (September/October).

Wiley, Lynn, and Elizabeth Clarage. 2012. "Building on Success: Evolving Local and Consortium Purchase-on-Demand Programs." *Interlending and Document Supply* 40, no. 2: 105–110. doi:10.1108/02641611211239588.

Additional Readings

Dooley, Jack, and Ricky Erway. 2012. "Demystifying Born Digital." OCLC website. Most recently updated August 23. http://www.oclc.org/research/activities/borndigital.html.

Erway, Ricky. 2012. *Swatting the Long Tail of Digital Media: A Call for Collaboration.* Dublin, OH: OCLC Research, September. http://www.oclc.org/content/dam/research/publications/library/2012/2012-08.pdf.

Horton, Valerie. 2012. "Trends in Library Collaboration: Deeper, Wider, and Riskier." *Collaborative Librarianship* 4, no 2: 38. http://collaborativelibrarianship.org/index.php/jocl/article/view/208/131.

Jones, Rebecca. 2011. "Radical Collaboration: Jim Neal." *Change and Innovation* (blog), June 6. http://dysartjones.com/2011/06/radical-collaboration-jim-neal/.

Kenney, Anne. 2011. "Academic Libraries in the Age of Cooperation." Presentation, AgNIC Annual Meeting, Beltsville, MD, May 18–19, http://staffweb.library.cornell.edu/system/files/AgNIC-2011.pdf.

Tenopir, Carol, Ben Birch, and Suzie Allard. 2012. *Current Practices and Plans for the Future.* ACRL white paper. Knoxville: Center for Information and Communication Studies (CICS) at the University of Tennessee.

http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/Tenopir_
Birch_Allard.pdf.

Technology

Anderson, Janna, and Lee Rainie. 2012. *The Future of Big Data.* Washington, DC: Pew Internet
and American Life Project, July 20. http://www.pewinternet.org/Reports/2012/Future-of-
Big-Data.aspx.

Arora, Diksha. 2013. "Responsive Design vs. Mobile Sites vs. Native Mobile Apps: Which
One's the Best?" *Vandeley Design* blog, February 19.
http://vandelaydesign.com/blog/web-development/responsive-mobile-native/.

Breeding, Marshall. 2012. "Tech Review and Forecast for 2012." *Computers in Libraries* 32, no.
10 (December). http://www.infotoday.com/cilmag/dec12/Breeding--Tech-Review-and-
Forecast-for-2013.shtml.

Campus Computing Project. 2012. "Campus Computing 2012: Mixed Assessment for IT
Effectiveness." Campus Computing website.
http://www.campuscomputing.net/item/campus-computing-2012-mixed-assessments-it-
effectiveness.

CDW-G. 2012. "Bring Your Own Device." White paper. *EdTech* website.
http://www.edtechmagazine.com/higher/sites/edtechmagazine.com.higher/files/108532-
wp-hied-byod-df.pdf.

Corn, Michael A., Cathy Hubbs, and Brian T. Nichols. 2011. Interview by Rodney Petersen.
"Alternative IT Sourcing: A Discussion of Privacy, Security, and Risk." *EDUCAUSE
Review* 46, no. 4 (July/August). http://net.educause.edu/ir/library/pdf/ERM1142.pdf.

Dahlstrom, Eden. 2012. *ECAR Study on Undergraduate Students and Information Technology
2012*. Louisville, CO: EDUCAUSE Center for Applied Research, September.
http://net.educause.edu/ir/library/pdf/ERS1208/ERS1208.pdf.

Diaz, Veronica, and Malcolm Brown. 2012. *Learning Analytics: A Report on the ELI Focus
Session.* EDUCAUSE Learning Initiative Paper 2 (May).
http://net.educause.edu/ir/library/PDF/ELI3027.pdf.

Duggan, Maeve, and Lee Rainie. 2012. *Cell Phone Activities 2012.* Washington DC: Pew
Internet and American Life Project, November 25.
http://www.pewinternet.org/Reports/2012/Cell-Activities/Main-Findings.aspx.

Evans, Dave. 2012. "How the Internet of Everything Will Change the World . . . for the Better
#IoE." *The Platform,* Cisco blog, November 7. http://blogs.cisco.com/news/how-the-
internet-of-everything-will-change-the-worldfor-the-better-infographic/.

Freedman, Gordon. 2012. "Cloud Technology Can Lift the Fog over Higher Education."
Chronicle of Higher Education, April 29. http://chronicle.com/article/Cloud-Technology-
Can-Lift-the/131673.

Gartner. 2012. "Gartner Identifies the Top 10 Strategic Technology Trends for 2013." News release. Gartner website, October 23. http://www.gartner.com/it/page.jsp?id=2209615.

Grajeck, Susan, and Judith A. Pirani. 2012. "Top-10 IT Issues, 2012." *EDUCAUSE Review* 47, no. 3 (May/June). http://www.educause.edu/ero/article/top-ten-it-issues-2012.

Johnson, Larry, Samantha Adams, and M. Cummins. 2012. *NMC Horizon Report: 2012 Higher Education Edition*. Austin, TX: New Media Consortium. http://www.nmc.org/pdf/2012-horizon-report-HE.pdf.

Johnson, Larry, Samantha Adams Becker, M. Cummins, V. Estrada, A. Freeman, and Holly Ludgate. 2013. *Horizon Report: 2013 Higher Education Edition.* Austin, TX: New Media Consortium. http://www.nmc.org/system/files/pubs/1360189731/2013-horizon-report-HE.pdf.

Linthicum, David. 2012. "Get Ready for the Personal Cloud." Cloud Computing, InfoWorld website, August 3, http://www.infoworld.com/d/cloud-computing/get-ready-the-personal-cloud-199150.

Parry, Marc. 2012a. "As Libraries Go Digital, Sharing of Data Is at Odds with Tradition of Privacy." *Chronicle of Higher Education,* November 5. http://chronicle.com/article/As-Libraries-Go-Digital/135514.

———. 2012b. "Big Data on Campus." *New York Times,* July 18. http://www.nytimes.com/2012/07/22/education/edlife/colleges-awakening-to-the-opportunities-of-data-mining.html?pagewanted=all&_r=0.

Rainie, Lee. 2012a. *Two-Thirds of Young Adults and Those with Higher Income Are Smartphone Owners.* Washington, DC: Pew Internet and American Life Project, September 11. http://www.pewinternet.org/~/media//Files/Reports/2012/PIP_Smartphones_Sept12%209%2010%2012.pdf.

———. 2012b. *25% of American Adults Own Tablet Computers*. Washington, DC: Pew Internet and American Life Project, October 4. http://www.pewinternet.org/~/media//Files/Reports/2012/PIP_TabletOwnership_August2012.pdf

Schroeder, Stan. 2012. *Apple's Tablet Market Share Drops to 50.4%.* Mashable, November 5. http://mashable.com/2012/11/05/apples-tablet-market-share-drops-to-50-4-percent-report/.

Waters, John K. 2012. "Mining Data to Help Students." *Campus Technology,* November 15. http://campustechnology.com/articles/2012/11/15/mining-data-to-help-students.aspx.

West, Darrell M. 2012. *Big Data for Education: Data Mining, Data Analytics, and Web Dashboards.* Governance Studies at Brookings, September. http://www.brookings.edu/~/media/research/files/papers/2012/9/04%20education%20technology%20west/04%20education%20technology%20west.pdf.

Assessment and Accountability

ACRL Assessment in Action: Academic Libraries and Student Success. 2012.
http://www.ala.org/acrl/AiA

Booth, Melanie. 2012. "Learning Analytics: The New Black." *EDUCAUSE Review* 47, no. 4 (July/August): 52–53.

Brown, Karen, and Kara J. Malenfant. 2012. *Connect, Collaborate and Communicate: A Report from the Value of Academic Libraries Summits*. Chicago: American Association of College and Research Libraries.

CHEA (Council for Higher Education Accreditation). 2012. *Federal Update* no. 28 (December 14).

Cox, Brian, and Margie Jantii. 2012. "Discovering the Impact of Library Use and Student Performance." *EDUCAUSE Review* Online, July 18. http://www.educause.edu/ero/article/discovering-impact-library-use-and-student-performance.

Hernon, Peter, and Candy Swartz. 2012. "The Assessment Craze." *Library and Information Science Research* 34, no. 2 (April): 79.

Hiller, Steve. 2012. "What Are We Measuring, and Does It Matter?" *Information Outlook* 16, no. 5: 10–12, 41.

Hufford, Jon R. 2013 "A Review of the Literature on Assessment in Academic and Research Libraries, 2005 to August 2011." Preprint. *portal: Libraries and the Academy* 13, no. 1: 5–35.

Jankowski, Natasha A., Stanley O. Ikenberry, Jillian Kinzie, George D. Kuh, Gloria F. Shenoy, and Gianina R. Baker. 2012. *Transparency and Accountability: An Evaluation of the VSA College Portrait Pilot*. Champaign, IL: National Institute for Learning Outcomes Assessment.

Johnson, Larry, Rachel S. Smith, H. Willis, Alan Levine, and Keene Haywood. 2011. *The 2011 Horizon Report.* Web version. Austin, TX: New Media Consortium. http://net.educause.edu/ir/library/pdf/hr2011.pdf.

Lewin, Heather S., and Sarah M. Passonneau. 2012. "An Analysis of Academic Research Libraries Assessment Data: A Look at Professional Models and Benchmarking Data." *Journal of Academic Librarianship* 38, no. 2: 85–93.

Long, Phil, and George Siemens. 2011. "Penetrating the Fog: Analytics in Learning and Education." *EDUCAUSE Review* 46, no. 5 (September/October): 30–40. http://net.educause.edu/ir/library/pdf/ERM1151.pdf.

Oakleaf, Megan. 2010. *The Value of Academic Libraries: A Comprehensive Research Report.* Chicago: Association of College and Research Libraries.

Stone, Graham, and Bryony Ramesden. 2012. "Library Impact Data Project: Looking for the Link between Library Usage and Student Attainment." *College and Research Libraries*. Accepted September; anticipated publication date: January 1, 2014. http://crl.acrl.org/content/early/2012/11/08/crl12-406.short.

Sullivan, Teresa A., Christopher Mackie, William F. Massy, and Esha Sinha, eds. 2012. *Improving Measurement of Productivity in Higher Education: Panel on Measuring Higher Education Productivity, Conceptual Framework and Data Needs*. Washington DC: National Academy.

Additional Readings

Creaser, Claire, and Valerie Spezi. 2012. *Working Together: Evolving Value for Academic Libraries.* Leicestershire, UK: LISU, Loughborough University/Sage, June.

Nitecki, Danuta A. 2011. "Space Assessment as a Venue for Defining the Academic Library." *Library Quarterly* 81, no. 1: 27–59.

Oakleaf, Megan. 2011. "Are They Learning Yet? Are We? Learning Outcomes and the Academic Library." *Library Quarterly* 81, no. 1: 61–82.

Oakleaf, Megan, Michelle S. Millet, and Leah Kraus. 2011. "All Together Now: Getting Faculty, Administrators, and Staff Engaged in Information Literacy Assessment." *portal: Libraries and the Academy* 11, no. 3: 831–852.

Sobel, Karen, and Cassidy R. Sugimoto. 2012. "Assessment of Learning during Library Instruction: Practices, Prevalence and Preparation." *Journal of Academic Librarianship* 38, no. 4: 191–204.