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After the Book

Information services for the twenty-first century

GEORGE STACHOKAS



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List of abbreviations

AACR2	Anglo-American Cataloguing Rules, Second Edition
ACRL	Association of College and Research Libraries
ADA	Americans with Disabilities Act
ALA	American Library Association
ARL	American Research Libraries
AV	Audio-visual
BI	Business intelligence
BISG	Book Industry Study Group
CAS	Certificate of Advanced Study
CLIR	Council on Library and Information Resources
CNIB	Canadian National Institute for the Blind
CSS	Cascading style sheets
DDA	Demand driven acquisitions
EAD	Enhanced archival description
eLib	Electronic Libraries Program (UK)
ERM	Electronic resources management system
FTE	Full-time equivalent
GPO	Government Printing Office
HCI	Human-computer interaction
IAML	International Association of Music Libraries
ILS	Integrated library system

ING	Information Now Generation
ISIC	Information Specialist in Context
IT	Information technology
JD	Jurius Doctor
K-12	Kindergarten to 12th grade
LIS	Library and information science
LMS	Library management system
MBA	Master of Business Administration
MIS	Master of Information Science
MLIS	Master of Library & Information Science
MLS	Master of Library Science
MOOC	Massive Open Online Courses
MPR	Master of Public Administration
NARA	National Archives and Records Administration
NEA	National Endowment of the Arts
NIH	National Institutes of Health
NLS	National Library Service for the Blind and Physically Handicapped
OPAC	Online public access catalog
PDA	Patron driven acquisitions
RTC	Resistance to change
SDLC	System Development Life Cycle
SFTAR	Successful full-text article requests
STEM	Science, Technology, Engineering and Mathematics
WAGE	Web Content Accessibility Guidelines

About the author

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The challenge of electronic resources

Abstract: This chapter introduces the argument that electronic resources pose a fundamental challenge to libraries. New skill sets, different organizational structures, and different approaches to work are required to manage electronic resources. Brief descriptions of subsequent chapters are included.

Key words: electronic resources, information management, information science, library science.

Libraries and librarians have been defined by the book throughout modern history. What happens when society increasingly lets print go in favor of storing, retrieving, and manipulating electronic information? What happens after the book? The academic library of the twenty-first century is first and foremost a provider of electronic information services, but is also much more. Contemporary users expect today's library to provide information as quickly and efficiently as other online information resources, but also look for guidance in how to use information, assistance with managing information, and access to technology and other resources that are not always affordable to the individual. Librarians need to change what they know, how they work, and how they are perceived in order to succeed in a world that increasingly abandons print.

Many innovations have been implemented in libraries in recent years. Redefining the library as place, developing hybrid libraries that provide the best of print and electronic resources, alternative acquisitions methods such as patron driven acquisitions (PDA), improvements in information literacy and instruction, data management, and new positions such as the emerging technology librarian are just some of the many efforts

undertaken by libraries. A few libraries have become fully electronic, but even these often continue to suffer from outmoded organizational structures, inadequate library and information science (LIS) education, and misconceptions about the role of libraries. Libraries will have to take the next step of assembling recent innovation into a new global strategy to develop fully electronic libraries with appropriate services, new organizational structures, and improved information management for the twenty-first century.

After the Book advocates a transition to a fully electronic or digital library, but this transition requires careful planning and will necessarily progress at different rates across libraries. Even as libraries become fully electronic, care must be taken to ensure that disadvantaged user populations are able to keep up with the rest of society. The transition from print to electronic resources may need to be modified depending on the resources of individual libraries and the precise characteristics and needs of local user populations. Academic libraries, especially those that serve financially sound institutions, will likely lead the way while some public libraries and special libraries may need to continue hybrid services for a somewhat longer period of time, but should make the change as soon as feasible. Given the high cost of some information resources in the twenty-first century, libraries must carefully manage the transition from print to electronic in such a way that access to information is expanded rather than reduced.

To support these changes and to ensure the long-term success of libraries, due care must be given to the perceptions of stakeholders and the wider public. Libraries do not have the resources to support their work independently and must endeavor to remain relevant to users and those who provide funding to libraries. Considerable work is necessary in marketing and developing a more modern image for the librarian as an information specialist. The librarian, however, is currently a professional whose entire identity is derivative of the historical role of the book in Western civilization.

Perhaps the most important and most difficult task is reforming higher education in LIS. There are a high number of intelligent, competent, and well intentioned professors and instructors in LIS programs, so this criticism is not meant to pass judgment on specific individuals or even specific courses, but rather on the overall system of LIS higher education. It is difficult to think of another profession in which there is such a wide gap between formal education and professional practice. While a few programs have included more instruction in information technology

(IT), electronic resources management, advanced metadata, and other increasingly important areas of specialization, many programs in North America continue to offer a mostly traditional Master of Library Science (MLS) degree. Most MLS degrees can be completed in one or two years and largely consist of electives with a mixture of courses that sometimes address outdated issues and concepts formed during the print era. The history of LIS education in the UK is somewhat different than the USA because the UK followed an apprenticeship model that de-emphasized degreed professionals until after the Second World War, but now faces similar problems.

This book is not intended to provide a full critique of higher education in LIS, let alone a detailed description of coursework necessary for addressing critical problems, but it is possible to sketch in broad strokes what is needed. Given the diverse roles of professional librarians and the necessarily interdisciplinary nature of information management, higher education in LIS must become equally complex. Instead of a single homogenous degree, practitioners should study a universal core or foundational set of courses followed by specialized training in areas relevant to contemporary practice. Successful completion of these additional modules or areas would result in certification. Very advanced work in highly specialized areas would require doctoral degrees rather than master's degrees. Also, when it makes sense to do so, additional training in other disciplines would benefit from becoming more formalized and standardized.

Highlighting useful innovations already undertaken by libraries, discussing recommendations for the reorganization of libraries and educational reform, along with some practical suggestions for experimentation constitute the heart of this book. Unfortunately, electronic resources bring almost as many problems as solutions for information needs. Some of the most obvious challenges for libraries are legal and financial and include skyrocketing costs for online serials, problems of ownership and preservation of digital content, as well as staff trained to serve the needs of another era. Of course, part of the problem is cultural in that librarians and society still associate the library with print and are arguably having trouble adopting services that are no longer based on physical collections and encompass a very broad range of professional knowledge and skills.

Defining the problem

Electronic resources pose a fundamental challenge to libraries. Since the late nineteenth century, librarians have faced competition from other professions while struggling to define themselves and learning how to manage an ever increasing amount of information. Despite many changes since that time, one of the single points of certainty has been the library itself, the facility used to store books and other information encoded in physical media, but now that point is no longer fixed. Electronic resources are available online and users do not have to go to the library to download articles or read e-books. Librarianship is no longer anchored to the library. Furthermore, librarians are increasingly diverse in their skill sets and backgrounds so that they are now effectively members of a pluralist profession that incorporates an increasing number of specialized areas.

Despite lingering affection for books and other printed materials, there can be little doubt that libraries are increasingly providers of electronic information. To start, consider trends in our largest academic libraries as documented by Martha Kyrillidou and Shaneka Morris in the 176-page *ARL Statistics 2008–2009* report. Two statistics in particular, the initial circulation (when a book or item is first checked out) and total circulation, indicate a long-term decline in the use of library books by faculty, staff, and students in many of North America's largest academic libraries. Statistics for the American Research Libraries (ARL) group that includes institutions such as Harvard University, the University of Chicago, and the University of Texas at Austin show that the median circulation of print materials declined from 509,673 in 1991 to 414,482 in 2009, an average annual decrease of 1.1 percent. Meanwhile, the total number of students enrolled in institutions served by these libraries has actually increased during the same period with a median value of 18,290 students in 1991 and 23,303 students in 2009, an average annual increase of 1.4 percent (Kyrillidou and Morris, 2011, p. 8).

A fact well known to professional librarians, but not to some outside libraries, is that libraries already spend more money on electronic resources than on books or other printed materials. Member institutions of the ARL spent around \$1.3 billion on library materials in the 2008–09 fiscal year. On average, each ARL library spent 56.33 percent of its total materials on electronic resources during this period (Kyrillidou and Morris, 2011, p. 21). Spending on print monographs has tended to decline in libraries during the same period. As just one example,

spending on East Asian library subject collections in North America fell by 12.55 percent from 2011 to 2012, partly due to budget cuts, but also to an increase in e-book acquisitions (Fu, 2013). The picture is similar for higher education in the UK in that print acquisitions have been frozen or reduced while spending on electronic resources continues to increase, partly due to space constraints and changes in user preferences (Fearn, 2009).

Recent trends also indicate that society is moving increasingly toward the e-book and away from the printed book. The BookStats report indicates that e-books accounted for only 0.6 percent of market share for the trade market in 2008, but this figure rose to 6.4 percent in 2010 (Kelley, 2011, pp. 12–13).

Amazon announced in May 2011 that sales of Kindle e-books surpassed their sales totals for hardcover and paperback books combined (Hardawar, 2011). The Book Industry Study Group (BISG) using data from a recent consumer reading survey of the USA has estimated that sales of mass market paperbacks fell by 23 percent from 2011 to 2012, sales of hardcover titles fell by 7 percent, trade paperbacks fell by 10 percent, and audio books fell by 9 percent (Reid and Milliot, 2012).

What is the role of the library in the twenty-first century?

As society increasingly leaves print behind, what is the role of the library in the twenty-first century? Despite all the many changes in recent decades, the library is first and foremost an information services provider, but in the broadest possible meaning of those words. Not only do contemporary libraries provide or facilitate access to the information stored in e-books, electronic journals, and databases, but these organizations also teach information seekers how to find what they need, manipulate information for various purposes, and provide other forms of direct support for research, teaching, and study by individuals and institutions in a variety of ways. Consider the following examples of work that is increasingly performed in libraries on a routine basis: negotiating discounts for electronic resources provided by vendors, applying metadata to institutional records, digitizing rare photographs for long-term preservation, teaching students how to assess the quality of published scientific research, testing new mobile devices and software, or helping a research team to organize their data sets.

Libraries in the early twenty-first century, at least most libraries, still have book shelves that contain monographs, bound periodicals, and other physical items that are cataloged, shelved, and circulated, but this is changing. Predicting the final demise of the book is risky and many have been burned by making bold claims too early, but the book and the physical space required for information services based on books are becoming increasingly difficult and expensive for libraries to provide. Apart from special collections, museums, and archives, it is more important to consider the library as an organizational unit with a unique mission rather a physical facility or library as place. Libraries came before librarians in human history and even some of the most progressive librarians sometimes, perhaps even unconsciously, think of their professional role as an extension of the library, but we need to turn this association upside down. Any physical facilities that are associated with a contemporary library should be put to the best possible use, but physical space is no longer strictly required and does not define the library. The user community or the clients of the library define its purpose, not its particular collection or current assembly of information resources.

User communities can be colleges, universities, municipalities, or the residents of other administrative divisions of government at all levels, but also private firms, corporations, or fee-paying user groups of various kinds. The information age, which has become a cliché but is still a useful concept in many respects, has no shortage of communities that can benefit from the work of properly trained information specialists. Marcia Bates has observed that librarianship can be considered as a kind of meta-discipline in that librarians have traditionally provided information services for a wide variety of content across subject disciplines (Bates, 2007). Librarians have collected, organized, classified, and provided access to information about biology, geology, the arts, humanities, and many other subjects, but always from the unique perspective, skills, and organizing principles of librarianship as an information discipline (Bates, 2007). While drawing upon the knowledge of other more traditional academic and applied disciplines the information disciplines make a unique contribution through the provision of information services.

The lifecycle librarianship concept posited by Bill Crowley (2008) in which information education becomes the primary and almost exclusive mission of the librarian rejects professional roles that seem to be more grounded in information science, including technical services functions previously associated with librarians. The actual needs of users make it necessary for information disciplines (and practitioners) to focus

primarily on functions of information management, but also information education, broadly defined. The ideas of Marcia Bates can be used to help guide the transition of librarianship to a new kind of information discipline for the twenty-first century, but some practical accommodation for relatively recent developments in information literacy instruction and education about information are necessary without making that the focus of the entire profession as some might want. Bates separates education from the information disciplines as a distinct category of meta-discipline (Bates, 2007), but information literacy and teaching users about how to discover, evaluate, and manipulate information are also important professional roles for contemporary information specialists.

How librarians can be their own worst enemies

Librarians and those most interested in libraries have sometimes been their own worst enemies when it comes to electronic resources. The author Nicholson Baker wrote *Double Fold: Libraries and the Assault on Paper* to criticize libraries for replacing fragile print collections, including newsprint, with microfilm (Baker, 2002). While not addressing electronic resources directly, Baker applauded the view that books should be treated as museum artifacts with a moral responsibility to hold onto most materials forever (Baker, 2002, p. 225). Contrast this with the view of Rick Anderson, who has argued that the future of library collections when it comes to electronic resources is no collection at all (Anderson, 2011). Anderson goes on to explain that libraries can simply provide metadata identifying that a particular electronic book or article exists and then wait to purchase a copy on behalf of the user only after interest in actually viewing that particular content is confirmed (Anderson, 2011). Anderson's view is admittedly toward the other extreme of the continuum regarding library collections, but Baker's concept of the library makes no sense given contemporary technology. Why should a research library, or more importantly those who fund the research library, waste valuable money, time, and space on carefully maintaining a printed book when a digital copy may already be widely available? Obviously, genuinely rare books can and should be treated differently, but there are still some librarians and users among us who genuinely believe that a library's print holdings are a sacred trust not to be violated.

Resistance to change, as well as the ritualistic continuation of outmoded ways of doing things, is among the more obvious barriers to successful change management for libraries. More subtle and much more dangerous are what this author considers to be misguided efforts to redefine the profession of the librarian in reaction to technological change and the growing reduction in importance of physical collections. While I agree that librarianship must be redefined, I believe some of our colleagues have redefined it in the wrong way. Arguably, some thinkers have emphasized the educational role of the librarian at the expense of work in managing, organizing, and providing access to information.

William F. Birdsall has argued that understanding the shift to electronic resources requires not only consideration of technology, but also examination of political and economic interests, not least of which are assumptions about economic efficiency and the commodification of information. His *The Myth of the Electronic Library: Librarianship and Social Change in America* is well structured, states his assumptions clearly, and makes a bold case throughout the book for preserving the “sensuous library” managed by the “therapeutic librarian,” a professional identity grounded in the tradition of the personal service professions (Birdsall, 1994). Birdsall does not deny the impact of IT on society, but argues that ideas and beliefs about the proper role of libraries shape our understanding of these changes and subsequent actions. Birdsall seems to argue that any broad concept about how to organize the library and the profession of the librarian is necessarily a kind of myth in that it contains both objective and subjective elements. The now dominant myth of the electronic library was preceded by an earlier myth of the library developed in the nineteenth century. Apart from a collection based on print, this earlier myth of the library assumes that the autonomous public library is its operational base and the institutional basis of librarianship. Governed by a liberal political ideology, the library fulfills the social need of providing knowledge and opportunities for self-improvement to members of the community as a free public good (Birdsall, 1994, p. 5).

Birdsall argues that the myth of the electronic library assumes a post-industrial or information society as envisioned by Daniel Bell (Birdsall, 1994, pp. 47–8). According to Birdsall, library as place need not surrender to the electronic library because some of the changes in how society is using information are driven by political choice, or the absence thereof, rather than determined by changes in technology itself (Birdsall, 1994, pp. 54–9).

It is true that technological change is sometimes presented by vested interests as offering only one or a few choices when other options may genuinely be available. Special interests have been and are invested in the success of specific applications of technology, including IT, so one should never celebrate technology in an uncritical manner. Yet the cumulative impact of the growth of scientific knowledge, experimentation with new technology, and millions of individual consumer choices has made the shift to the electronic library inevitable. If Apple did not exist or if Amazon was not interested in developing a global market for its e-books can we safely assume that no one else would have developed the tablets or e-readers that have finally made e-books a viable technology? Could someone have forbidden civilian applications of the Arpanet or defense network several decades ago so that no one would eventually allow the Internet to develop? Project Gutenberg developed the first e-book in 1971, but few know this because it was extremely inconvenient to read the first e-book. Now that e-books are becoming even more convenient to use than print books, how can we, as librarians, force society to retain print because we have a particular preference for what a library should be? While conceding that biases inevitably lie behind some conceptions of the electronic library, it is very unlikely that this technology and its social and economic consequences would have developed along radically different lines. Historically, human beings have tended to copy innovations that conferred tangible benefits or some kind of advantage in competition between individuals or groups. Some human beings have rejected useful innovations, of course, but also have tended to suffer negative consequences.

Perhaps even more problematic in some respects is the way that many librarians have decided to redefine the librarian as being primarily an educator, almost to the exclusion of other types of work, despite the fact that the comparative advantage of the professional information specialist lies both in managing information and teaching users how to discover information. Teaching is very important work, but the work of other types of specialized librarians is also very important and necessary for libraries to provide comprehensive service. Birdsall's therapeutic librarian may be a viable model for the librarian as educator in that the therapeutic librarian can assist with specific research problems and help inculcate values and habits compatible with lifelong learning, but a library with poorly managed discovery tools, inaccurate and incomplete metadata, and generally inadequate infrastructure is likely to turn users away. Information literacy is extremely important and, as I have mentioned earlier, I agree that this is a critical aspect of our

contemporary professional work, but it is only an aspect, not the whole or central purpose of the information disciplines. Classifying, organizing, analyzing, and otherwise managing information is also an important purpose of librarianship. Instructional training in how to discover and use information is ultimately derived from this fundamental purpose. That does not mean that librarians should not explore pedagogy or take more advanced approaches to education, but only that these approaches should be well grounded as part of this larger mission.

Bill Crowley expresses concern about librarianship being seen as a legacy profession that should not be subsumed into a larger information science in his *Renewing Professional Librarianship: A Fundamental Rethinking* (Crowley, 2008, p. 140). Instead information studies and some of the technologically based work that underlies those studies should be made sharply distinct from librarianship (Crowley, 2008, p. 143). As a practical matter, this concept would seem to fit reference librarians quite well, but not emerging technology or electronic resources librarians, let alone systems librarians who must usually work very closely with IT. Crowley decries the partial success of the so-called information movement in its efforts to capture American Library Association (ALA) accredited higher education and argues that the emphasis on information is a threat to the professional status of librarians (Crowley, 2008, pp. 88–93).

What essentially seems to be happening in the case of Crowley and others who make similar arguments is that they are unable or unwilling to address the broader implications of technological change on society and libraries that, after all, constitute only a small part of a much broader culture. This is partly a byproduct of how libraries, especially academic libraries, have downsized in recent years as technical service units and some more technologically based operations within libraries have been outsourced or otherwise conceded to vendors. This process has tended to leave behind a reduced workforce with mostly public services specialists who have begun to redefine librarianship along the lines of their own specialized work with users rather than along the lines of the original conception in the late nineteenth century, which was actually broader in scope. To be fair, some early advocates of the electronic library have advocated more or less the same thing. More recent ideas about information science are also problematic in some respects, but these also tend to offer much broader conceptions for what an information specialist can and should do.

The library in context

Some of the change that is required for libraries to continue to be valuable and successful now was anticipated in the 1970s and 1980s. This decade was a time period when most libraries were just beginning to accept the computer and the automation that came with it, specifically the integrated library system (ILS) with associated electronic back-end systems and online public access catalog (OPAC).

Searchable databases also entered the library during this period and librarians were already concerned about information access and what some perceived as an imbalance between public and private interests (Schiller, 1981). The Online Revolution in Libraries conference held in Pittsburgh in 1978 included 700 attendees who discussed how to integrate traditional and online services, the role of the librarian as an information intermediary, and concerns about whether the poor and disadvantaged would have equal access to information (Nyren, 1978).

Vincent Giuliano, Arthur D. Little, Inc., Joseph Becker, and Anthony Oettinger, among others, summarized a number of key findings in a 1978 report sponsored by the National Science Foundation called *Into the Information Age: A Perspective for Federation Action on Information*. They divided information into three separate eras with the following basic characteristics (Arthur D. Little, Inc. and Giuliano, 1978, p. 10):

- ERA I: discipline-based information that emerged during the nineteenth century, including a number of journals for the sciences;
- ERA II: mission-driven information for big science and technology that emerged during the Second World War; and
- ERA III: problem-based information for complex socio-technological problems that emerged during the 1960s and 1970s.

ERA I was based on print, and research libraries were cited as a key part of the infrastructure while electronic information, mostly government provided and computer assisted, supported ERA II. The problem-based information systems for ERA III were considered as yet unknown in their organization and structure at the time of the report's publication. Growth in science, rapid change in technology, and the need to balance the economic value of information with the public interest were some of the issues addressed by the report. Giuliano suggested that both academic and public libraries needed to change to very different

principles of operation as information intermediaries and community information dissemination centers respectively (Arthur D. Little, Inc. and Giuliano, 1978, pp. 125–9). Many of the recommendations of this report informed the transition from print to electronic information that was subsequently pursued by the US Government.

F. Wilfrid Lancaster wrote *Libraries and Librarians in an Age of Electronics* in 1982. Many of the changes that we now take for granted – the ubiquitous Internet, desktop computers in the home and office, as well as the emergence of mobile devices – were only just beginning or still in the future, but Lancaster was an early advocate of the replacement of a library based on print collections with the electronic library. Lancaster argued that the library as an institution would become obsolete, but some type of librarian would still be needed. Lancaster separated the work of librarians into three major areas: (1) selection and acquisition; (2) organization and control; and (3) the provision of services. Lancaster argued that only the third function would remain, although vastly increased in importance, for librarians in the electronic age. According to Lancaster, electronic resources would not require complex acquisitions work and metadata (although he did not use this term) would be applied by some central source or the content provider. Services would include work as information consultants, training or instruction, searching sources on behalf of clients, information analysis, creating user profiles, assisting in personalized information management, and updating researchers on new information (Lancaster, 1982, pp. 167–9). It is interesting that this concept could produce a type of librarian somewhat similar to that advocated by Bill Crowley, but there are some important differences. Lancaster perceives the librarian as becoming a different type of professional with a new mission, more or less admitting that a new name would be in order when the library goes entirely electronic (or online to use the contemporary term). More importantly, Lancaster would not recognize or be concerned like Crowley to maintain sharp distinctions between information and library core curricula in higher education (Crowley, 2008, p. 143).

Most academic libraries, and many public libraries, in North America, the UK, and many other economically developed parts of the world have made a successful transition to providing electronic information, but the work is incomplete for a number of reasons. One problem is that most libraries still have a workforce that was partly developed or hired when information services were still based on print. Another problem is that some libraries tend to value seniority and experience

over innovation. Conformity is often rewarded more than individual initiative or creativity. Cultural change within the library as a workplace is desperately needed. Libraries need to promote innovation in order to survive, not try to accommodate outmoded ideas about what libraries can and should do.

Some assumptions about libraries

While some of the changes that libraries have undergone were anticipated by the very earliest proponents of the electronic library, and I have only mentioned a few of these early advocates and just scratched the surface of their literature here, some predictions have not come to pass or have been somewhat different than anticipated. Acquisitions remains complex and financial management is still required by libraries because one function that has not gone away is the organized subsidy for information that most individual faculty members, students, or consumers cannot realistically be expected to pay for. Deinstitutionalization of cataloging or metadata has also produced mixed results in that many content providers have simply hired librarians at much cheaper rates to provide lower quality metadata that skews search results in negative ways. The core of the library is based on those services that are directly provided by public services specialists, but the library as an organization must also rethink the way problems of the law, information economics, IT, and metadata will be managed in the twenty-first century to optimize total service. Finally, successful implementation of new services requires libraries to be reorganized with an eye toward improving both routine management and strategic development.

Some ideas that underlay the argument of this book include:

- Librarianship is a modern profession that is still based on assumptions developed in the late nineteenth century when most information systems were based on print resources. Serious efforts at reform require exposure, analysis, and debunking of these ideas as no longer appropriate for contemporary librarians.
- Academic libraries have pursued innovation unevenly, embracing change in information literacy and instruction while neglecting or failing to integrate changes in IT, metadata, and other technical services functions for a variety of reasons.

- Technical services functions that remain in libraries are still based on assumptions from the 1970s when technological automation enabled by computers was first introduced into libraries.
- Arguments made against the electronic library, the library as information services provider, and opposition to information science in the past are representative of continuing ideas and interests that still limit the progress of modernization in contemporary libraries.
- Rapid growth in the quantity and complexity of information requires new approaches to providing information services.
- Problems of scarcity and the economic management of information are more crucial to information services than ever before.
- Librarians need to take an active role in developing new business models and services such as open access publishing.
- Librarians need to become information specialists with a professional identity focused on abstract information needs rather than be stewards of the library.
- The library retains its importance as an organizational unit, not a building or physical facility. Physical facilities, including spaces for archives, special collections, community centers, and other spaces for users will be necessary for some libraries, but not all. Some libraries may not require additional space apart from office or workspace.
- The library of the twenty-first century will need to develop a smaller but smarter and more effective workforce than its twentieth-century counterpart. Not only librarians, but also other professional and paraprofessional personnel will require more training and more opportunities to develop their personal potential in order to provide the high level of service expected by users.
- Higher education in LIS needs to provide specialized training that reflects the full range of actual professional practice.
- Information specialists need to become a more diverse professional group with greater specialization, more advanced skill sets in areas traditionally not associated with librarians, and more doctorates.
- Information specialists sometimes need to coordinate work more closely with professional affiliates, members of other professional groups that specialize in work that supports information services.

The information needs of a more complex society

Society has more complex information needs in the twenty-first century than when modern libraries were created in the nineteenth century. Some scholars such as Ann M. Blair have argued that the information age is not quite as unique as one may imagine given that society has always struggled to manage large amounts of information (Blair, 2010) in her excellent study of historical information management, but there are importance differences. From the First World War onwards, developed economies have been awash with data about everything from severe weather events to managing deep space exploration. Even small business is largely run on desktop computers and/or outsourcing to other vendors with more advanced computing power, not to mention the phenomenon of online retail. Computers are embedded in cars, cash registers, medical diagnostic equipment, and can be found on nearly every desk in every office cubicle around the globe. Some of this work may be done without a computer, but not with the same speed, precision, and convenience that most of us have now come to expect.

Growth in scientific knowledge and new applications of technology have made lifelong learning and information literacy more important than ever for every person alive today, not to mention the continuously changing needs of increasingly complex professions and occupations. The library as an organization can play a critical role in helping members of specific user communities to evaluate online information resources, subsidize or provide access to resources that are beyond the means and/or awareness of users, and teach users how to employ new technology.

Libraries across the world increasingly require new skills in order to excel. Janie M. Mathews and Harold Pardue analyzed 620 position advertisements for librarians collected from ALA's online JobList from 1 October 2007 through 22 March 2008. Many of these librarian positions required a noticeable level of IT skill: 37.75 percent of these jobs included references to skills associated with web development, 29.5 percent with project management, 27.25 percent with systems development, and 24 percent with systems applications (Mathews and Pardue, 2009). Responses gathered from focus groups in Australia indicated that librarians require additional knowledge of IT, marketing, leadership, and communication skills to address the impact of new technologies on the library (Partridge et al., 2010).

Information specialists also need to work to mitigate or reduce some of the unintended negative consequences of our growing reliance on IT.

There is some evidence that American adults may be reading less on average in recent years as indicated by a recent survey conducted by the National Endowment of the Arts (NEA): 56.9 percent of American adults reported reading novels, plays, short stories, or poetry in 1982, 54 percent in 1992, 46.7 percent in 2002, and 50.2 percent in 2008 (NEA, 2009, p. 3). While the figure for reading is somewhat improved for 2008, unlike participation in other cultural activities, the overall reduction in reading is arguably cause for concern.

Apart from instruction and other public services functions, information specialists can and should work with publishers and other content providers to improve the quality and accessibility of e-books in order to encourage reading as society continues to reduce its use of print. While e-books, especially e-books sold on commercial platforms, are increasingly popular, a recent user experience survey of quantum mechanics students in the UK found problems with slow page loading, awkward navigation, and fatigue from extended onscreen reading (Muir and Hawes, 2013). Many of the platforms currently available for academic titles seem much less user friendly than those available from online bookstores such as Barnes & Noble and Amazon.

Libraries have done a good job in working with consortia and other partners to reduce costs for electronic resource subscriptions for their own user communities, but information specialists also need to consider how to address the information needs of the poor and disadvantaged on a larger scale. Keeping the poor as well informed as the rich may be not be possible in all cases, but we could arguably do more to ensure that minimal standards of information literacy, technology literacy, not to mention critical thinking skills are met.

Making the case for solutions

The problems facing libraries are undoubtedly complex and one cannot predict what libraries may look like at the end of the twenty-first century, but it is possible to extrapolate current trends and incorporate some of the more useful recent innovations into a coherent strategy for transitioning to fully electronic libraries. Arguably, this transition could be completed in five to ten years in most academic libraries in North America, the UK, Australia, and New Zealand. Public libraries in these areas may need to pursue a longer transition period depending on local user needs, but should also begin serious planning for providing

services that do not include print. More research would be required for mere speculation, let alone tentative estimates, regarding other parts of the world, but it is doubtful that Western Europe, Israel, and rapidly developing parts of Latin America, Eastern Europe, and Asia will be far behind in developing more fully electronic libraries.

Challenge as opportunity

Overall, the information age actually does constitute a great opportunity for information specialists, but only if we abandon our outmoded ideas and practices regarding librarianship and try to work with others to ensure the most positive transition to electronic resources that is possible. Printed books will be with us for a long time to come, but are no longer a good investment for institutions or large organizations that need to document, store, manipulate, or manage large amounts of information. The specialized warehouse skills required by staff for handling physical items also constitute a poor investment of time, training, and healthcare benefits in the cash-strapped public sector and the cost-conscious private sector.

Just because libraries face greater competition does not mean that libraries have lost their function as information service providers. Organizing and helping users to make sense of information, not just as educators, but also as technical services specialists, remains extremely important. Many of the benefits that librarians have provided to society remain hidden or invisible because of underestimating the value of good metadata and mistaking the work of the larger and more important virtual library for the increasingly less used physical one.

What to expect from this book

This book is not intended to answer all of the possible questions about how to make a successful transition to a more purely electronic library in the twenty-first century, but it should inspire critical thought and discussion about how to get started, as well as provide some practical ideas for experimentation. Here is what to expect from the rest of the book. Chapter 2, “Diversions and half measures,” addresses the problematic ways in which libraries have attempted to adapt to electronic resources. As previously mentioned, assumptions from the 1970s when print collections were still dominant continue to inform how libraries are organized and work on a routine basis despite the ongoing shift in

society from print to electronic information. The literature about the hybrid library, arguably a halfway measure, as well as library as place will be explored in greater detail. Finally, the historical role of the codex, the printed book, will be explored. More books have been printed in recent decades than during any previous era in human history, but usage of print is highly dependent on changing needs and preferences of specific user communities. The transition to electronic information seems to be occurring more rapidly in highly developed Western economies, but electronic resources are increasingly important worldwide.

Chapter 3, “The problem for libraries in the twenty-first century: the need to accept a paradigm shift,” discusses how one of the greatest threats to libraries is the professional librarian. Despite a decades old literature about the electronic library and continuous change in how society uses information, many librarians still embrace a professional identity that fits the nineteenth century better than contemporary needs. Fuller consideration is given to the impact of IT on libraries, changing user expectations, and how the professional landscape has actually evolved despite efforts by some librarians to resist or redirect change to protect their perceived professional interests.

The next three chapters offer my own practical suggestions for how to address problems in education, the organization of libraries as information service providers, and adapting to scarcity in all of its many forms. All of these problems are enormous in scope and complexity when one takes all of the underlying factors into account, but it is my hope that some ideas will actually be tested in the marketplace of ideas or else lead to more critical thinking.

Chapter 4, “Solving the problem, part 1: professional identity and preparation,” addresses the need for more robust higher education for information specialists with more specialized coursework, certification, and standardized testing. Current LIS education models generally assume that most librarians, regardless of how specialized their work may be, will earn a nearly identical master’s degree. Apart from Special Collections and Archives, and a few digital offerings, there are generally no additional certifications required or additional formal areas of specialized training. Given the wide range of skill sets that are actually necessary for success in such specialized positions as the electronic resources librarian, subject specialist in chemistry, assessment librarian, or metadata librarian, it only makes sense to develop formal education that more closely matches the actual diversity of professional practice. Ten areas of specialization will be explored in this chapter. Also, the need for additional training for affiliated professionals who work in libraries

or with librarians such as IT, legal support, and accounting/business management will be explored.

Chapter 5, “Solving the problem, part 2: reorganizing libraries to serve users,” is the largest chapter of this book. Problems under consideration include the role of library as place vs. library as organization, the phased de-accession of print and other physical materials, the systematic reorganization of personnel into new functional areas, and the development of the virtual library or the web presence of the library. Libraries need to develop a robust web presence that will actually be more important to most users than their physical space. As twenty-first century libraries become fully electronic, consideration must be given to repurposing old buildings vs. new construction, especially as book stacks are removed. Reassigning space in old buildings will normally mean that libraries will need to share space formerly under their complete control or even exchange it for better venues that have the right mix of office space and user space(s) for modern technology. Traditional technical services will be replaced by electronic resources management while circulation units are replaced by more streamlined operations management. Overall, more highly trained professionals and advanced paraprofessionals will take the place of clerical staff or other lower skilled positions made redundant by automation, more advanced technology, and demands for new services. Student workers will fill in the gaps in academic libraries while volunteers will assist public libraries on special projects.

Chapter 6, “Solving the problem, part 3: adapting to scarcity,” considers the constraints under which libraries in the twenty-first century need to work in order to be successful. Economic constraints are among the more obvious ones, but also the sheer size of the information explosion itself is a formidable constraint in and of itself. Finding how to work with other libraries, especially consortia, vendors, publishers, and other organizations are considered as important means of handling the limitations of the single library’s resources. The importance of assessment and developing sustainable services is also discussed.

Chapter 7, “The digital divide,” is an examination of fundamental social problems and needs that must be addressed by libraries and other information services providers in the twenty-first century. How do libraries and information specialists themselves keep up with rapid change? How do we help our users? What kind of infrastructure is needed to ensure long-term social mobility for disadvantaged user populations? What about users with disabilities? If mismanaged, could the widespread use of electronic information lead to a kind of dystopia with less reflection, more superficial conformity, and widespread misinformation?

How can libraries continue to preserve the public record for government information, for history and scholarship? How do libraries balance privacy and public safety with the emergence of a wide range of electronic surveillance activities conducted by governments, corporations, and other entities in the twenty-first century?

Chapter 8, “Conclusion,” provides a restatement of my argument, a general review of evidence and suggestions presented, and a call to consider positive action on these problems. Again, *After the Book: Information services for the twenty-first century* will not provide detailed answers to all of these complex questions, but it is my hope that these ideas will inspire both discussion and positive action. Electronic resources are neither good nor bad, but rather both. Librarians need to adapt to a changing world, but also help users make the best use of electronic information.

Diversions and half measures

Abstract: Despite the shift to electronic information, many libraries are still organized in ways that have not fundamentally changed since the 1970s. More personnel in technical services still manage print resources instead of electronic resources. The hybrid library, previously a useful concept, is now a distraction that is delaying the transition to fully electronic service.

Key words: electronic library, electronic resources, hybrid library, information as object, library as place, resistance to change.

Modern librarians have changed quite a bit since the late nineteenth century. Card catalogs have been replaced by OPACs and more recently by sophisticated discovery services such as Encore, Primo, EDS, and Summon. Print subject indexes were replaced by CD Rom and later by searchable online databases. Gazetteers, almanacs, and encyclopedias have yielded to their more convenient online versions. Most government information in the USA is now produced in electronic form. Electronic Resources Librarians, Emerging Technology Librarians, Metadata Librarians, Geographic Information Systems (GIS) Librarians, and Bioinformatics Specialists are just some of the new types of professionals who owe their new positions to the increasing use of electronic resources.

While libraries have changed with the times, have they changed enough? Has change in libraries kept pace with changes in technology, user needs, and preferences? That is a difficult question to answer and libraries vary quite widely in their overall adaptability, but more often than not the answer is probably no. Well established libraries continue to operate as if their physical facilities do not need to change and seem to resist fundamental reform and reorganization. Instead, a number of models that were previously progressive, such as the hybrid library,

continue to distract librarians from the need to develop viable fully electronic libraries.

Library as place

Library as place has been a concern for many librarians almost as soon as the first computer appeared in libraries. What is the role of the library as a physical structure when the storage and retrieval of physical items becomes less important? With the exception of special libraries and branches of larger libraries, most public and academic librarians are used to being able to work in, identify with, and consider at least one building as *their* library. The literature of library as place is rich and diverse, with many different perspectives, including those who argue that the library should no longer be a physical place at all.

Change is not decline

William F. Birdsall argues that the library must retain its physical presence as a means of garnering support, especially for public libraries, through the power of imagery and the appeal to the senses that monumental public buildings can evoke in users (Birdsall, 1994, pp. 68–9). Fried Weise also notes the power of the physical library as a symbol of learning and a direct connection to our collective intellectual past (Weise, 2004). William Gosling, writing at the end of the last century, predicted that libraries would continue to need to provide books and other on-site services to meet the needs of students in academic libraries for many years to come (Gosling, 2000).

Turning again to the question of how books and other physical materials are actually used, there is considerable evidence that circulation of print items has sharply declined during the last 20 years. Charles Martel has looked at these statistics from a number of sources, including ARL, the National Center for Education Statistics, the Association of College and Research Libraries (ACRL), the Association of Southeastern Research Libraries, as well as specific institutions such as the University of Maryland and California State University (Martell, 2008). Drawing on just a few examples, ARL has reported that circulation in medical libraries has fallen from 4,849,000 in 1995 to 2,056,000 in 2006, while circulation fell 26 percent in libraries of the Association of Southeastern Research Librarians from 1999 to 2006 (Martell, 2008). Circulation for

Ivy League institutions, private universities, and ACRL were relatively flat showing increases of around 2 percent during roughly the same period (Martell, 2008), but this could reflect a delay in developing online services across the very large ACRL group.

Writing around the turn of the century, Scott Carlson noted how many academic library buildings seemed deserted in 2001. Circulation, usage of print materials, fell by 20 percent from 1997 to 2001 while reserve loans had fallen by 60 percent. Meanwhile, usage of electronic journal articles had increased by 350 percent since 1999 and searches in databases by 800 percent (Carlson, 2001). Carlson discussed how librarians were beginning to relax rules, install comfortable furniture, and even offer spaces for socialization and recreation like cafes in order to keep gate counts high, although noting that evidence was unavailable regarding the impact on the learning experience (Carlson, 2001).

Change is not decline. Libraries responded to the challenge of electronic resources with new efforts at space planning in the early 2000s. Joseph Rizzo summarized four underlying considerations that must be addressed when planning library space: (1) choice – meaning space that is comfortable and convenient for users; (2) community – the need for human interaction; (3) communication; and (4) and expectations – does the space feel right to users? (Rizzo, 2002). Academic libraries should be reorganized as campus hubs with different spaces for welcoming students, socialization, collaborative learning, and reflective learning, as well as physical collections. Snack bars, presentation rooms, and artistic displays that show positive attributes of the academic institution were other possible uses of space (Rizzo, 2002). A case study of the Loughborough University Library in the UK raised questions about the tension between communal space that can be used for contemplation and personal study with social space that lends itself well to conversation and group work, but not necessarily intensive work (Bryant et al., 2009). While many academic libraries in North America, the UK, and Oceania now have designated quiet areas, implementation may not be successful if the library is too small or attempts to include too many different types of space in a limited area.

Any discussion of the library as place must also consider the hybrid library, a concept developed in the 1990s that sought to combine the best features of the traditional library with the electronic or digital library. Essentially, libraries would continue to provide print collections while increasing the number of electronic resources (databases, online journals, and increasingly e-books). Another underlying assumption has been the ongoing need to improve library web pages and search and discovery

tools. Arguably a half-way step between a traditional and fully electronic library, the hybrid library assumes the continued importance of the library as a place. The US Digital Libraries and the Electronic Libraries Program (eLib) in the UK are just some examples of digital library initiatives that were launched during this period. Charles Oppenheim and Daniel Smithson studied the development of hybrid libraries in the UK in the late 1990s and discovered there was considerable diversity of opinion regarding what a hybrid library should be in practice (Oppenheim and Smithson, 1999). One of the main problems in implementing hybrid libraries was cultural, not technological, as library staff and some users were resistant to innovation (Oppenheim and Smithson, 1999).

Does function follow form?

To some extent, all libraries have faced the problem of adapting changes in function to less than flexible organizational structures. Some staff members who had worked in libraries for decades suddenly found that their skills and experience were no longer necessary for the library to fulfill its mission in the 1990s. Shelving books, checking out books, applying labels, opening boxes, and preparing shipments to the bindery are all tasks that do not require advanced skills, although a good aptitude for customer service, tact, and the ability to work well with others would certainly be helpful. Even many libraries in the twenty-first century continue to have veteran staff members who are arguably not well prepared to take jobs in other industries as their own work is made redundant by automation, electronic resources, and changes in service. As a result, change sometimes occurs more slowly than administrators, professionals, and users would like. Fundamental change, even when systemic efforts are made, is often distorted as a kind of practical compromise in which function follows form rather than the other way around. I will not cite any specific examples for obvious reasons, but as a general case, one might consider situations in which work that could be performed by one person is shared by three or four due to historical divisions between workflows or departmental organizations. Worse yet would be work that is simply not performed or performed very slowly.

Oded Nov and Chen Ye have studied how resistance to change (RTC) has influenced the development of digital and hybrid libraries. Measures of personal differences of library personnel such as computer self-efficacy, computer anxiety, and RTC combined with specific system characteristics such as screen design, relevance, and terminology can help

administrators and planners to assess effort expectancy when intending to adopt digital library functions (Nov and Yen, 2009). While a highly structured diagram with defined mathematical relationships is presented as a model, the key point is that RTC must be included in all planning for making improvements or changes in library services. Interestingly, Nov and Ye also suggest trying to limit the perception of change by using clever systems design or other methods of concealing the extent of differences with superficial continuity (Nov and Yen, 2009). Attempting to conceal real changes would seem to work only part of the time and this approach might seem to be problematic as technological and organizational models continue to diverge from historical models over time.

Another problem for libraries in making changes apart from any resistance on the part of staff and users is that change has occurred at different rates in the wider world. Some publishers have moved quickly to the electronic model while others have not. For most academic libraries, the transition from print to electronic format has actually occurred as an extended transition. As recently as 2009, 29 percent of serials orders placed by academic libraries through the SWETS information service were still in print format while 31 percent were print + online (Profera and Stamison, 2010). Some library personnel, employees or students, would still be needed to process incoming print materials if libraries wanted to make this information available to users.

Finding new efficiencies for print

Libraries that hold physical materials have to include a variety of features in order to provide services such as book stacks, a physical environment that is conducive to storing books, loading docks to receive large shipments, and work spaces for opening boxes and other physical processing work that are close enough to other technical services operations, such as cataloging, but still not visible to users who would not find observing this work useful. This physical infrastructure has led to the development of units that specialize in the different aspects of work related to receiving, cataloging, organizing, and shelving printed materials. Some units such as those that mainly handle physical warehouse functions must disappear as the library shifts to more electronic resources. Other units such as acquisitions or cataloging may find new life in transforming to meet the needs of electronic resources

management, although not with the same numbers of personnel required during the 1970s or other earlier phases of library development.

Better, faster, cheaper with limited benefits

The twenty-first century is, in many respects, witness to the most efficient business models and turnaround times for the management of print resources that libraries in the developed world have ever known. Most users can quickly find out if their local library holds a book by using search and discovery tools on the library's website and also find the book using the relevant call number or ask staff where the book is if it is not where it is supposed to be. Many libraries will order a book if it is not available and then hold it for the requestor. Interlibrary loan service networks are well established in the UK, North America, Oceania, and Europe, and many parts of Africa, Asia, and Latin America.

Print is more efficient than it ever has been, but it is still not going to be sustainable as an information service that most institutions will be able to support easily in the twenty-first century. One of the underlying reasons for this is that no delivery of a physical item, no matter how fast, can match the near instantaneous retrieval of online information. Online information is more convenient for most users who need information right now. The busy student writing at 2:00 am, the administrator desperate to finish their report before the next meeting, or the casually curious web surfer all represent types of users who will not be satisfied with extended wait times. The fact that some information is available as an electronic resource leads many users to devalue, ignore, or even fail to discover content that is only available in print format.

Laura Manley and Robert P. Holley remind us that the e-book is not a fad, but has a long history, at least as an idea, if one considers Vannevar Bush's memex, a mechanical device that would allow users to store and access their books, records, and communication (Manley and Holley, 2012). As a practical matter, the development of the e-book has been dependent on another device that has been also partly inspired by Bush: the computer. While the first e-book was created by Project Gutenberg as early as 1971, improvements in personal computing and the development of new electronic devices, especially tablets and handheld e-readers, can be considered prerequisites for widespread adoption. Without a physically comfortable reading experience and technology that is capable of quickly rendering pages of text, the e-book would remain a curiosity

instead of the fastest growing segment of the market for overall book sales (Duncan, 2011).

The rise and fall of the printed book

The early twenty-first century may be considered to be the turning point for the physical book, as it is a time when both the technology of publishing and the worldwide communications network have both improved to their greatest possible extent, but only to face long-term decline at the expense of the e-book. Not only are consumers opting for e-books online through Amazon and other vendors, but the physical book is in decline in other areas as well. Borders, formerly one of America's largest bookstore chains, went out of business in the early twenty-first century, and many other brick and mortar stores face similar challenges from the convenience and efficiency of online retail. It is interesting that only some of Borders' former locations were acquired by competitors such as Barnes and Noble or Books-a-Million that actually sell books. Many stores have been acquired by other companies or converted to other uses. Even the book stores that acquired this newly available retail space have been at pains to announce their presence in the e-book market (Rosen, 2011). The printed book market shrank in the UK by more than £40 million in the first half of 2013 (Stone and Farrington, 2013).

One should consider the decline in retail for new print books as just one more phase of extended decline in using paper to store and retrieve information. If one traces the emergence of more efficient forms of paper documentation, including IBM punch cards, then proceeding to mainframes, then personal computers, then onto the Internet, not to mention mobile devices and Cloud computing, the decline of print is virtually inevitable. It is true that many early predictors of the demise of the book have risked looking foolish. Nonetheless, the fact that the human imagination of some individual visionaries somewhat preempted the actual economic and social feasibility of widespread change among the larger human population is no reason to dispute this case. No doubt there are many who still prefer reading print to electronic books and thus print books will still be published and sold, but this is rapidly becoming a secondary market in our fast paced information economy.

Changes in the adoption of new IT by academia sometimes seem to occur in waves in which a few innovators are followed by a slightly larger group of early adopters followed by different segments of the wider

population, but some are inevitably left out. Many secretaries, clerks, receptionists, and bookkeepers lost their positions to desktop computers and software during the 1980s and 1990s. Printers, warehouse workers, and some shipping companies are likely to lose work as the book declines. As previously mentioned, libraries are likely to lose lower skilled positions as a result of these changes as well.

The hybrid library

The hybrid library was a useful and progressive concept in the 1990s, as it enabled the relatively conservative organizational structure of the academic library to begin to include electronic resources, but this concept has become something of a stumbling block in the 2010s. One of the most important problems is that electronic resources were brought into the library as a separate silo. This was necessary because support staff trained in acquisitions and cataloging were not prepared to manage online information resources. Much of the work of technical services, and also circulation, was carried out during the 1970s when the ILS was developed – essentially computerized management of print resources.

Retaining the hybrid library as an organizational concept in the second decade of the twenty-first century creates an undue financial burden on many libraries in a number of ways. Libraries must retain loading docks, shelving, and other physical plant to service an increasingly unused category of materials.

This ongoing decline in the use of print collections contributes to the false impression, increasingly held by many potential users, that the library is an obsolete institution that is diverting scarce resources from other important needs. Only by embracing electronic resources and handling the transition process internally can libraries hope to avoid having change imposed externally. Libraries that refuse to change over time could suffer painful reorganization, distribution of personnel to other administrative units, or simply dissolution. Nonetheless, the transition from the hybrid library to a fully electronic library must be carefully managed and take the unique needs of particular user populations into account. Many academic libraries seem to be dragging their feet when it comes to electronic resources, but going fully electronic is not yet an option for libraries that serve disadvantaged user populations. Nonetheless, it is important to recognize that the hybrid library is a necessary transitional phase to the fully electronic library, not a final destination.

Electronic resources as other

Information services based on electronic resources require a fundamental change in how libraries are defined, organized to deliver service, and support the needs of users. Some librarians have argued that the shift to electronic resources is a change in format that does not require a fundamental re-evaluation of how libraries provide service. They tend to reason that libraries have always tried to provide their users with the best information possible to meet their unique needs. Electronic resources are just text, art, music and other content in different containers that represent fundamentally the same information as in print resources while the work of the librarian has not really changed. This is an oversimplification, a variation of the cliché that there is nothing new under the sun.

Through the lens of collections, electronic resources are fundamentally different in that the library no longer is a physical repository. Taking academic libraries as an example, sound principles of collection development for print resources required the careful selection and long-term storage and preservation of items that would be useful for research and teaching at the institution served by the library. The library also had a larger mission in preserving the historical record for posterity and sharing rare physical items with other libraries through Interlibrary Loan and other related services. Libraries had limited physical space so it was important to select valuable academic content, usually the more advanced content the better. Weeding was necessary for physical materials because space was limited and users might also find materials by browsing and thus risked distraction by inferior or outdated content (Francis, 2012). Usually, but not always, space was as much a constraint as cost in making selections. Making arrangements for tracking the movement of physical items through the library, theft prevention, fines, fees, and billing for lost items, even mending and book repair were all part of the service of maintaining a warehouse full of books printed on paper.

Electronic resources are usually hosted online and do not take up any physical space in the library. Cost, license terms, and technology are the only real constraints on collection development. There is actually no need to weed an electronic collection, as content can simply be suppressed or have different rules of discoverability applied through new metadata. Freely available electronic resources, including open access resources, are increasingly as important as access to content that

the library pays for. A library's electronic collection is not so much a collection as an ever changing assortment of pieces of digital information that the library tracks on behalf of users and makes available through its search and discovery tools. Some content is permanently owned, very little is usually stored by the library itself, more content is leased, and still more content is freely available but tracked by the library to increase discoverability and convenience for the user. It is true that what is freely available can often be found with Google, but not necessarily with the same accuracy, speed, and relevance that locally customizable and more specialized search tools can provide. Nonetheless, libraries should not shun freely available resources such as Google Scholar, MagPortal.com, or Scirus, especially when other online subscription indexes are not available through some libraries due to the high cost (Price, 2009).

Given the variability of license terms for electronic resources, not to mention rapid changes in technology, collection management for electronic resources requires much greater legal and technical expertise than collection development in the print era. Information specialists need to track multiple business models, coordinate activities with vendors and other entities, and make sure that content fits the technology and preferences of the user population served by their library. While libraries still need to provide access to what is needed for contemporary teaching and learning, it is not strictly necessary to anticipate future needs and acquire access in advance, as print libraries have previously done (Keller, 1992). Instead, it is possible to acquire content through PDA or other forms of demand driven acquisitions (DDA) in which the user is able to trigger payment for content through the library's search and discovery tools.

Electronic resources were managed by a very small group of professional and support staff in the 1990s and well into the 2000s at many institutions. They also used very different tools, including A–Z lists such as EBSCO A-to-Z, SFX, and 360 Core for electronic journals, web pages for links to databases, and ultimately a separate electronic resources management system (ERM) that had developed entirely separately from the decades-old technology of the ILS used to manage print resources. Electronic resources management workflows included work such as gathering usage statistics, branding websites, and troubleshooting access problems (Stachokas, 2009). To improve service, libraries will have to focus technical services on electronic resources, not print.

The problem of perspective: mistaking a transitional phase for the end

By providing electronic resources, however imperfectly, some librarians have been tempted to think that they have fulfilled their obligation to users when it comes to change. Rather than viewing the hybrid library as a transitional stage toward a completely electronic library, some professionals would prefer to stop and hold onto their print collections, including materials that would not normally be considered rare or otherwise worthy of being held in special collections, archives, museums or other special preservation units. Holding onto print is a temporary measure in the twenty-first century, but arguably justifiable in cases where users, not librarians, are better served by print. Libraries that serve disadvantaged user populations with limited access to technology or the Internet will need to maintain print services for a longer period of time than other libraries, but will also need to prepare their users for a more complete transition.

There are a number of factors that have produced this resistance to change among librarians: (1) most library personnel who are currently employed were trained during an era when print resources were still more common than electronic resources; (2) the number of personnel who have direct experience working with electronic resources on a routine basis has been kept artificially small since the 1990s, thus reducing the influence of this important group; (3) some units, especially technical services personnel, have actively resisted change due to technophobia, fears of unemployment (Glasser and Arthur, 2011), and a lack of funding and other opportunities for retraining; and (4) there is a false assumption that the change in format for information resources does not require a more fundamental change in professional identity, training, and the organization of libraries. What this fundamental change actually requires will be discussed in more depth in the next chapter.

Libraries, especially public libraries, have also faced the problem that some of the loudest and most vocal users are sometimes among the least representative of all users when it comes to their needs, general outlook, and preferences. Understanding what users want and need will always require careful assessment of both quantitative and qualitative information. Aggrieved minority opinion can sometimes distort the perceptions of library planners, but studying overall usage patterns, conducting usability testing, using scientific surveys, and other systematic collection of evidence should help libraries to stay on track. Two studies of public opinion in Norway found that most users expected that libraries

needed to change in order to stay relevant (Evjen and Audunson, 2009). Another finding from the same study, perhaps not surprisingly, was that those who did not use the library tended to have a more conservative or traditional view about the library's role and purpose in the community than active users who had kept up with changes in services. There may be some cases where political pressure or user opinion is sharply against developing fully electronic service and those unfortunate libraries may have to wait longer to make the transition than some of their peer institutions. However, it must be understood that not all users can be made happy and libraries must be prepared to make positive change without 100 percent support or consensus.

The problem for libraries in the twenty-first century: the need to accept a paradigm shift

Abstract: Librarians need to accept that electronic resources and the ongoing shift to the use of electronic information in everyday life make traditional library services and traditional approaches to librarianship increasingly irrelevant. Recognition of the dependence of the modern library on IT must be accepted in order to compete with other information professions and service providers. Building on existing innovations, librarians can work to change libraries, learn new skills, and convince users that fully electronic libraries constitute valuable assets worthy of their support.

Key words: electronic library, electronic resources, paradigm shift, perceptions of librarians, professional identity, user expectations.

Libraries have made some progress in terms of providing electronic resources, creating new positions with appropriate skill sets, and reorganizing work to serve users better. This progress has been uneven, however, with wide disparities among institutions and communities. Knowledge, financial resources, and receptivity to change vary among libraries and those who work in them. Legacy print collections, workflows, and pools of employees with limited or inappropriate skill sets are holding libraries back from making important changes, but most importantly, the idea of the traditional brick and mortar library with services and a professional identity based on books is the greatest problem. As a group of Nigerian librarians recently put it, “There is no gainsaying the fact that academic and research libraries that still rely on traditional services alone are on the verge of extinction” (Igwe et al., 2013). Some librarians only reluctantly accept change as a means of

temporarily staving off disaster, but they need to accept what is lost and move on for good. Only then can libraries become creative and dynamic institutions that meet the needs of contemporary users.

The information architect, Alex Wright, wrote about his impression of libraries in *Glut: Mastering Information through the Ages*:

Today, if you walk into almost any library, you will find what is still, at its core, a nineteenth-century institution. The primary feature of most libraries is still a set of long shelves populated by industrially printed books, organized according to a proscribed hierarchical system of call numbers, maintained by specially trained workers laboring in a highly regimented organizational system. The old card catalog may have given way to computer terminals, but the underlying organizational and ontological structures of the modern library have hardly changed at all. Librarians still follow cataloging practices that originated in the 1850s; library organizations are notoriously top-down, hierarchical, and process-oriented operations. And like steelmills, factories, secondary schools, and other institutional offspring of the nineteenth century, libraries are struggling to reinvent themselves in the postindustrial age. (2007: pp. 166–7)

Print fetishism: information as object

Information in the physical library is quite literally an object, a printed book, a periodical, a reel of microfilm, a map, or even a DVD. Morell D. Boone has written about a paradigm shift for libraries from the perspective of a monastic culture in which print materials are protected to a marketplace that is capable of providing modern competitive services (Boone, 2003). Leaving aside the intrinsic value or potential use value of the information stored in these containers, the physical library (absent any electronic resources) is necessarily a physical repository. Generations of librarians have put great energy into developing and protecting growing collections of information objects for many years, sometimes even when the information contained in these objects is less than unique or considered of marginal value. Ranganathan's (1963) third law of library science "every reader his [or her] book," not to mention his fifth law, "The library is a growing organism," have been taken quite literally in collection development. Electronic resources

require libraries to take a different approach to collection development and other information services.

Libraries in the twenty-first century are defined by the range of information services provided to a specific constituency or group of users, not by a physical building or collections that are held. Information can be held on servers anywhere around the world, but access for a particular user is determined by legal and technical requirements, not to mention discovery or their ability to find that the information exists at all and is relevant to their research or other information needs. The library's primary mission in developing the collection is to provide access to information, not necessarily to store or preserve that information. Some libraries will continue to have a repository function that encompasses materials in diverse formats, but other libraries will no longer have physical collections or even digital repositories of any kind.

How librarianship is defined by the book

Modern librarianship developed in the print era and is intrinsically linked with the physical library. The history of the library is considerably older than the history of the librarian and while it may not be entirely fair to do so, we can roughly date the emergence of the modern profession using the formation of the American Library Association (ALA) in 1876 in the USA and the Library Association (LA) in the UK in 1877. While both organizations evolved separately and had distinct approaches to higher education for librarians before recent times, both organizations arguably share primary responsibility for developing the modern profession as we know it today.

What were some of the assumptions behind the development of modern librarianship? First and foremost, librarians work in libraries. Second, the work of both public and technical service specialists was derived from physical collections of materials. Apart from interlibrary loan and other more complex services that developed later, librarians spent their time acquiring, cataloging, organizing, and providing reference service based entirely on physical collections. Information that was outside the boundaries of the physical library was often the province of the archivist, the museum curator, or even the journalist, but libraries were very much bounded objects that continued specific types of information objects.

Librarians were associated in the popular mind very early on with books and, as a recent report from OCLC shows (DeRosa et al., 2011), that association still lingers among users. The close association

between librarianship and books is an internal problem that limits our profession's ability to reform itself, but just as problematic is the impact of this association on external support for librarianship. If this situation continues, librarians risk the problem of seeming and becoming obsolete. A professional identity based on abstract information services rather than physical items is necessary for the librarian to survive in the twenty-first century.

Information vs. delivery systems

Focusing on information in the abstract should help librarians and other personnel who work in libraries to understand that the physical containers of information, books, CD-ROM, newspapers, or microfilm, are not what libraries exist to provide. Libraries exist to provide services based on information. Since information is being created at a faster rate than at any other time in human history this mission offers substantial opportunities to librarians and other information professionals. Given improvements in computing and increasing reliance on big data, this trend is only likely to continue.

There are many opportunities and a growing need for instruction or education about information. As educators and students are busy, librarians can increasingly fill a widening gap in higher education in which they provide supportive information services to help ensure that students integrate sound research methods and best practices for managing different types of information into all of their academic work. Librarians can also assist users with managing their personal information online and provide practical tips about appropriate and inappropriate uses of social media. Librarians can also help to track changes in technology, evaluate options for users, and teach users how to make the best possible use of new technology.

Again, given the rich opportunities for instruction and the reduction in the importance of the repository or warehouse function for libraries it is tempting to assume that no technical services functions or personnel will be needed or that only a skeleton crew with outsourcing and automation will be sufficient. This is not the case. The print repository function is being removed off site, but an electronic repository function is growing. Viable libraries will be expected to manage, if not directly store, increasing amounts of data and other electronic information, not just academic journals or e-books. Negotiating contracts for electronic resources, applying metadata to locally created collections, advising

vendors about outsourced metadata, troubleshooting access problems, setting up new software, and maintaining a strong IT infrastructure are just some of the many roles for technical services that are expanding, not diminishing in importance. Focusing on information as object rather than information as service can lead to confusion and incorrect approaches to downsizing and automation, especially in technical services.

Technical services units in the nineteenth century, and the twentieth century to a great extent, could sometimes afford to take a more deliberative approach to their work by choice or necessity. Librarians and support staff were generally diligent, engaged, intellectually curious, and motivated to be productive, but this was not always the case. Furthermore, not all units had the necessary human and material resources required to complete their work quickly or adapt readily to changing standards. In more than one large academic library this author has seen multiple storage rooms filled with books waiting to be cataloged that were likely never touched. Given that most libraries were physical warehouses with collections that included both high and low demand items, it should be no surprise that once items were purchased, received, cataloged, labeled, and shelved, there might be no need for additional work, at least not for previously cataloged materials, for which demand was likely low anyway. Electronic resources are quite different. Platforms are constantly being updated. Both hardware and software quickly become obsolete. As access to electronic resources is often leased, even the economic transaction to acquire most resources becomes an iterative process that requires re-evaluation and assessment of different business models rather a simple one-time purchase from a preferred provider.

Traditional acquisitions work has been largely replaced by a more complex electronic resources acquisitions model. Mariella Pilgrim and Arlene Dobaille at the Alma Jordan Library of the University of the West Indies in Trinidad & Tobago have written about their institution's recent journey from print to electronic serials. Their previous print process could be summarized in four basic steps: (1) request; (2) order; (3) receive; and (4) catalog. Their electronic acquisitions process contains many more steps: (1) initiate contact; (2) trial; (3) user feedback, usage statistics; (4) negotiation and license agreement; (5) authorized signature of university librarian; (6) purchase; (7) register/activate; (8) e-resources finder/backend database; (9) administrative record keeping/data storage (Pilgrim and Dobaille, 2011).

Some libraries might describe these steps differently or include additional ones, but this account represents the general complexity of managing electronic resources for acquisitions.

IT and the library

IT is foundational in the twenty-first century library. Having a website that is down is worse than closing the physical doors to the building because it will actually impact more users. One notable example of this would be the ten-year study of serials usage at the University of South Carolina (USC) School of Medicine Library that showed an 85 percent decline in the usage of print from 1992 to 2002, including print journals that had no electronic counterpart (Rosati, 2006). Traditional librarians who preside over mainly physical collections are often loathe to admit it, but regular stacks and reading rooms without Internet access are increasingly study halls and refuges for those unfamiliar with computers. Libraries need to provide modern spaces that are well equipped to manage IT, but service is more important than space.

Libraries need to review and define the scope of the information services with an emphasis on developing sustainable budgets and programs for IT. If necessary, this could require consolidating positions in other library operations, especially those responsible for managing shrink print collections, but may also require a careful balancing of outreach, information literacy, and liaison functions with IT and other public and technical service functions. As an example, would it make sense for a library that serves a small liberal arts college to employ both a physics information specialist and a mathematics information specialist without having an emerging technology librarian?

Electronic resources are much more convenient to use and have many advantages over print resources, but libraries do need to invest in technology support in a way that was completely unnecessary in the print era. Delivering information to users through the web requires that libraries build usable websites, troubleshoot access problems, support access for user devices that are continuously evolving, and make continuous improvements to every aspect of service. Few, if any, commercial banks have a website in 2013 that is identical to what they provided in 2001. The delivery systems for electronic resources are superior to print resources, but constantly change because platforms, devices, and user preferences change.

Constant change as the new routine

Libraries, especially academic libraries, have to balance academic conservatism with business pragmatism in order to function and continue

as respected contributors to academia and the wider community at large. Websites have to be updated routinely and as quickly as possible. The library has to adapt its IT infrastructure as quickly as many users select new technologies, perhaps even quicker in order to introduce new tools and techniques to users. Too often, libraries have to catch up with users because of lack of funding, staff time, or staff with appropriate skills. Gathering information about users will become increasingly necessary to provide users with appropriate information. Work behind the scenes is just as important in twenty-first century libraries as work in public or in the classroom.

As libraries developed in the nineteenth and twentieth centuries, conservation was often more important than innovation. Identifying, collecting, and acquiring collections of books meant to be held indefinitely for the sake of posterity, literally preserving human knowledge as a kind of secular temple, was the mission of the library. This state of affairs sometimes produced librarians and support staff who were overly suspicious of change and tended to prefer established standards unless proof in advance of the value of innovation was provided. Experimentation and testing of new services was generally avoided or so bogged down in rigid procedures that change was incremental unless driven forward by external forces such as changes in vendor-supplied services, budget cuts, or demands by funding agencies. Change for the sake of change is not helpful, but being resistant to change is even worse in the twenty-first century. Science, technology, and the frontiers of human knowledge are fluid and library print collections cannot keep up. Many organizations suffer from inertia unless driven forward by circumstances, but those who manage information in the so-called information age do not really have the luxury of clinging to the past.

Organizational culture in libraries can sometimes block much needed changes. Deep conflicts exist in many libraries regarding the purpose of the library, professional values, staff perceptions of use and users, judgments regarding wants and needs, the precise role and authority of decision makers, and what library personnel know or think they know about users and themselves (Raber, 1995). Successful implementation of any new organizational changes in libraries will require careful assessment of attitudes and reconciling conflicts whenever possible. Of course, one cannot allow even determined groups to prevent necessary changes from taking place because the very existence of libraries in the twenty-first century is what is ultimately at stake.

Electronic information is much more useful and more flexible than print collections. When nursing titles become out of date, these must be

physically weeded from the library, but the library could theoretically hold multiple generations of nursing titles in electronic format being careful to apply different types of metadata in order to change search and discovery results, but also to label some information as outdated. Electronic information can be manipulated conceptually rather than only in space like physical collections. An important aspect of change and a hidden cost for libraries that most are only gradually becoming aware of is that the metadata about electronic information requires constant manipulation and improvement in order to make it discoverable and useful to different user types. To think that information need be cataloged only once is an assumption of the twentieth century that no longer applies in the twenty-first. While much of the process of applying “new” metadata can be automated, some professional librarians will need to assess and reassess how large data sets, works of science, and materials about politically sensitive subjects are cataloged.

The importance of metadata in developing a strong infrastructure for the Semantic Web cannot be overstated. Gail Hodge reminds us that metadata schemas serve many different purposes for different types of users such as “resource discovery, location, collection organization and management, administration, rights management, technical reproducibility and preservation” (Hodge, 2005, p. 44).

Enhanced archival description (EAD) for special collections, ONIX International for e-commerce, and the ISO Standard for Digital Geospatial Metadata are just some of the many types of non-MARC metadata that are increasingly important to libraries. Metadata frameworks, crosswalks, and registries that integrate controlled terminologies can help ensure interoperability (Hodge, 2005). Understanding how to integrate this type of information across multiple scholarly domains is the natural work of librarians or other information specialists and not IT per se.

Metadata for managing information internally is also of importance to libraries. Librarians at the University of Saskatchewan have experimented with adding a variety of descriptive tags, developed apart from formal metadata schemas, to enhance internal tracking and decision making regarding electronic resources management. A locally created attribute such as “source” had the following possible values: locally-created, vendor-subscribed, consortium, open access, and one-time purchase or “format/type” that could be index, aggregate, document collection, e-book collection, or reference (Sorensen et al., 2011, pp. 132–3). The University of Saskatchewan Library did have an ERM, but found it advantageous to apply admittedly imperfect but useful home-grown

metadata and business intelligence (BI) because they could quickly revise and deploy small applications rather than wait for the longer-term process of correcting complex software and tools (Sorensen, et al., 2011).

The expectations of users

Some librarians have arguably skewed assessment and their entire understanding of user expectations based on an implicit goal of preserving the physical library. Some studies have reviewed late night students as being critical to users because students have honestly answered that they value the library for being open and for being a quiet place to study. Dramatic increases in online usage, more comfortable and alternative study spaces to libraries, and the overall cost to institutions have been ignored as many academic libraries extend hours in a desperate attempt to keep redundant physical structures open.

Both users and librarians tend to devalue the online or electronic library and overvalue the physical one when considering the overall identity of the library and the services it provides. Partly this is due to insufficient or poor web design, unsystematic or dated branding of electronic resources, and a general lack of identification with and education about the electronic library on the part of librarians. As long as librarians put forth the book as their brand, users will not sufficiently associate librarians with electronic resources, emerging technology, data management, and instruction about how to use the increasingly complex universe of information. As Carson Block, former President of the Colorado Public Library Association, wrote in a recent article about this very issue, “Books are our current brand, but in a world that is shifting to electronic forms, and to fulfill our public good role, our brand needs to change,” (2012, p. 10).

Users generally expect strong customer service from all library personnel, up-to-date and relevant websites and research guides, time saving and accurate discovery tools, as well as technology support when they encounter access problems. Libraries also need to find more ways to accommodate users with disabilities, including learning disabilities, in order to ensure that increasingly electronic information resources meet all needs. Users that have experience with Google and Amazon also expect convenience and rapid delivery of information when the library has to use resource sharing or find other ways to provide information that is technically not part of the library’s collection.

The emergence of new information profession(s)

Librarians also need to be more responsive, adaptive, and flexible because of growing competition from other professional groups. Information science, the sometimes competitor, but arguably closely related profession is one example of a potential competitor, but more likely to influence and perhaps threaten libraries are new types of documentation and information specialists emerging from IT, as well as the disciplines of Education and Communication. Some of this competition is amorphous and arises from the emergence of overlapping activities, but some competition is better organized and more self-conscious about occupying professional space that is at least partly held by librarians.

Apart from information science, in which important differences with librarians are likely to become rhetorical over time – in truth, information scientists and librarians are increasingly the same people – librarians need to pay special attention to efforts by online publishers, IT consultants, and other academic groups arising from Education to step into areas that may be better served by librarians. Teaching users how to evaluate information, optimize the use of online discovery tools, and manage their data are all natural extensions of information literacy work pioneered by librarians, but experts in pedagogy, information architects, and usability specialists from other disciplines will also want to weigh in on these important subjects and may also find institutional homes on campus outside the classroom. Competition is a good thing and given the complexity of some problems it is only natural that multiple disciplines may pursue answers, but librarians will need to constantly map out and protect their role as information specialists in the online world in a way that was unnecessary in the print era. It was difficult to duplicate the services offered by print libraries without creating another library, but virtual libraries are less well defined and it will be easier for other groups to duplicate some electronic library functions.

General developments

Librarians will continue to face competition, both for positions and in the realm of ideas, with experts in records management, archives, and other professional groups that investigate ways to organize the ever growing amount of information generated by routine commercial, government, and research activity. Documentation and records management experts,

not to mention archivists, have been around for a long time, but librarians need to keep track of new developments and continuously address new ideas and useful innovations proposed by other types of information specialists.

Human-computer interaction (HCI) has developed as an interdisciplinary field that emerged from the desire to improve how computers are designed and deliver information and provide service to human users. Some efforts have been made to develop HCI as a separate profession, but interestingly Indiana University has integrated both its HCI program and its Library Science program into a larger School of Informatics (Indiana University School of Informatics and Computing, 2013). Informatics, interdisciplinary programs concerned with the interaction between people, information, and technology, is of growing importance. Programs are relatively new and the curriculum is still in development, but usually consists of the study of computation and another academic discipline such as biology, sociology, or even art (Groth and Mackie-Mason, 2010).

Librarians without libraries?

Many librarians in the twenty-first century will not work at physical libraries at all, but will still be able to carry out their designated functions as information specialists. Special libraries at hospitals and law offices where space is at a premium and expensive will increasingly be replaced by electronic resources. Librarians will continue to have office or meeting space that can be used to do their work or support users, but reading rooms, spaces for non-existent print collections, and any other space assigned to libraries will strike funding bodies as unnecessary extravagances. Physicians, attorneys, and corporate executives have access to their own computers and library IT infrastructure is often integrated into the larger parent organization's IT infrastructure.

Libraries with their own designated buildings will have a very different footprint than in the print era and likely take up much less physical space. Academic and public libraries that have large numbers of personnel and a diverse number of specialized librarians will need computer labs, classrooms, or other meeting spaces in addition to office space in order to provide optimal space. Libraries with their own servers and IT specialists will obviously need room for them as well. Having a distinct building designated as a library is likely to become increasingly rare, however, because libraries that already have large buildings will

probably want to share them with other entities or co-habit buildings previously owned by or assigned to other organizations to reduce costs.

Academic libraries are likely to face three distinct patterns in developing space in the twenty-first century as the transition from print to electronic collections continues: (1) lend space to other campus units in the form of classrooms, meeting spaces, or areas retained by the library, but no longer needed for library functions; (2) share space with other permanent occupants such as campus IT, student learning centers maintained by other types of information specialists, other administrative units, or even other academic disciplines; (3) relocate to another existing space or building that has a better infrastructure for IT such as more electrical capacity, better HVAC (heating, ventilation, and air conditioning), or a better wireless network; or (4) invest in new buildings, either standalone or shared with other units. Converting stacks space to other uses is one problem for libraries and their parent institutions, but the need to have physical infrastructure that is appropriate for computers, mobile devices, and other technology is another.

Public libraries will face similar options, but with the important caveat that it might be somewhat more difficult to find partners in space conversion and other arrangements. Many public libraries are already located in close proximity to other community centers or points of interest, but some are isolated. Fully electronic libraries may want to consider relocating to shopping malls, other shopping districts, government buildings, or near schools where their libraries have been forced to shut down due to budget cuts. The Design Institute for libraries recently held by the Library Journal in South Carolina emphasized the benefits of colocation of libraries with other centers of public interest, as well as partnerships (Kuzyk and Fialkoff, 2011). Public libraries might also want to consider setting up public access terminals or computers in strategic locations to meet public information needs, although some legal and technical questions would need to be worked out.

A tale of three libraries

The transition of the modern library from information services based on print to a fully electronic or digital library can be considered in three distinct phases. Obviously, some trends will have been anticipated or initially developed in the previous phase and there are many differences among libraries with some having experimented with new organizational

forms and services before others, but a general scheme can be applied to most academic libraries in North America.

The first phase, the *automated print library*, arguably began in the 1970s and lasted through the 1980s with print libraries adopting ILs and OPACs in order to manage and make their physical collections accessible to users. This early phase of automation brought the computer into the library, even if most computers available to users were simply access terminals for searching the online catalog. Libraries had to bring in some IT experts during this early phase of automation and also improved their ability to gather and analyze statistics that measured print usage and visits to the library. Organizational structures tended to remain conservative with most librarians working in public or technical services.

The *hybrid library* began in the 1990s as electronic resources, mostly online journals, were offered to users and libraries developed websites. This phase arguably is ending only now as new fully electronic libraries are developed and other libraries begin to phase out their print collections. As discussed earlier in this book, the hybrid library assumes a mixed collection of physical and virtual materials. Also, the hybrid library assumes a mixture of personnel types with some personnel working primarily with print resources and others managing electronic resources. Libraries have also greatly expanded their definition of service during this phase and emphasized other functions such as education and applied information services like GIS.

The final phase, the *electronic library*, is the subject of this book, but the precise characteristics of electronic libraries cannot be mapped out for the distant future, perhaps only 10 to 15 years into the future. Only an extrapolation and analysis of current trends is generally feasible. While there is some overlap between the phases and the unique history of individual libraries will vary considerably, Table 3.1 overleaf summarizes some of the most important characteristics across most libraries.

Table 3.1 Comparison of the automated print library, hybrid library, and electronic library

	Automated print library	Hybrid library	Electronic library
Systems management	ILS	ILS ERM	Library management system
Discovery tool(s)	OPAC	OPAC A–Z List Database List Discovery layers	Discovery services Other services optional
Information resources	Print and other physical materials	Print and other physical materials Electronic resources	Electronic resources
Print materials	Book stacks	Book stacks Remote storage Repositories	Special collections and archives only in libraries Repositories
Circulation of print materials to users	Yes	Yes	No
Reading rooms	Utilitarian furniture in formal environment	Comfortable furniture in informal environment	Moveable furniture in informal environment
Food and drink	Forbidden	Allowed in some areas	No restrictions in most areas
Infrastructure	Reading lamps	Some computer workstations, some wireless	Computer workstations and other technology embedded throughout Wireless throughout
Metadata	Anglo-American Cataloguing Rules, Second Edition (ACCR2) rules applied to MARC records	ACCR2 rules applied to MARC records Dublin Core, EAD, and other metadata schemas	RDA rules applied to MARC records Dublin Core, EAD and other metadata schemas

Collection development Business models	Highly stable Content acquired from traditional publishers/jobbers Permanent ownership of physical materials	Unstable Content acquired from multiple sources Permanent ownership and leasing of content	Unstable Content acquired from multiple sources Rights to content vary widely
Personnel types	Mostly support staff supervised by professional librarians	Roughly equal numbers of support staff and professional librarians	Mostly professional librarians and other professionals with few support staff
Outsourcing	Minimal	Some cataloging and IT	Varies widely by library size and type
Customer service	Public service desks for reference and circulation	Public service desks for reference and circulation Learning commons Technology support Professional consultation	Learning commons Technology support Professional consultation
Types of professional service	General reference	General reference Subject expertise GIS Informatics Data management	Subject expertise GIS Informatics Data management

Solving the problem, part 1: professional identity and preparation

Abstract: There is a need for more robust higher education for information specialists with more specialized course work, certification, and standardized testing instead of current models that provide similar education for most librarians. Ten areas of specialization are explored in this chapter. The need for additional training for affiliated professionals who work in libraries or with librarians such as IT, legal support, and accounting/business management professionals will also be considered.

Key words: educational reform, higher education, information management, library and information science, professional development, professional identity, specialized librarians.

Librarians require a new professional identity, different training, and more advanced skills in order to succeed as information professionals in the twenty-first century. As discussed in the previous chapter, the contemporary librarian needs to focus on managing information in the abstract, regardless of format, and with the assumption that innovation, efficiency, and flexibility are all important professional values. While many important improvements have occurred in LIS education since the 1970s the overall number of academic programs have still not adapted to the new electronic information model. Solving the myriad problems that face higher education for librarians will not be simple or easy, but plotting out a general strategy for improvement can and should provoke frank discussion and experimentation. Given recent changes in the workplace and the relative conservatism of academia when it comes to

pedagogy for librarians, the community of practice will have to engage the community of instruction in order to make systemic improvements.

Accepting the need for a new professional identity is one thing, but real changes must be made to formal education for librarians to make meaningful improvements rather than simply attempting to change perceptions. Librarians are trained as if they all perform the same kind of work, but most professionals in both academic and public libraries are highly specialized. The work of an electronic resources librarian is very different from that of a librarian liaison or a preservation specialist in special collections. Too many librarians must learn their specialized skills on the job. This chapter will explore how a complex profession requires an equally complex educational system.

Redefining the librarian as a professional

Leaving aside the literature about professionalization for the time being, along with questions such as licensure and legal privileges, librarians are a distinctive occupational category that has been very closely associated with libraries, accessible repositories for books and other physical materials. Information science arose after the First World War as a somewhat more abstract alternative to library science. These two closely related professional groups have existed in tension, alternating between creative synthesis and opposition for decades. This confusion is reflected in the names of academic programs and academic degrees, not to mention the use of the term library and information science (LIS) that the author has included throughout this book. To make a very crude simplification, information science has more established theory while librarianship has more established practice. To create a responsible, morally engaged, diverse, interdisciplinary, and practical professional group, the best of both fields must be integrated into one dynamic and ever improving profession. While some scholars such as Marcia Bates have argued that librarianship is really a practical application or subfield of information science based on specific types of collections (Bates, 2006) and there is considerable value in this explanation, practicing librarians have actually made a number of valid contributions to the realm of ideas as well as provided great service to generations of users over the years. Librarians and those who teach them have much to be proud of in

terms of their historical accomplishments, but now they must reorganize, rationalize, and redefine what they do in fundamental ways.

What does society need?

Print materials will not disappear completely and are still going to be part of some collections, although increasingly shifted away from library book stacks and into repositories or special collections. Usage of print, however, is way down, as demonstrated by statistics across libraries, especially for academic and personal research. Society's overall use of the online information resources continues to increase, however, and society needs libraries and librarians that are well equipped to manage electronic information.

Users seek convenience, accuracy, and relevance in search results. Being used to Google, not to mention the slick websites maintained by Amazon and other commercial entities, users are not likely to put up with unnecessary steps to get to what they need. Today, there are many alternative information service providers to libraries and the number of these alternative providers is likely to increase in the future. Some publishers would prefer to sell articles directly to users. Individuals and organizations are another source of subscription revenue for online journals, digital newspapers, specialized databases, and even more comprehensive information services.

To be competitive in a tough information marketplace, libraries need to be able to create and maintain interesting and relevant websites, as well as advanced search and discovery tools. Providing full text content quickly and conveniently is also important. Finding information online that requires several days for interlibrary loan or other resource sharing to process is likely to steer some users away from the library. Accurate metadata that promotes discoverability is also extremely important. Libraries have a number of opportunities to provide metadata that is superior to and more relevant, especially for academic research, than commercial websites, but this requires considerable investment on the part of libraries and careful balancing of strategic priorities. Another opportunity that is increasingly well understood is the general need for instruction and customer service.

Libraries need to find more ways to help users with their information, whether that comes in the form of large scientific data sets or student research papers in the case of academic libraries or family memorabilia in the case of public libraries. As practitioners of a more comprehensive

and abstract information service, librarians can assist users with complex projects that manage or even produce information that is no longer automatically added to the wider collection or freely distributed to all users. Likewise, some libraries may begin to experiment with fees for services or other means of pursuing cost recovery. Caution is advised, however, as the unique mission of the library, as opposed to some other types of information providers, has historically been that of expanding access to information rather than helping others to limit access.

Libraries will continue to provide information services based on electronic resources, so in that sense, the emphasis on collections continues, but the foundation of twenty-first century information service is not the collection itself. Librarians collectively will need to have a very strong grasp of relevant theory about information, including how it is created, organized, and made useful for a wide range of human activities. Metadata will need to become more descriptive and useful for current users, but also address the needs of future generations as the unique characteristics of electronic information make long-term discoverability and preservation questions more urgent. Education about information and forms of instruction will continue, but greater emphasis will be placed on applied information services such as GIS or bioinformatics. Librarians will need to engage in critical analysis of their own work and how to improve it on a routine basis, so assessment and analytics will become more important.

The librarians of the twenty-first century

Viewed from a practical perspective, librarians in the nineteenth and much of the twentieth century could be categorized by the following familiar areas of specialization: reference, cataloging, circulation/access, preservation, acquisitions, and collection development. Later specializations such as interlibrary loan and systems emerged, although not always managed by professional librarians, in the latter part of the twentieth century as transportation systems continued to improve and libraries pursued automation. The twenty-first century already includes new areas of specialization such as electronic/digital resources, emerging technology, bioinformatics, GIS, and metadata. A whole host of support professionals in IT have also joined many large libraries such as specialists in web design and information architecture. User experience and copyright experts straddle the fence and are sometimes librarians, but may have training in other disciplines. This level of change is what

has already occurred, but details are still being mapped out and higher education in LIS generally lags behind changes in practice.

While new positions have emerged in libraries, one should not overestimate the educational, cultural, or ethnic diversity of the current population of working professionals. A recent study conducted of LIS graduates in Australia in 2010 revealed that over half of graduates had received their education prior to 1998 and 29 percent prior to 1994, before the Internet emerged. Only 5 percent indicated an interest in higher degree research at the doctoral or master's level. Most Australian librarians were white and female between the ages of 25 and 49 with English as their native language (Combes et al., 2011). A study of LIS graduates in North Carolina in 2009 with 1903 respondents revealed a professional workforce that had a mean age of 47.09 years and was 82.03 percent female and 86.69 percent white (Morgan et al., 2009). Scarce funding and the closure of many LIS programs in Australia may make it difficult to change this situation in the near future (Bundy, 2012).

The change from print to electronic format as discussed previously does not simply reflect a change in format, but an increase in the depth and breadth of the library's responsibilities, as well as challenges and opportunities, in managing information services. Given demographic changes in society, especially the USA, the number of users of diverse ethnic and cultural backgrounds is likely to increase greatly as well. Traditional technical services and traditional public services must both be replaced by modernized units with appropriate skill sets, new workflows, and a different culture. Both a new organizational structure and a new professional identity are needed for libraries to thrive in the contemporary information marketplace.

LIS programs continue to teach traditional services leavened by some IT course work, a few courses in digital resources or electronic resources, informatics or GIS, but progress needs to accelerate and higher education needs to abandon the assumptions of the print era entirely. Increasingly, practitioners worldwide recognize this need. Nigerian librarians have called on national programs and the government to promote greater integration of IT into the curriculum (Ozioko and Nwabueze, 2010). Likewise, Japanese librarians have also discovered a greater need for computer literacy training and mathematics course work in addition to courses that emphasized the humanities (Toshimori et al., 2010). Generally, most administrators and educators in LIS programs are aware of the problem and many programs include some digital offerings, and even continuing education and certification in digital resources (Youngok

and Rasmussen, 2009), but a more comprehensive approach with in-depth training is needed.

Reforming higher education for LIS

Courses must be redesigned to reflect electronic resources as the primary format for libraries and consider web design, computer and technology literacy, technology support, user instruction, and problems inherent in managing electronic information as foundational rather than unusual. While this author welcomes the small number of electronic resources course offerings that currently exist, it is reflective of the problem that electronic resources is still viewed as a distinctive area of practice, not unlike special collections, when it is arguably the single most important service to most users that modern libraries actually provide.

Electronic/digital resources should be split into the many component skills actually required by new types of specialists, some of which have been around for decades while others are only now beginning to emerge in the most advanced academic and public libraries. Separate courses should be made available for skills that are actually applied in routine professional work such as licensing, evaluating technology, best practices for technology support, electronic resources management, digitization, or digital preservation. Emerging technology librarians, one of the more recent new types of specialist, should receive additional training in IT and related fields in order to be fully equipped to advise their fellow librarians and users. More formal course work is needed in assessment and analytics. Additional course work is also needed in library administration, management, and customer service for an increasingly complex technologically based information service system. Depending on the educational deficits to be addressed, libraries should copy what is relevant and useful from other academic disciplines or occupational groups, partner with other disciplines to provide mutually beneficial training, and experiment with new courses that reflect contemporary practice.

Restructuring the MLS degree and its many variations

The MLS degree is no longer appropriate when it is based mostly on print resource models. Variations such as the Master of Library &

Information Science (MLIS) or Master of Science of the same, and Master of Information Science (MIS) sometimes contain more useful elements, but most of these degrees share some common problems. First and foremost, these degrees are too simple to earn. Most only require one to two years of academic study and most students are free to complete their studies with the easiest electives available. Specialized skills are usually developed by graduates later after accepting their first professional position. There are exceptions with special collections and archives being the most notable given certification and relatively pertinent course requirements. Some academic libraries look closely at relevant course work and are less likely to hire those with inappropriate skill sets, but there is no formal mechanism for enforcing universal standards for specialization. ALA and other professional associations offer some guidelines and, to be fair, there are many brilliant instructors and administrators in top ranked LIS programs who do whatever they can to improve higher education, but a more systemic approach is needed. This author cannot assume to have all the answers, but it is my sincere hope to provoke discussion about appropriate goals and to begin to recommend some practical strategies for experimentation.

There is a tension between the unique needs of specific user populations and best practices and standards for libraries. Some have argued that academic libraries will become more different over time for this reason among others. Greater divergence in organizational structure is entirely possible, but there are other forces that may limit the acceptable range of difference among libraries. For one thing, it is necessary for accrediting bodies to develop broadly applicable standards for higher education. While LIS education is widely considered to be inadequate now, that may change in the future. The proposed solutions in this book are only an example of how to pursue positive change, and there are many intelligent people working on ways to address known problems. Also, if the community of learning and community of practice develop closer links in order to adapt to the changing needs of libraries, there will likely be more pressure to accept commonly agreed upon standards.

The twenty-first century library is an electronic information services provider. Print exists in special collections, browsing collections, or is held in offsite repositories. Staffing for print services in both public and technical services will be replaced by electronic/digital resources staff with various areas of specialization, responsibility, and expertise. Library instruction or teaching is assumed to be a service that all libraries must provide. Technology support, functionality testing, user experience testing, and the evaluation of emerging technology are also services that

fall under the purview of libraries. Finally, and perhaps among the most important functions of libraries, is metadata. Librarians will work with and use metadata provided by other professional groups, commercial vendors, and users, but will still take final responsibility for improving metadata standards and enhance metadata for local user populations, other contemporary users, and posterity. Libraries must also become adept at handling the business administration and legal administration of information, work that will likely include librarians as well as specialists in other disciplines. Finally, libraries will need to work hard to ensure that their online information resource platforms and services have the best possible IT infrastructure, work that necessarily requires close coordination with specialists in other fields. Organizing all of this complex work in an ever changing environment will be difficult, but LIS higher education must do its best to map out what is needed and reorganize course work to supply it.

Certification and specialization

Librarians are specialized, but all must work together in order to provide comprehensive information services that benefit users. Necessarily, there must be some overlap in the education of metadata, information literacy, and emerging technology specialists, but each specialist also requires some additional course work that is most relevant to their particular area of practice. One approach might be to create a modular system in which all librarians are first required to complete a general or foundational core set of courses to which must be added one or more modules in areas such as licensing or special collections.

Some schools already boast programs with modules as part of their provisions for awarding interdisciplinary degrees, notably the Information School, University of Sheffield in the UK which has awarded specialized master's degrees in such areas as Multilingual Information Management, Electronic & Digital Library Management and Information Literacy (Corrall, 2010). The Sheffield program is organized around three categories of e-content and digital library specialists, discipline-based information and knowledge specialists, and context-specific technology and media specialists (Corrall, 2010).

The Graduate School of Library and Information Science (GSLIS) at the University of Illinois at Urbana-Champaign offers a separate Master of Science degree in Bioinformatics and a certificate of advanced study (CAS) in digital libraries, an informatics minor, and multiple degree

specializations including community informatics, data curation, K–12 (kindergarten to 12th grade) school librarianship, socio-technical data analytics, special collections, and youth services (<http://www.lis.illinois.edu/academics/programs/specializations>). The School of Information and Library Science at the University of North Carolina at Chapel Hill offers specializations in Academic Libraries, Adult Services in Public Libraries, Archives and Records Management, Children and Youth Services, Digital Libraries, Organization of Information and Materials, Reference, School Library Media, and Special Libraries and Knowledge Management (<http://sils.unc.edu/programs/graduate/msls/specializations>).

Successful completion of each module would require examination, not just completion of the course work itself, and certification would be provided in addition to the master's degree. As an example, five courses in the foundation might be: (a) History of Library and Information Science; (b) Introduction to Classification and Subject Analysis; (c) Introduction to Information Science Theory; (d) Introduction to Assessment; and (e) Customer Service for Information Specialists. Other modules would include four to six courses, but completion of the degree would require a minimum of 12 courses. Overlap between areas of specialization would be prevalent as there might be some things that both an emerging technology librarian and a licensing specialist need to know about technology business models, but might not be as relevant to a GIS specialist. Some possible areas of specialization for organizing educational modules are shown in Table 4.1.

Librarians would still need to complete a minimum number of courses or credits to complete their degrees, but all would have to select at

Table 4.1 Specializations within LIS

Licensing & Copyright	Subject specialist: (a) Social Sciences (b) Physical Sciences (c) Arts & Humanities	Applied information specialist: GIS	Library Systems and Electronic Resources Management	Human Computer Interaction & Usability
Library Administration	Applied information specialist: Informatics (multiple subjects)	Special Collections	Metadata	Assessment & Analytics
Library and Information Science Foundation				

least one area of specialization in addition to any electives taken. Such areas of specialization would be reflected on their academic transcripts and likely have a positive impact on matching candidates to the unique characteristics of open positions. Course work in most LIS programs would likely require some courses taught by LIS faculty while others would be farmed out to other academic disciplines on campus, for example courses in statistics taught by professional statisticians or IT courses taught by experts in computer science.

The selection of the ten modules is not arbitrary, but a reflection of current practice in libraries and an attempt to capture skill sets that are particularly necessary for the management of fully electronic libraries. This model has been developed with academic libraries in mind, but future public library professionals would also benefit from this kind of training. Additional modules in information services for children and adults could be added to supplement the training of future public librarians.

Other variations and/or additional modules might need to be explored as academic programs strive to adapt to the needs of the community of practicing librarians because change is constant and it is difficult to predict future needs. These modules do not address training at the doctoral level because most programs already require extensive training, dissertations, and other demonstrations of specialized knowledge.

Taking a closer look at the modules listed in Table 4.1, Licensing & Copyright would be designed to train licensing specialists as well as copyright librarians in those aspects of the law and contracts that they would likely encounter in their routine work. Negotiation and other aspects of vendor relations are arguably problematic areas for librarians, but hopefully one or two courses could be included within this module. Successful negotiation skills can be taught, but also require practitioners with the right mix of personality traits and social skills. A few academic programs already offer courses in electronic resources management that also include some instruction in negotiation, but course work needs to be more focused, especially as libraries move beyond the unitary electronic resources librarian position and toward a more rational and systemic division of labor.

Given limited managerial training among most librarians and the fact that some libraries will be fairly large units, librarians need formal training in library administration. LIS programs could offer this certification as part of academic degrees for new professionals, but also as continuing education certificates for newly promoted librarians or other professionals seeking promotion. Furthermore, most librarians

will continue to work using a master's degree as their terminal degree, but otherwise may want to pursue additional certifications over time. It might also be wise for employers to begin requiring further education as positions evolve and demands for new skills increase. Perhaps only one or two courses addressing the specific organizational characteristics should be taught by LIS faculty. It would actually be very helpful if future library administrators were directly exposed to experts in management, public administration, and human resources. Some aspects of library administration are unique to libraries, but some problems are common to all complex organizations. LIS programs could partner with other academic units to provide instructors or recruit experts in areas outside traditional librarianship to serve as LIS faculty.

Subject specialists would receive training in three broad categories of Arts & Humanities, Social Sciences, and Physical Sciences. Some LIS programs have made considerable improvements to general course work for reference and public service staff such as addressing techniques for using search engines, Web 2.0 services, communication, and improving customer service (Larsen, 2007), but more is needed, especially for in-depth instruction for subject specialists. Training and certification examinations would be based on the three broad categories of Social Sciences, Arts & Humanities, and Physical Sciences because there are some broad similarities across these three major types of disciplines, but to be a successful chemistry librarian or physics librarian would require additional specialized course work, and a second advanced degree in these disciplines would be even more beneficial. Creating an LIS certification process for individual academic disciplines would simply be difficult, but students can be tested on the broad responsibilities expected for subject specialists in contemporary academic libraries.

Applied information specialists will likely increase over time and the categories here may be joined by other types in the future. For now, GIS and informatics are arguably representative of areas that have the highest likely demand from users. Librarians that receive this training will be expected to serve as advanced consultants to users, but also provide personal assistance with specific individual and group projects. Need for such education is demonstrated by a recent study of Canadian science librarians who expressed reluctance to provide bioinformatics services because of a lack of training (Dennie, 2010). A survey of American programs in bioinformatics reveals that programs have been hosted by a wide range of departments such as Biology, Computer Science, Chemistry, Health Sciences, Biochemistry, as well as LIS programs. While there is an obvious cluster in biology and related disciplines (Hemminger

et al., 2005), bioinformatics and similar disciplines arguably constitute an opportunity for librarians. Specialists in bioinformatics will probably find most jobs in academic libraries, but public libraries would also benefit from providing other applied information services such as GIS to their users. Public libraries with trained specialists could provide additional information management services to community organizations and volunteer groups as well as individuals. Some of these courses could be taught by LIS faculty, but informatics would require additional course work in computation and specific subject disciplines.

Metadata course work would encompass both cataloging and classification as historically taught in LIS schools, but also new metadata schemas and some of the theoretical reasoning behind the development of new types of metadata. Work will be more complex and have broader applications than traditional cataloging, but the overall number of trained specialists is still likely to remain smaller than the number of catalogers trained in the twentieth century. Course work would also include appropriate study of technology and the judicious application of automation. Twentieth-century libraries could make do with rooms full of copy catalogers, but no twenty-first century library can afford to ignore batch processing and other systems enhancements to bibliographic records.

Special Collections programs would encompass training in the assessment and procurement of both physical materials and digital resources. Course work would also include preservation techniques, rare books, and practical applications such as EAD, but differ somewhat from contemporary programs in that additional emphasis would be placed on managing and preserving electronic records and data sets. The course work for this particular module would be extensive and together with the foundation and a second module might take two to three years for completion. Special Collections and Archival certification programs are already well established and it will not be necessary to reinvent the wheel, although some balance may be required to make sure that the number of required courses is comparable to other certifications. It is not recommended that the standards of particular academic programs replace those of bodies that currently certify archivists, but only that a Special Collections certification exam should be required for the completion of a master's degree in LIS.

Library Systems and ERMs would replace traditional technical services and would essentially constitute what many understand as the back end of the contemporary electronic resources position. Course

work would be practical and emphasize the activation of electronic resources, the administration of management tools, discoverability, and troubleshooting access problems. Elements of business management, acquisitions, and online commerce would also be included in course work. Consideration was given to splitting this module into Library Systems/IT and ERM, but the newly emerging convergence of ERMs and ILS into library management systems like that of Ex Libris Alma or Serials Solutions Intota is an argument against making sharp distinctions. Librarians who receive this certification should not only be qualified to manage electronic resources management units, but also library systems units. This certification is not intended to produce programmers, web designers, or computer technicians per se. However, LIS programs could and probably should provide additional course work in these areas or provide degrees in IT or Computer Science taught by professional specialists.

Assessment & Analytics is included as a separate module to meet the growing needs of the assessment community within libraries. Practical training in how to use commonly available metrics such as COUNTER usage statistics and altmetrics for social media will be included, but combined with more complex ideas. Additional course work will help practitioners to design and evaluate new metrics, and also consider how such metrics can be put to the best possible use. Both qualitative and quantitative measures important for evaluating libraries would be included in the curriculum. Students would also learn techniques, and best practices for integrating assessment into the routine work of organizations and how to train other staff would contribute to successful assessment. Again, some courses could be taught by LIS faculty while some could be taught by faculty with specialized training in other disciplines.

Human Computer Interaction & Usability is a very important area for librarians, but this certification is designed as much to inform the work of electronic resources managers, systems librarians, and administrators as it is to create unique specialists. Some libraries will hire specialized usability experts, but more likely most libraries will integrate appropriate techniques and best practices into the routine work of other specialists.

Some important areas of specialization such as emerging technology need not require additional dedicated modules, but course work in the other recommended modules could suffice. An emerging technology librarian might benefit from courses in Library Systems & Electronic Resources Management as well as Human Computer Interaction & Usability, and perhaps even Assessment & Analytics. Again, further

instruction and secondary advanced degrees in other areas, especially IT, would also enhance the skill sets of emerging technology specialists.

The work of librarians has diverged ever more broadly from their formal education in recent years because of changes in technology and other developments in libraries. Reforming higher education to reflect the diversity of specialized roles that librarians actually perform every day would constitute substantial progress, but not provide all of the solutions. Experimentation is required to determine the best configuration of modules and underlying course work. Standards for certification and procedures for testing would also have to be established and likely corrected and improved over time. Depending on any applicable government or institutional regulations, libraries will still be free to hire whomever they want anyway, but degrees with specialized certifications will make it easier for employers to identify and hire librarians with appropriate skills.

Training in other disciplines and interdisciplinary studies

Most LIS programs are not currently equipped to provide certification in multiple modules or expand their curriculum to include all the necessary course work. Partnership with other academic disciplines will be necessary to teach LIS courses, but also to enable LIS students to take courses in other disciplines that will count toward the completion of their LIS degrees or provide useful secondary degrees. Given the inherently interdisciplinary nature of library and information science, LIS educators and practitioners will likely always need to work with experts in other disciplines to teach new generations of librarians. As LIS programs become more rigorous and complex in the future, however, LIS schools will need to develop faculty with an unusually broad array of knowledge and skills in comparison to other academic units.

Some LIS programs may also want to consider continuing to offer dual degrees, for example, combining the Master of Business Administration (MBA) or Master of Public Administration (MPA) with an LIS degree, as well as the more common Juris Doctor (JD)/MLS. Other options include combined degrees with geography or earth sciences for GIS librarians, the obvious subject disciplines, and education with LIS information literacy specialists who focus on theories of learning and pedagogy. Some areas of specialization and some dual degree programs can and should be rare since the market is not likely to produce many available positions. Small

libraries will still be limited to hiring fewer librarians, but it is arguably easier for a specialized librarian to work as a generalist than vice versa.

LIS programs also need to investigate ways to work with computer science, other IT, and law programs, not only to train librarians, but also to train IT specialists and attorneys who may work with libraries in the future. Library vendors, perhaps even more than libraries, need to investigate ways to improve training in academic programs where members of other professional groups support libraries. LIS programs can offer courses for computer programmers, attorneys, and other specialists who work with libraries and/or consult with faculty in these disciplines about the unique needs of libraries.

Perhaps more daringly, libraries could consider contributing to the development of new areas of specialization outside librarianship. There are many attorneys that already work with complex questions regarding intellectual property, but given the explosion in information perhaps it is time to consider the development of specialized information attorneys, experts in how federal, state, and international law applies to copyright and other issues of electronic information. These new attorneys would not only consider questions of law applicable to property and use permissions, but also other types of user rights, privacy, surveillance, electronic government, public access, and other relevant issues through the unique lens of information science. Development of such programs would require close partnership and greater initiative from legal experts, as well as LIS educators. Information attorneys would be expensive and rare, but a few large libraries, consortia, and vendors could use their advanced expertise in order to help craft clearer and more intuitive legal standards for using information in the twenty-first century.

LIS programs and librarians in the marketplace

Improvements in higher education for librarians, if undertaken systematically, could reduce the total number of accredited LIS programs around the world. Maintaining a complex modular educational system for librarians may enhance the prestige and strategic advantages of large and successful programs while further marginalizing programs that cannot provide similar courses. Given the greater investment in time required to obtain the master's degree and what would likely be a more rigorous certification process, the total number of applicants would also be reduced. It is important to make sure that all parts of the world have

access to libraries and that libraries be staffed with sufficient numbers of trained personnel, but it might be better to invest in a smaller number of good programs rather than a larger number of mediocre programs given the increased demand for higher skill levels. Other factors such as distance education and flexible hybrid programs that include instruction on and off campus would also provide an alternative to local instruction that does not meet high standards. Of course, smaller programs could also partner with larger ones to provide multi-campus hybrid programs in which a prestigious national program provides some instruction and oversight for a less prestigious institution that offers some on-site instruction.

Notable among relatively recent efforts in distance education for librarians is the LEEP program launched by the University of Illinois at Urbana-Champaign in 1996. Students experience a ten-day orientation program on campus and then are allowed to take various online electives to complete their degrees. All courses require at least one face-to-face session held once per semester. Designers and implementers of the program have attempted to impart a sense of professional identity and camaraderie among each cohort of students by including these elements of interpersonal interaction (La Barre et al., 2012). Cataloging and metadata instructors have found it sometimes difficult to make course materials available online, but have generally been pleased with a high level of student participation and contributions to collaborative work. A variety of strategies from posting projects to online bulletin boards, asking students to give presentations via telephone, and frank discussions about metadata and the future of cataloging have produced successful results (La Barre et al., 2012).

What does the marketplace look like for recent LIS graduates in recent years? Jacqueline Smith recently identified the MLS as the single worst master's degree in terms of future employment and income prospects in an article in *Forbes* online (Smith, 2012). Ralph Scott, editor of *North Carolina Libraries*, counters that librarians are not in it for the money like some other professionals seem to be and the intrinsic rewards of helping users are difficult to measure (Scott, 2012). While Scott's heartfelt statement is genuinely true for most librarians it does not address the practical problem of economic sustainability. Librarians need to be able to pay for the necessities of life and manage their student debt in order to function as contributing professionals.

Are too many LIS graduates pursuing too few jobs? The situation does not seem as dire as it likely is for graduates with advanced degrees in the humanities, but a recent survey of LIS graduates in 2009 in the

USA showed that while full-time placements had increased to 72.9 percent in 2009 from 69.8 percent in 2008, the number of temporary and non-professional placements had also increased to 10.6 percent and 19.4 percent respectively (Maatta, 2010). Brett Bonfield used data from the National Center for Education Statistics (NCES) and other sources to estimate the likely need for new LIS graduates from academic years 2009–10 through 2016–17 to be around 5040 students in the USA. Unfortunately, American LIS programs awarded 7162 master's degrees in 2007–08 and 7091 in 2008–09 (Bonfield, 2011).

Beyond rhetoric: developing a new professional culture

Librarians have played an important role in conserving and protecting knowledge, even well before modern professionalization began in the late nineteenth century. Arguably, moral imperatives have informed librarianship as much as theory and professional technique. Librarians have advocated for the freedom to know, resisted calls for censorship, and promoted lifelong learning and reading as intrinsically valuable to a modern democratic society. The existence of prison libraries, the bookmobile, investments in braille collections for the blind are all, at least in part, examples of the commitment of the librarian to social outreach. These are commendable activities by librarians, but there is a downside to all of these activities. Some librarians have taken on aspects of a secular priesthood presiding over temples of knowledge and thus contributed to the neglect of professional improvement.

Learning and using what is new is just as important as understanding what is old. Preserving the past is arguably best left to specialists within librarianship or other professions entirely rather than being the focus of the contemporary librarian in the twenty-first century. Given that most government information is now born electronic, and nearly all commercial activity is going paperless as well, it makes little sense for thousands of librarians to protect shrinking and increasingly forgotten mounds of paper documents in the name of preserving the public's right to know. Digitization will be necessary in most cases to make these collections visible. Very long-term preservation will require transferring paper documents to more stable and durable physical media. As an aside, the historical accident of fire has preserved ancient Sumerian documents, clay tablets inscribed with cuneiform now hard baked, better than many

disintegrating paper and papyrus documents of other ancient peoples. Twentieth-century paper tends to be less stable and more vulnerable than many sixteenth- and seventeenth-century materials. Some type of ceramic microform or other very hard materials will be needed for true long-term physical preservation, but long-term digital preservation with enhanced security to reduce the chance of corruption will likely be more efficient and economically viable. Redundancy and the retention of multiple copies will be necessary to ensure retention and counteract the potential corruption or intentional tampering with electronic documents, but the retention of multiple print copies in each local community is becoming less viable.

The librarian of the twenty-first century must adopt the professional techniques and competence of information science while retaining the social conscience and ethics of the librarian. Instead of focusing on gathering information into the library and corralling users into the same finite space, librarians should look outward and join a broader information universe. The purpose of the librarian is to gather intelligence about what is out there, mark paths of discovery, guide information seekers, and facilitate access to information. Collection and preservation are just some of the many techniques of librarianship, not its fundamental objective.

Libraries, like all organizations, face internal and external forces that oppose creative change. Some are impersonal such as sunk costs in existing plant and equipment – the physical library with its many book stacks is one example – but also the more problematic issue of large numbers of clerical service employees whose positions are almost entirely dependent on specific workflows. While some of the fears and concerns of staff may be justified, depending on specific conditions and institutional history, general cynicism by employees and unfounded skepticism of management are also factors that must be considered whenever significant changes are made. When library employees react negatively to change, directors and managers are tempted to withhold information and force compliance, which can set up a negative escalation of the problem. Overcoming cynicism will take time, but some strategies include the use of positive incentives for desired outcomes, identifying trusted individuals who can help lobby or argue for change, and continuing forthright communication while recognizing that motives and strategies will be questioned by some, regardless of effective communication (Stanley et al., 2005).

The psychology of information management

Librarians in the twenty-first century must serve the immediate needs of their defined user population while simultaneously keeping the needs of larger social groups in mind. Concern for access to knowledge as a whole, preservation, and professional ethics must inform the routine work of all librarians, but professional specialists need to apply their individual skills to the problems of the unique community of users served by the academic, public, or special libraries that employ them. The Indiana State Library is responsible for the information needs of Indiana, but the Tippecanoe County Library needs to consider only users in Tippecanoe County most of the time. If the Indiana State Library provides access to certain types of government information to residents of Tippecanoe County then the County Library does not need to do so. Providing a good selection of apocalyptic fiction to young adult readers might not be important for the State Library, but the County Library probably needs to investigate possibilities. Likewise, academic libraries will become more specialized in their respective collections and services over time. The need to duplicate core services or acquire resources just in case at the local level is much less acute with electronic resources.

Information literacy and instruction can be somewhat generalized, but hopefully some of this work is being performed in primary and secondary schools and most disciplinary faculty in higher education can be assumed to be familiar with information in their own fields. Librarians need to be careful not to teach what is too simple, already known, or redundant when it comes to information literacy. This risks devaluing the professional role of the librarian and is not fooling anyone. Teaching how to evaluate information and sharing techniques and sources relevant to specific fields can be an invaluable service, but needs to be carefully targeted to user populations that will actually benefit from additional training. Instruction at the point of need should be undertaken with all due humility and an emphasis on good customer service. I once observed a colleague attempt to teach a PhD student in physics how to search a database when the user in question had asked a more specific technical question.

Both general and discipline-specific instruction is arguably more helpful for first-year students, first-generation college students, or non-traditional students who may need additional assistance in adapting to the academic rigors of contemporary higher education. Technology literacy, assisting users with information needs outside their own disciplines, and assistance with mathematics, statistics, and data management are

likely to be in higher demand than general instruction about how to search databases that are increasingly intuitive to use or how to navigate the library's website. Making searching needlessly complex or rolling out every piece of extraneous information about information is a great discredit to the libraries that succumb to pressures to overcompensate for their desire to be educators. Libraries need to carry out instruction, but that is only part of their professional role and arguably the least important part. Some of the hardest and most important work of libraries in the twenty-first century is done behind the scenes, not in front of the classroom.

Subject specialists, not just technical services and systems specialists, have work that they must do behind the scenes to support the mission of the library. Liaising with academic departments is very important work. Ideally, subject specialists will help libraries track user needs among the specific groups that they network with. Advising on collection development (not deciding), discipline-specific metadata, and the overall assessment of services that impact practitioners of specific disciplines will continue to fall under the purview of the subject specialist. Rich and rewarding careers are possible in these areas of librarianship and some make indispensable contributions, especially in large academic libraries, but additional training and knowledge is needed. Some subject specialists have training that is essentially similar to that of reference librarians and one or two courses and a change in title make genuine impact in this important work unlikely. The future lies with advanced specialists in areas such as bioinformatics and GIS who can provide direct services to users in addition to instructional services.

Working with knowledge in practice

Librarians will continue to develop new techniques for managing information, but will also need to borrow more consciously from other disciplines, especially IT. Improving and diversifying metadata is critical, both for libraries and for society at large. Too much of our electronic heritage is at risk of disappearing as formats change and organizations responsible for specific infrastructure come and go. Too many librarians, and non-librarians, tend to think of libraries as primarily catalogers who use MARC and/or RDA. Equipped with more education and licensed to be more creative, future metadata specialists will arguably provide some of the most important and long-lasting services provided by libraries in the twenty-first century.

Given the complexity of information and the wide range of potential areas of specialization, even systemic reform will not be able to meet all possible needs. Professional associations, continuing education, and employers will still have to address any potential gaps in preparation and skill development. A good example would be the case of music librarians. The International Association of Music Libraries (IAML) UK & Ireland branch partners with volunteers, employers, and LIS educators to see that professional development and training needs for music library personnel can be met. A Courses and Education subcommittee of IAML UK chaired by an education officer oversees a complex program of formal and informal education comprising day courses, seminars, presentations, visits, and networking events that engage both libraries and LIS programs (Roper, 2012).

Teaching the teachers: outreach to academia

The liaison model favored by subject specialists has its place in the academic world, but could be improved substantially. Applied information specialists such as GIS, and technical services specialists such as metadata librarians actually provide the core of unique services that libraries can provide to users. Other professionals also work with GIS and metadata, but librarians can arguably work better than experts in other fields when it comes to service as interdisciplinary experts in information itself.

The role of liaison is much cloudier, often defined by individual librarians and faculty, and all too often amounts to limited efforts in bibliographic instruction, support for undergraduate research, and some collection development.

What some subject specialists actually do in academic libraries is arguably a better fit for the public library. Many users of public libraries, although no one can ever assume, will not have advanced subject expertise in particular fields that they have questions about. Physicists, medical doctors, and attorneys are likely to have more precise information about their respective fields than most librarians, however, and the work of subject specialists sometimes amounts to making sure that the right books are ordered, the correct databases are renewed, and that undergraduate students are well versed in what the library has to offer for their research papers.

Subject specialists in advanced academic libraries should find ways to gather more information about the unique characteristics of the users whom they serve, including advanced research, usage of information resources not provided by the library, and differences in information-seeking behavior. Many of the more competent subject specialists already try to do this kind of work, but both librarians and libraries need to gather information about users more systematically. Subject specialists can also work with their colleagues in IT and technical services to develop specialized information portals and other unique discovery paths that suit practitioners of particular disciplines.

Educating academics about new roles for librarians and LIS profession(s)

Academic libraries are financially supported by institutions of higher learning and must address the perceptions and concerns of faculty, staff, and students who may have limited knowledge about how libraries have changed in recent years. Librarians must demonstrate their worth through action, but also dialogue, in which important changes to library services are clearly communicated to all stakeholders. Those who support libraries must also be kept well informed of how changes in the law, technology, and vendor business models impact libraries.

Most twenty-first century academic libraries, especially large academic libraries, are complex organizations that provide a wide range of services from classroom instruction to negotiating complex license agreements with vendors. Since librarians have often been slow to accept the full range of diversity of their activities it is difficult to communicate this reality to others, but libraries need to show that providing information services requires a wide range of specialized personnel who require reasonable salaries, professional development, and opportunities for advancement in order to ensure a high level of service. Higher education still requires strong libraries and libraries require strong people with appropriate skills. Whenever possible, libraries need to showcase the complex nature of contemporary services through various kinds of outreach and marketing. Librarians have been talking about the need for better marketing for decades, so this is nothing new, but the message has to change with the times. Too much focus is arguably still spent on the book itself, or on the activity of reading, but libraries provide a wide range of services of which introspective reading is only one. Libraries need to reveal more work in managing data, GIS support, bioinformatics, education about

information, electronic resources management, and, above all, good online customer service.

Developing institutional and public support

Developing long-term public support for libraries, both academic and public, will require a continuous demonstration of value. Libraries effectively subsidize access to expensive information resources, some of which might otherwise be difficult to find, despite Google and other search engines designed for a wider information market. Libraries need to speak about traditional ideals and goals such as the pursuit of knowledge, public access to government information, and personal development, but be prepared to provide evidence that information services are being provided that genuinely benefit users while being reasonably cost-effective. Libraries cannot and should not be run like private businesses, but in these difficult economic times, librarians need to demonstrate that their work is still relevant and still worth funding. Saving money or being fiscally responsible is important, but the most important criterion is a demonstration of value to the user.

Quantitative and qualitative information that tells the story of how the library is helping the unique community of users that it serves must be shared routinely and continuously with stakeholders.

Many academic and public libraries now have online dashboards that provide curious users with information about on-site visits, web analytics, and usage of electronic resources at a glance. Some libraries also send out email alerts to users or community members that advertise services and events.

Some of this work, especially the quantitative information, is already being gathered and disseminated by libraries, but improvements could arguably be made in web design, delivery, and general advertising techniques.

Greater emphasis needs to be placed on the library as a virtual presence rather than as a physical site that requires constant visits in order to be useful. It must be accepted that with changes in technology, some of the on-site users who were previously forced to use the library are not going to return sometime in the future. Libraries can and should make the best possible use of space, but that space is no longer the most important asset for information service. Librarians also need to re-educate their users and the wider public about how the twenty-first century library is helping users find what they need. Instead of publicly

lamenting a decline in gate count, libraries can emphasize increases in electronic usage and more appropriate uses of physical space, such as providing the unemployed or those in poverty with free access to the Internet via on-site computer workstations.

Libraries also need to tell their story using qualitative information to highlight new services and their impact on higher education or other research and educational activities. A twenty-first century library is much more than the sum of its collections. The role of information specialists in supporting complex research projects, assisting first-year students with information literature, and assessing emerging technology needs to take center stage in narratives about the library. Also, the contributions of personnel behind the scenes and the infrastructure required to support their activities also has to be brought out in the open.

From embedded librarians to strategic partners in higher education

Embedding librarians in classrooms, both physical and online, has increased the role of reference librarians and subject specialists in higher education. The embedded model has many advantages for both students and librarians. Librarians are very familiar with course assignments and many research needs well before students consult them because embedded librarians participate in some classes and are sometimes designated as co-instructors. Apart from saving time and reducing possible misunderstandings between librarians and users when immediate assistance is needed, students also have the benefit of asking multiple questions of a librarian who is already familiar with their objectives and who can help them to improve their research strategy over an extended period of time. Drawbacks to this strategy include that it can be very time consuming for librarians, and some institutions are not equipped to provide all the staff time necessary to cover all needs. Librarians must also work to overcome possible friction with disciplinary instructors (Hoffman, 2011). Nonetheless, there is accumulating evidence of the popularity of these services among students such as a Capella University Library study that revealed a 400 percent increase in reference transactions in 2007, the year that a new embedded librarian service was initiated (Bennet and Simning, 2010).

Libraries need to become strategic partners with administrators and faculty on campus. Some academic libraries have already begun doing this through partnerships in data management, broad discussions about

information literacy and learning, and the rising Open Access movement for scholarly publications. Libraries that are already doing this important work need to stay the course, but also intensify their efforts, especially in the following areas: (1) digital repositories and archives that serve the parent academic institution as well as the library itself; (2) metadata for new interdisciplinary fields as well as new research lines in existing disciplines; (3) electronic textbooks as well as e-books in general; (4) the assessment and investment in emerging technology; and (5) technology support for faculty, staff, and students.

Within the health and medical sciences, the Medical Library Association developed a model called the Information Specialist in Context (ISIC) in which an informationist with training in medicine or science and information science would be embedded in clinical research and medical teams. A study of the effectiveness of these information specialists in the National Institutes of Health (NIH) was conducted using a baseline survey in 2004 with a follow-up survey in 2006. The authors of the study were cautious regarding their conclusions, but responses were quite positive about the program overall. Eighty percent of respondents would use the service again in 2004 while that number rose to 100 percent in 2006; 58 percent of respondents thought that information specialists reduced their workload burden in 2004 while that number rose to 89 percent in 2006 (Grefsheim et al., 2010).

Lin Wu and Misa Mi have developed a five-level model for measuring the level of integration of Health Science Librarians into academic programs on campus. Level 1 consisted of roles and activities restricted to the library with reference service and collection development. Level 2 would comprise the development of research guides, standalone instruction sessions, and occasional participation in courses as a guest lecturer or speaker. Level 3 would integrate the librarian into higher education as a team member or collaborator with co-instructional responsibilities, collaborative workspaces, and inclusion of library instruction into the course curriculum. Level 4 would mean that librarians would serve as faculty in the library with the freedom to develop and teach courses, and advanced professional service as provided by clinical medical librarians and consumer health librarians. At Level 5, librarians would hold faculty status in other academic units outside the library and collaborate with other non-librarian faculty on research, the development of educational programs, grant writing, and share physical space with other faculty and students across disciplines. Different levels of knowledge and skills would be required for each level ranging from general knowledge of faculty and student research

needs at Level 1 to extensive subject knowledge in Level 5 (Wu and Mi, 2013). This model is somewhat problematic in that excellent service as an information specialist does not necessarily require dual appointments or faculty appointments outside the library to provide excellent service. Also, appropriate influence over the curriculum does not necessarily amount to co-development of all aspects of curriculum, but the ability to address concerns unique to information science. Nonetheless, this is an interesting and thought-provoking model that advances discussion. Many points raised such as the need for greater specialized training for subject specialists seem indisputable.

An example of greater cooperation between librarians and faculty in multiple disciplines would be Purdue University's Instruction Matters: Purdue Academic Course Transformation (IMPACT) program. IMPACT integrates active-learning into foundational courses. Purdue librarians, involved at all stages of planning for the program, decided that embedded librarians needed to focus more on the overall learning process itself rather than simply teaching information literacy. IMPACT librarians would help instructors design goals, approaches, and assessment of pedagogy using their unique professional perspective (Maybee et al., 2013).

Libraries face direct competition from other professionals in information management when it comes to online archives and digital records, but a properly staffed academic library has many natural advantages compared to other archival units, and librarians should not be shy about trying to capture locally produced information assets. Librarians should talk loudly and often about their competence in gathering, storing, preserving, and describing digital records. If an independent college or university archives unit exists or if other some other unit currently stores institutional electronic or digital records, the library should try to capture it. If it does not exist, the library should create it. There are many options for setting up institutional repositories, including services provided by vendors, so even small academic libraries should investigate what is available.

Metadata in the twenty-first century is increasingly complex and multi-layered. The original creators of information, librarians, and users are all responsible for applying different layers of metadata, but librarians have a special responsibility for making sure that metadata applied to any specific information object is properly descriptive and sufficient to make content discoverable for as many possible uses of that information as possible. Catalogers in the nineteenth and twentieth centuries tended to assume that creating one good record according to the ACCR2 rules

should be sufficient, but metadata will have to be applied over and over again in the twenty-first century. This is partly because of changing formats and preservation needs, but also information that is created for one purpose can sometimes be put to purposes that were not anticipated or even well understood by the original creator. A simple example might be one in which an academic paper about a volcanic eruption that includes GIS data about the dispersal of ash and toxic gases could later be used in other studies. Another scientist in the future might use the same GIS data in a paper about the impact of the volcanic eruption on public health. Yet another scholar might write a paper about changes in land use and/or property values. Users may or may not be aware of this volcanic eruption as they conduct other research about the same geographic space in the future, but if the value of the original research is understood by librarians to be of possible value to researchers in other disciplines then metadata, including controlled vocabulary, can be applied to make it more likely that this useful information will be retrieved. Instead of waiting for users and social tags, librarians might want to consider creating multi-layered metadata and revising records as needed. Most records would not require additional work, but a few information sources, especially data sets, might require multiple layers of metadata.

Somewhat slow to adapt e-books, many libraries have not been particularly active in campus discussions about electronic textbooks. Both higher education and K–12 schools in the USA have begun serious exploration into permanently replacing print with digital text. Libraries need to be part of this larger discussion to ensure compatibility in format and service for library e-books and electronic textbooks, but librarians can also share and demonstrate their expertise in information management. Libraries can volunteer to assist with testing new technology, conducting usability studies, and gathering feedback from users. Whenever license agreements permit, libraries can also offer to preserve copies of electronic textbooks and related materials for future reference. Librarians can also work to ensure that user rights and privacy are protected as e-books could permit greater surveillance of reading habits and other uses. Both academic and public libraries should investigate how they can work with their respective user communities to promote appropriate uses for electronic textbooks.

The assessment and investment in emerging technology by campus IT should also be of concern to the library. While colleges and universities have many websites with a lot of diverse activity, much of the online activity is now conducted on library sites or sites that are somehow

affiliated with the library. While it may still be counterintuitive to some, the library is one of the largest stakeholders in university IT. To ensure compatibility and provide the best possible level of service to faculty, staff, and students, the library should be consulted about the adoption of new hardware and software, especially in terms of potential impact on information services. Large academic libraries need to ensure that they include both IT professionals and emerging technology specialists on their payroll and that a constant dialogue is maintained between library specialists and IT professionals of their parent institution. Likewise, public libraries could play an increasing role in assisting K–12 institutions and other community organizations to adapt to new technology, especially when school libraries face budget cuts.

A final word on the librarian and competing professions in the twenty-first century

When all is said and done, the term “librarian” is just a word. Arguably, society still needs organizations called libraries in order to ensure the widest possible access to accurate and useful information, especially academic libraries, but libraries no longer hold a monopoly on providing information access and will never get it back. While the future may bring even more substantial and lasting changes, the library of the early twenty-first century is no longer a building or limited to a place, but an organizational structure composed of skilled professionals who provide access to information, educate users, and provide other information services that are ultimately derived from their knowledge and expertise rather than particular resources or collections. To survive as a distinct professional group, librarians have to change, but if librarians cannot change or refuse to change, other groups will likely emerge that may fill important roles vacated or neglected by librarians.

Developments in informatics look particularly promising as potential replacements for library and information science as we know it today, but there are several reasons to try to reform librarianship rather than waiting for other currently established or newly emerging disciplines to fill in the gaps. One reason is that the overall cost in time, money, and other resources to society would be lower if existing organizations and personnel can help guide the transition from print to electronic resources rather than creating entirely new institutions to serve as information service providers. Libraries also have a tradition of autonomy, providing services to, but not entirely directed by or beholden to the clients whom

they serve. Dense networks of library consortia, active engagement in local, regional, and national professional organizations, as well as active lobbying for access rights and legal protections for libraries and users indicates a strong tradition of civic consciousness among librarians that does not seem quite as pronounced in records management, documentation, museum studies, or other information disciplines, at least not to date. Librarians will need to work hard to reform their own profession or work very closely with the profession(s) most likely to replace them in order to preserve these valuable aspects of information service.

Solving the problem, part 2: reorganizing libraries to serve users

Abstract: The chapter discusses the role of library as place vs. library as organization, the phased de-accession of print and other physical materials, the systematic reorganization of personnel into new functional areas, and the development of the virtual library or the web presence of the library. A detailed discussion of how fully electronic libraries might be organized with sample organization charts is included. Traditional technical services will be replaced by electronic resources management while circulation units are replaced by more streamlined operations management. Overall, more highly trained professionals and advanced paraprofessionals will take the place of clerical staff or other lower skilled positions made redundant by automation, more advanced technology, and demands for new services.

Key words: collection development, de-accession of print, electronic resources management, library as place, library organization, technical services, space management in libraries.

Contemporary libraries need to be organized with the assumption that the most useful information exists in electronic format and what is not available in this format must become electronic in order to be useful. There are exceptions, of course, most notably special collections, archives, and museums that preserve rare print resources and other information objects as types of physical relics. There will usually be a value in human civilization for preserving some physical evidence of the historical record, but even the objects stored in these specialized facilities will require electronic description and perhaps extensive electronic

copies of the most relevant information contained in these objects in order to be of value to most individual users.

Of course, there are sharp limits to what should be retained in terms of physical information objects. One could take as an example the homes of famous individuals that have been turned into museums. What if the powers that be decided that many more homes should be preserved exactly as is for cultural, political, or economic reasons? We value the historical record, but do not want to live in museums, and most of us only occasionally visit. Despite nostalgia, the idea of forcing half a large city to forgo electronics while allowing the other half to pursue contemporary technology would strike most observers as ridiculous. Retaining legacy print collections and associated organizational structures risks turning libraries into museums. Splitting the library in half with some units and individual professionals modernizing while other important functions and responsibilities are simply dropped or otherwise neglected is not viable either. The library, encompassing the entire range of information service functions, needs to modernize.

Reorganizing to optimize electronic resources management

Assume that print materials outside special collections or archival units are indeed legacy collections and not for any type of routine use, what would the library look like? How would it be organized? First of all, the library need not be physical at all in the sense that collections require no physical support apart from the aforesaid special collections materials. Small special libraries or some media centers in secondary schools might consist only of office and meeting space without the need to spend money on additional costly facilities outside the primary function of the institution being served. The librarian in these situations is a true information specialist who both ensures that their particular clientele of users is well supplied with appropriate information and also provides personal assistance and instruction as needed.

Libraries that serve larger and more complex organizations and user groups will still require a significant physical presence in terms of space dedicated to information management and access, but the space will not consist of book stacks or other storage facilities for physical information. Special collections and archival units will be the only exception to this rule. Space needs will be determined by the physical needs of users and

the operational needs of library staff. Most usage of the library will take place off site, but users can still benefit from in-person meetings with librarians, collaboration with other users, and access to technology or other information tools that are housed in the library itself. Library personnel who manage information require office space, meeting rooms, and access to specialized technology and tools to do their work as well.

Matching personnel to work requirements

Nineteenth- and early twentieth-century libraries, home to extensive print collections, required a wide range of skills to operate. While some librarians were run by volunteers or non-degreed personnel, most large academic and public libraries developed a hierarchy in which professional librarians managed support staff. While specific titles and responsibilities were subject to local variation, libraries tended to be organized into separate units along functional lines with a much smaller managerial group presiding over the work of a larger labor force that usually possessed less education and fewer skills. Collection development, reference, and cataloging were almost always managed by professional librarians while acquisitions, circulation, and book stacks sometimes were. Acquisitions and book stacks units might be presided over by only a few librarians, if any, while different levels of support staff sometimes managed each other.

Computerization and other forms of automation have drastically reduced the total number of support staff, but a lot of work in libraries remains focused on processing physical items and performing relatively simple repetitive tasks. Downsizing has largely been driven by crisis, especially budget cuts and other administrative actions, rather than a strategic assessment of changing needs by librarians. As usage of electronic resources continues to rise and print usage continues to decline, libraries have suffered extensive cuts. It is a problem that some libraries continue to fund outmoded positions while being unable to support important new areas of work for libraries. Keeping additional circulation and acquisitions clerks on the payroll means less money for electronic resources management, emerging technology, data management, programmatic assessment, and advanced subject specialists in areas such as bioinformatics. This is not to say that libraries can simply or easily make this transition or that all rational cost-cutting efforts will be rewarded with additional or flat budgets. Libraries can seldom simply surrender redundant positions while expecting more funding for

new positions. It is also likely in some cases that the net cost of new professional positions is higher than that of support staff positions that may be given up, but holding onto unnecessary and outmoded work is increasingly untenable as users continue to shift to electronic resources.

Public vs. technical services

A problematic approach to downsizing is most obvious when it comes to consideration of how public and technical services have evolved in libraries over time. Rightsizing, sometimes a painful and misleading euphemism, is nonetheless the correct term for what libraries should do if a systematic and well informed effort is made to improve service for users. Rightsizing in libraries would mean that all important functions that are required to provide appropriate information services for a unique clientele or user group would be made available by the library. There is no magical formula, but if a library owns a large rare books collection then it stands to reason that some level of local and on-site expertise regarding special collections and/or rare books is required. Likewise, a library that provides electronic resources has to consider how important functions such as troubleshooting, web design, and the negotiation of complex license agreements are going to be carried out. Most functions will require a judicious mixture of automation, outsourcing, and local professional expertise, but these needs must be met, one way or another, in order to provide successful information services.

Some libraries have simply grown their public services at the expense of technical services without considering how many subject specialists or liaisons are actually required to meet local needs while starving technical services and IT of much needed professional positions. Libraries need subject specialists and must continue to develop and intensify their focus on information literacy, but not at the expense of other critical functions. For medium and large academic libraries, it is as important to track changes in technology, copyright law, and metadata. Subject specialists or liaisons must still juggle multiple responsibilities and have awareness of many different aspects of library and information science, but libraries need advanced specialists in other functional areas in order to adapt more quickly to new technology, apply professional methods and workflows to the library's web presence, negotiate cost-effective contracts with appropriate license terms, and manage data.

The old distinction between public and technical service is of limited value when one considers positions such as the electronic resources

librarian or the emerging technology librarian, but it should be accepted that some librarians will work directly with users and others will need to apply their expertise mostly behind the scenes. A contemporary metadata specialist will not and should not work quite like their MARC cataloging forebears, but it is still likely that metadata specialists will work less often with users than liaison librarians. So, in some sense, there will continue to be a front end and a back end for many library functions. What must change, however, is there must be greater coordination and communication between different functional areas. Some of this coordination must be vertical and come from administrative layers above the functional experts in institutional hierarchies, but some of this coordination must be horizontal and rooted in unique contributions to common objectives.

Troubleshooting electronic resources access problems, a function that many libraries do not yet carry out very well, is a good example of how public and technical services specialists must communicate and work together, but in distinct roles applying different expertise. Subject specialists need to have a solid grasp of information resources in their respective subject areas, but also a general sense of how the library's technology, including electronic resources, actually works. Liaisons should know how to troubleshoot basic problems, and many clever librarians will no doubt learn more, but technical services specialists, professional and/or support staff, need to update the proxy server, check and update administrative settings in vendor websites, and contact vendors for problems that require outside intervention. More technical problems, including those unique to particular computers or mobile devices, will likely require or at least be resolved more quickly with professional IT intervention. Providing good customer service and being able to interact with users is required of all personnel involved in troubleshooting regardless of their specific responsibilities and training.

Mapping out formal and informal communication pathways, joint workflows of various kinds, systematic documentation for assessment and service improvement are just some of the many ways in which public and technical services specialists must begin to coordinate their work in the twenty-first century library. All library personnel must support the common mission of providing information services through their respective areas of specialization while adapting to constant change. Constant evaluation and course correction will be necessary to stay moving toward strategic goals provided by a nimble library administration advised by appropriate committees, councils, and task forces.

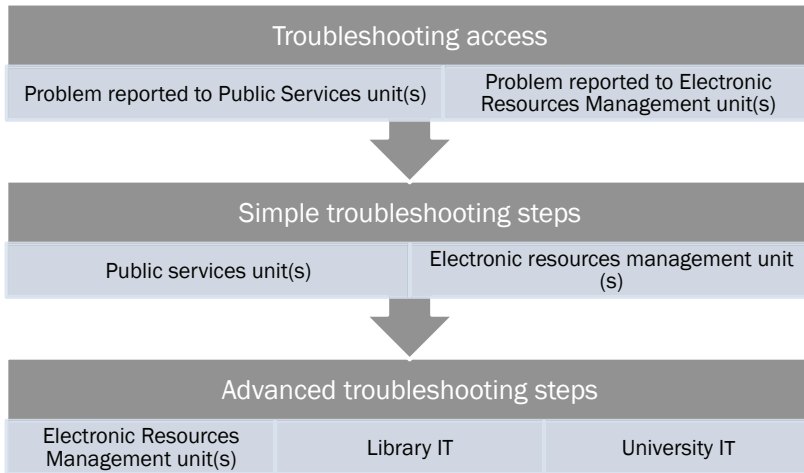
Organization for service

Many libraries are organized to provide services in silos, but organizing for service means rethinking library organization to meet user needs. Human resources and other legal requirements require clear lines of authority with appropriate supervision and reporting lines, but contemporary libraries have to find the right balance between departmental and unit structures with functional integration for service across units. Librarians have sometimes done this instinctively or experimented with various organizational options, including team and project structures, but contemporary libraries must constantly develop and redevelop appropriate units with newly defined relationships and responsibilities across units rather than settle for an organizational structure that is too ambiguous and undefined, or rigid and resistant to change.

Libraries need to map out workflows across units just as much as within units. Structure is necessary for successful communication, reducing unnecessary work or simplifying routine tasks, fostering accountability, and providing valid information for assessment. Too often, libraries change very slowly and stick to overly rigid administrative structures or simply abandon structure altogether because the problems seem too complex, too fraught with political danger, or simply too time consuming and expensive to solve.

Returning to our example of troubleshooting electronic resources access problems, we can map out which units are responsible in an imaginary academic library system (Figure 5.1). Problems might be reported in person, online, or via telephone to public services or electronic resources management units. Staff members in both areas would be qualified to handle simple problems such as assisting users with clearing their browser cache, deleting corrupt files, and identifying known security or other configuration issues.

If the problem is very easy to resolve, the equivalent of rebooting one's computer, there is no need to log details other than that a problem was resolved. It would be necessary, however, to consider that advanced troubleshooting steps would best be handled by electronic resources management units, including updating the proxy server, contacting vendors to resolve payment and technical issues, and resolving other specific problems with electronic resources. Some problems, however, may be specific to the computer or mobile device of the user, the user's university login, or other IT problems that require assistance from library or university IT (assuming that both exist). Complex problems will need to be logged in detail for future assessment and could reveal patterns that

Figure 5.1 Troubleshooting access problems

result in improvements to technology, software, or configuration options that benefit other users.

Collections and spaces in transition

Given the size and scope of print collections, the potential hardship faced by many loyal and hardworking library employees, not to mention some of the preferences of less technologically savvy users, many libraries will face an extended transition away from print collections rather than a quick, clean, and painless change to new space management priorities. Some information, perhaps almost incredibly in the second decade of the twenty-first century, is still only available in print format. Some academic disciplines and some user groups also seem uniquely disadvantaged in the electronic information universe, so libraries will need to consider how to carefully plan, communicate, and guide a complex transition process.

Samuel Demas and Mary E. Miler have stressed the need for revising and developing thorough collection management plans for twenty-first century libraries. Plans should address how the library's collection fits into the broad context of regional and national priorities, as well as local needs. Such plans should encompass collection goals and strategy, analysis, decision support tools, criteria for retention and weeding,

guidelines for disposition of withdrawn materials, and, last but not least, education, outreach, and communication with internal and external stakeholders (Demas and Miller, 2012). Fully electronic libraries, apart from special collections and offsite print repositories, might not need to engage in systematic weeding, but the overall argument makes sense. Libraries need to plan how to build collections, even virtual collections, in order to maximize scarce resources and coordinate resource sharing with other libraries. Plans must be flexible, however, in order to accommodate constant change in what is available and what users need.

Removing the stacks: managing the decline of print collections

Libraries will not need book stacks outside special collections and archival units in the future, but the future is a rather vague destination for some. Relatively affluent user groups own e-readers, but it is doubtful that this technology is as widely distributed in some poor inner-city neighborhoods or rural areas in North America. Likewise, some working-class and less advantaged parts of the UK, Ireland, and Australia may not be as well plugged into the Internet as robust information resources require. Smart phones may be seen in Afghanistan as the cliché goes, but appropriate technology and software for using electronic information to solve complex problems is less commonly available.

Specific academic disciplines such as mathematics have tended to resist the trend toward electronic resources while the quality of imagery in some online journals and e-books has not met the standards of some artists. Some of the publishers that serve ethnic studies programs, particularly African-American Studies in North America, have not been able to keep up as easily as larger publishers with the transition to electronic information. Some economically disadvantaged users may rely on browsing collections provided by libraries for information and entertainment that would otherwise be entirely unavailable to them.

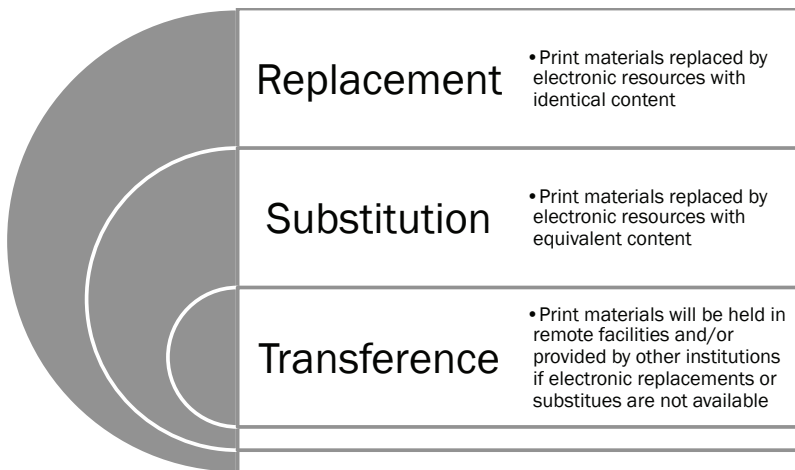
So, libraries need to take a very careful and complete assessment of their primary clientele or user group in order to determine how the de-accession or removal process of print collections should proceed. Large libraries that serve many different types of user will need to consider the special needs of each group in turn in order to craft a strategy so that information is not lost and service is not degraded. While focusing on the needs of their unique clientele, libraries will also need to consider the potential negative impact on posterity and take special care to preserve,

retain, or forward especially rare or unique materials to other libraries to ensure that important information is not lost to human civilization now or in the future.

Many knowledgeable and highly experienced experts in collection development have wrestled with these problems as libraries have adapted to changing circumstances and user needs. For the sake of simplicity and clarity, this author offers a general plan to remove and/or replace print collections that it is hoped that some institutions may find useful in developing their own more detailed plans. Some of the concepts and techniques discussed below will not be new and it is in fact to be hoped that many professionals are already well familiar with these considerations, but that assembling old and perhaps a few new concepts together into one coherent schema could be useful for consideration.

Reducing this process to its simplest elements, print materials can be replaced, substituted, or transferred from the library entirely. An example of replacement would be replacing a subscription to a print journal with its online version. Substitution might include such activities as replacing a print index produced by one publisher with an A&I database that covers the same subject matter that is produced by another content provider. Transference essentially means that facilities other than the library would retain print materials for preservation and future use. Examples of the latter would include remote storage facilities, print repositories shared by multiple libraries or library consortia, or resource sharing in which another library continues to carry the burden of providing access to these print materials (Figure 5.2).

Some librarians may find resistance from various quarters when replacing identical electronic content with print content, but retaining old print duplicates of electronic content usually makes no more sense than buying one print and one electronic copy of an item. Wanting to help others seems to be an almost intrinsic trait among those who choose to serve as librarians, but accommodating fear or resistance to change among users is not helpful. Only users who have disabilities or economic disadvantages that might somehow reduce or prevent their access to electronic information should be accommodated. Furthermore, all accommodations involving the retention of print materials should be considered temporary with an eye toward the pursuit of alternative solutions in the future. Long-term preservation of genuinely rare and unique materials and the setting aside of some print materials as representative artifacts of the historical record in special collections, museums, or archives are really the only legitimate long-term exceptions to electronic resources in the twenty-first century. Personal preferences,

Figure 5.2 Stages of transition from print to electronic resources

non-economic factors that extend beyond the needs of posterity, fear of or resistance to change, and simple inertia are not legitimate reasons to delay transition in libraries. Engineers build modern bridges, not covered bridges, so it makes no sense for modern librarians to take a nineteenth-century approach to collection development.

Nonetheless, it is important to undertake the transition from print to electronic collections in phases so as to prepare staff and users for the dramatic changes that will take place, but also to ensure that the library is properly organized to provide the best possible service. If librarians and other personnel cannot provide training, technical support, and other important services related to e-books then the library is not ready to provide large numbers of e-books. Likewise, some content providers still only work with print and large libraries that support specialized information seekers have no real choice but to continue providing some print services.

Local conditions, the unique characteristics of distinct collections, personnel, not to mention political and economic factors, make it impossible to provide a one-size-fits-all approach to this transition, but it is possible and necessary to offer a representative model that can perhaps be adapted or modified as needed. This transition will necessarily occur in phases, but the exact pacing and procedures will vary. As a model for consideration and adaptation, I present nine phases for transitioning to a primarily electronic collection in the library.

Phase I: rationalization of new acquisitions

- Electronic format is preferred for all new acquisitions/physical materials are only acquired when information is not available in electronic format.
 - Print portions of print + online subscriptions and any other physical materials attached to electronic resources are discarded if electronic only format is not available.
 - No print books or other physical materials are accepted as gifts unless these materials are worthy of inclusion in special collections, rare books, or other archival units.

Phase II: de-duplication of print serials

- Print serials and book series that are duplicated by electronic collections are removed from the library.

Phase III: de-duplication of microforms

- Microfilm, microfiche, and other microforms that duplicate electronic collections are removed from the library.

Phase IV: de-duplication of media (CD-ROM, DVD, Blu-Ray, etc.) and AV collections

- Media and audio-visual (AV) collections that duplicate electronic collections are removed from the library.

Phase V: removal of commonly held serials

- Serials that not available in locally accessible electronic collections, but are held in print repositories or otherwise available to users from other sources are removed from the library.

Phase VI: removal of commonly held monographs

- Monographs that are commonly held or stored in repositories are removed from the library.

Phase VII: review and processing of local collections (for example, dissertations, theses, yearbooks, and other locally created materials held in the regular stacks)

- Legal requirements and historical responsibilities for collecting materials are taken into consideration, especially for any materials that could be considered as institutional or community records.
 - Local collections are assessed for their value as institutional records and contributions to the greater historical record.
 - Materials are separated into categories for destructive and non-destructive digitization (replacement by electronic format), retention in repositories, or retention in special collections or other on-site archival units accessible to specific categories of users.
 - Materials that have no value as records, legal requirements for retention, or are otherwise deemed unsuitable for digitization or retention are destroyed.

Phase VIII: moratorium on the acquisitions of all new print, media, AV, and other physical materials

- Library ceases buying, leasing, renting or borrowing physical materials.
- Resource sharing is provided in electronic format or in print copies that may be retained by the user.

Phase IX: review and processing of all remaining physical materials held in regular stacks

- Remaining serials, monographs, media, AV, and local collections are removed from the regular stacks and transferred to special collections, archival units, or repositories.
- Regular stacks are closed and space is reassigned to other library functions.

Rationalization and de-duplication are undertaken during the early phases because these steps are likely to be less controversial and there is less concern about the loss of potentially useful information. It is also easier to move forward with serials before books because those users who still prefer print already find it more convenient to print out articles discovered online rather than go to the library to scan or make

photocopies. The treatment of media and AV collections may require some modification depending on local needs, but given improvements in streaming video, not to mention the increasing use of mobile devices without the ability to use CD-ROM or DVD, it is unlikely that the library will want to continue to host these types of collections as the de-accession of print materials continues to its logical conclusion.

Print materials that are commonly held, but not available in electronic format, will need to be transferred to a dedicated repository or other remote storage facility with suitable environmental controls and provisions for accessibility. Essentially, these facilities will serve not only to extend the physical life of print, but also as holding stations for materials that may be subject to non-destructive digitization in the future. Since these facilities are expensive, it is likely that most libraries will have to share space. The total number of commonly held print materials will decline, but access will still be provided to users. Digitization on demand and cooperative agreements with publishers and copyright holders (some of whom may no longer have access to works that they own) will enable libraries to make content more widely available if some books stored in these repositories later become more highly desirable. One can imagine future historical studies and/or interdisciplinary research addressing questions not yet considered that may make this material relevant again, but most material stored in the repository is not likely to be highly used if someone has not yet found a reason to digitize it.

During the transitional phase while print and other physical materials are being de-accessioned, libraries need to revise gift policies and stop receiving donations of other unwanted materials, no matter how well intended by the donor. Leaving aside exceptions for rare books, libraries need to forward donations to print repositories or simply refuse to accept these materials. Book sales and other special events based on the use of physical materials also need to be discouraged. As users of all types begin to reduce their own print collections they may be tempted to impart their items to libraries. Good librarians and healthy institutions are also capable of saying “no” when even well intentioned actions violate the principles of their mission. Contemporary libraries cannot afford to view the book as a sacred object. Only the information that the book contains should be sacred. Many books are going to be recycled or destroyed in the twenty-first century, but this is not the same thing as destroying information as it truly was in the past when print was one of the few mediums suitable for long-term preservation. Libraries will have enough problems reducing the size of their own print collections

and meeting their new responsibilities as electronic information service providers without adding unnecessary burdens.

Repurposing and retraining staff dedicated to managing print

Some professional librarians will have difficulty adapting to a new model based on electronic resources and its related services. Some of those questions have been or will be addressed in other parts of this book, but support staff, particularly support staff whose work is derived from print collections could have a difficult time. Given the loyalty, hard work, and many years of service that some library staff members will have provided it is understandable that many librarians want to protect jobs and sometimes even delay changes that may hurt economically vulnerable workers. Librarians need to balance the worthy goal of helping staff with their responsibilities to users and the wider community that supports libraries. Given scarcity, librarians need to understand that maintaining redundant or unnecessary workflows is starving funding for necessary work inside and outside the library. This does not mean, however, that there is no moral obligation to support staff whose work is made redundant by change. Professional librarians, other professionals in the libraries, and supervisors need to be judicious in reassigning work and identifying opportunities for retraining, and provide whatever other assistance is available to staff members who previously managed print resources as these materials are removed from libraries.

First of all, administrators and other leaders in libraries need to accept that this transition is occurring and stop hiring staff for positions that may no longer exist in the near or medium term. Simple and repetitive work should be automated, outsourced, or assigned to volunteers, students, or even temporary workers depending on the specific characteristics of each unique library. Some library support staff members in large libraries have worked for decades in positions that required relatively simple forms of work. Examples include the full range of physical processes involving books such as opening boxes, shelving, filling out paper forms, delivering print items to users, and checking out books. This type of labor, essentially unskilled, is increasingly too expensive to maintain for full-time employees. Workers lacking in skills sometimes also lack initiative, intellectual curiosity, and adaptability. These traits are all required in contemporary libraries given constant change in technology, evolving user preferences, constrained budgets, and the need

for developing new services. Some libraries find it necessary to delay or compromise new initiatives, necessary for survival in an increasingly competitive information sector because of the problem of integrating unskilled labor into change management.

Library employees who show initiative, a genuine enthusiasm for helping users, and want to learn new skills should receive encouragement and financial support whenever possible. Newly open and existing positions that manage print resources should be converted into positions that improve electronic resources management, customer service, supervision of student workers and volunteers, as well as other forms of technology support for users. Workers can be trained to test functionality of electronic resources, mobile devices, and other online platforms to improve the library's tutorials, as well as overall strategy for technology implementation. Instead of having employees check out books, retrain workers in how to provide direct assistance to users with disabilities, answer basic reference questions, and troubleshoot basic problems with computers, printers, and mobile devices. Digitization or the conversion of print content into electronic is desperately needed given that print information is increasingly unused, inconvenient or hidden from users. Scanning work, applying basic quality control, and even some forms of metadata should be within the reach of most employees provided that appropriate professional expertise and supervision are made available for complex projects.

Some practical examples of new work that can be undertaken by staff in electronic resources management include the following. Mississippi State University Libraries created an interactive form to check electronic journal holdings and test access proactively in the hope of finding and correcting problems before users do (Han and Kerns, 2011). Testing how well information resources work was never an issue in the print era, but it is a necessity when working with electronic resources. Too many libraries continue to acquire, activate, occasionally brand, and then leave their electronic resources virtually untouched unless a user finds a problem or something comes up during an instruction session or the occasional usability test. Fortunately, some testing routines are simple enough that high skill sets are not necessarily required and this could be a means of helping some clerical staff hired under an outmoded set of expectations to remain productive in a fully electronic library.

As a practical matter, learning commons and other more innovative uses of library space cannot be proctored by unskilled or semi-skilled employees. Librarians, other information professionals, IT experts, and in some cases IT students and volunteers, are needed to provide a higher

level of service because the future of libraries is rooted in applications of technology to discover and use information. Units that are primarily responsible for managing print will need to reorganize or disband so that the library can afford to support electronic resources, information literacy training, and other forms of instruction properly.

The best strategy for most libraries when it comes to reassigning personnel who manage print in the twenty-first century would be to: (1) stop hiring permanent benefits-eligible support staff whose work is likely to become unnecessary in five to ten years; (2) work with currently employed staff to find new ways that they can contribute to the success of the library; (3) provide retraining on the job; and (4) facilitate advancement whenever possible. Many libraries, especially academic libraries, already do this, but every vacant position should be reviewed and reclassified as needed.

Finding the appropriate space for the library

Print libraries have historically encompassed book stacks and reading rooms, as well as office space and room for physically processing materials. Leaving aside special collections, browsing collections, and other specialized areas, this basic pattern holds true for most nineteenth- and twentieth-century libraries. It should be assumed in the twenty-first century library that print will not be stored anywhere on site except for special collections and browsing. Libraries will need to consider how all of their stacks space should be reassigned.

Space in libraries should serve the following general purposes: (1) work and meeting space for library personnel; (2) housing technology infrastructure for library information resources; (3) technology infrastructure for users in the form of computer labs, learning commons, and smart classrooms; (4) service points that facilitate comfort, convenience, and efficiency for users in working with information resources provided by the library. A fifth area of consideration for some libraries would be special collections or archival units with environmental controls. Depending on the size and scope of collections, as well as the size and skill sets of special collections units, these types of units could be located in close physical proximity to other library units or physically separate from the main library facility. Finally, some libraries may wish to consider maintaining small browsing collections of print materials partly for marketing and partly for aesthetics in lounges

and reading rooms, but these collections will also likely disappear from the most advanced libraries.

The Library & Information Science Library at the University of Illinois at Urbana-Champaign closed its physical doors for good in May 2009, but professional personnel continued to provide full electronic service through a virtual LIS library. Declining on-site usage, including hourly head counts and on-site reference activity, precipitated this change. Faculty members and students were surveyed prior to closure and some were opposed citing their concerns that this move indicated a decline in support for LIS services. The most important services cited by those who wished to maintain the physical library were “one-stop shopping, the ability to browse, an environment conducive to research and study, and access to knowledgeable, helpful librarians” (Searing and Greenlee, 2011, p. 282). As a practical matter, disbanding the physical library led to the dispersal of the collection to other library facilities and transfer of some personnel, but the LIS Librarian, one support staff member, and a temporary graduate assistant continued to provide specialized service to LIS users. A new service model was developed that was intended to be both more digital and more personal with students having ready access to remaining staff in the same building where LIS classes were held (Searing and Greenlee, 2011).

A post-closure survey revealed that opinion was divided with sizeable numbers of faculty and students finding no fault with the new virtual LIS library while others saw considerable drawbacks. Some positive features cited by faculty included use of the LIS library website to keep track of new resources that were listed online. Many did find it more convenient to interact with the LIS librarian who now kept office hours in the same building as the Graduate School of Library and Information Science (GSLIS). Despite concerns about missing the ability to browse collections physically, nearly 40 percent requested delivery of physical library materials from the main library and other remaining physical sites while only a little more than 20 percent opted to retrieve materials themselves. Also, nearly 40 percent of LIS faculty members looked for online copies of books or e-books instead (Searing and Greenlee, 2011).

It is useful to consider some examples at this point. Some of the earliest proponents of fully electronic libraries are found in Science, Technology, Engineering and Mathematics (STEM), more specifically engineering libraries. The Fiedler Engineering Library at Kansas State University opened in 2000 with a predominately electronic collection, but still includes some print reference works and serials not available in electronic format. Given that most information in engineering is current

and useful for only two-and-a-half to seven-and-a-half years depending on the particular subject area, an electronic collection was deemed to be easier and more convenient to manage than print. From the start, Fiedler was developed with technological infrastructure in mind with computer workstations, wiring appropriate for heavy use, and a robust wireless network (Trussell, 2004). Providing information literacy training, instruction in the use of technology, good working relationships with IT, as well as continuous upgrades of technology, and the ability to provide just in time delivery of information were just some of the challenges that librarians faced in developing electronic services (Trussell, 2004).

The Frederick Emmons Terman Engineering Library at Stanford University is embedded in a newly developed engineering quad of eight acres and intended to serve a population in which graduate students outnumber undergraduates four to one. Print materials have been reduced by 85 percent and the collection is intended to become entirely electronic in 2022. Flexible seating arrangements, 11 computer workstations, and a laser printer constitute the heart of the facility and are surrounded by ten study carrels, four public kiosks, and seven study tables. Graphing calculators, a TI-84 and TI-89, as well as Kindles and Sony eReaders are available for checkout. While the library does not include a café, it is physically located on top of Forbes Family Café and Ike's Place in the same building. Four subject specialist librarians and three full-time equivalent (FTE) support staff manage the facility with staff sitting in open cubicles to be more accessible to users (Edelson, 2010).

The University of California Merced, which opened in 2005, is the newest member of the University of California (UC) system. Constructed with current needs in mind rather than tradition, the Leo and Dottie Kolligian Library has no reference desk. Students and paraprofessionals answer simple questions at a general Service Desk while deferring more difficult questions to librarians. Librarians can respond immediately if available or make appointments with users to provide further assistance (Davidson and Mikkelsen, 2009). According to the library website, the collection comprises approximately 70,000 online journals, 580 databases, 102,000 books, and 3,965,000 online books, albeit 3,150,000 are made available from HathiTrust (UCMerced Library, 2013). Leaving aside the large HathiTrust contingent, the UC Merced Library offers 815,000 online books, approximately eight e-books for every one print book in its local collection. Resource sharing with its sister campuses, not to mention the California Digital Library, provides access to more than 36 million items.

The University of Texas at San Antonio opened the Applied Engineering and Technology Library (AET) in 2010, a completely electronic operation with no books. A total of 425,000 e-books and 18,000 online journals were made available to serve faculty, staff, and students of the College of Science and College of Engineering. Overall, student reaction has been favorable to the 80-person capacity facility citing the greater convenience of working with entirely electronic collections and the fact that engineering and science librarians seem less distracted by problems of managing physical materials (Fish, 2010). The AET is a successful and highly used facility with over 1900 visits per week while classes are in session, but perhaps more impressively, over 500,000 e-books were circulated in 2012. The AET Library is organized for user convenience with ultramodern furniture, ten desktop computers, a printer, scanner, and five large LCD screens. Study group niches and three group study rooms foster collaborative academic work. To encourage the use of e-books, e-readers are available for checkout that are already pre-loaded with both popular and STEM research titles (Scharnberg, 2013).

An example of a new public library with an entirely electronic collection is BiblioTech, a new facility that opened in Bexar County, Texas in September 2013. Located outside San Antonio, BiblioTech uses the 3M Cloud Library, an e-book lending service developed for public libraries. Users can browse e-book selections on touch-screen discovery stations located on site and then download content to their own devices. BiblioTech has a modern informal arrangement of space that includes multiple computer workstations and a coffee shop, but no physical library materials. Many residents of Bexar County are low-income and BiblioTech is the first public library to serve the area. Notably, the overall cost of establishing a new electronic library was cheaper than creating a traditional public library because of its smaller size. To help bridge the digital divide, BiblioTech provides 100 e-readers for checkout along with digital literacy classes (Cottrell, 2013).

Academic libraries can work with other academic units to develop innovative classroom or learning spaces. The Parrish Management and Economics Library at Purdue University recently underwent a complete overhaul that removed nearly all print materials and refurbished space to include both quiet and social learning areas with comfortable furniture and ready access to technology. The LearnLab facility within Parrish is a 40-seat instructional computer lab that includes three multiprojection smartboards, dry erase boards with a digital camera to record what has been written on the boards. Seating is organized into clusters or pods in which students are able to face and directly interact with each other.

There is no front of the room or other privileged direction for study and interaction, so the LearnLab is a multidirectional space (Doan and Kirkwood, 2011).

The Art, Design and Media Library of Nanyang University in Singapore opened in 2007. Other libraries on campus lacked computer workstations, partly because of the large number of computer labs already on campus, but the Art, Design and Media Library provided multiple computer workstations. Other features included moveable seating, a glass writing wall, and a “wall of contention.” The latter feature was a glass window on which an LCD projector from inside the library was used to display contentious and attention grabbing images and text to those outside the library entrance in order to attract potential users (Anandasivam and Cheong, 2008).

Public libraries have also been experimenting with new ways to organize library space with the same goal of increasing convenience and comfort for the user. Dunedin Public Libraries in New Zealand opened a new Teen Space, which included leather sofas and arm chairs, bean bags, vending machines, dining tables, a widescreen TV, and listening posts for music. Library infostations were also embedded in what was intended to serve as both a social and learning space. The net result appears to be an overall increase in library usage by teens (Su, 2008). Turning to another example regarding the same user age group, the Glen Allen High School Library in Virginia was redesigned to emphasize the learning commons approach with an emphasis on learning as a social activity leveraging technology. Library space was organized into a more formal instruction area and an informal social learning space using low book stacks to mark the boundary. Laptops, interactive white boards, LCD large screen monitors, and projection were made available for student use in the commons space. Glen Allen also decided to combine technology instruction with other library functions, embedding the school’s Instruction Technology Research Teacher inside the library (Martin et al., 2011).

The move toward less formal library spaces is almost universal. Perkins Coie LLP reduced the square footage of their law library by 30 percent, but opened up space to natural light with glass walls and comfortable furniture that included fabric easy chairs, large worktables, and other ergonomic seating. Half-height book shelves made space for art. Satellite libraries outside the main library that had previously existed in separate rooms were integrated into hallways (Eaton, 2013).

Most large libraries should be able to reduce the total amount of space necessary for routine operations due to the loss of book stacks. Since

most libraries were also built before the Internet, careful consideration should be given to the costs of refurbishing old buildings versus building entirely new libraries that are purposely designed with electronic collections in mind. Given diverse local conditions and differences among user groups, libraries will need to find their own unique solutions to space management. Libraries need to consider whether to share space or maintain their own separate buildings, whether to refurbish or build, and how the location of the library may impact user behavior as a result of proximity to other resources valued by users.

There are no perfect answers that will fit all libraries, but it is important to keep in mind that libraries are primarily research centers, not study halls, restaurants, conference spaces or caterers of special events. Nonetheless, libraries should be physically comfortable and provide ready access to refreshments and other conveniences, but cafes, conference rooms, and study rooms should contribute to the overall purpose of the library as an information services provider. It is cheaper for colleges and universities to use other space with appropriately trained personnel to provide for the nutritional, recreational, and social needs of faculty and students. By all means include a café or two, but direct access to technology, support for mobile devices, and access to librarians and other trained professionals comes first. An example would be the case of some contemporary libraries that do everything in their power to increase foot traffic by turning unused book stacks into all night study halls. These nocturnal study centers seldom have trained personnel available during off hours and simply attaching more lounges to dormitories and/or creating more purposefully designed study halls and/or large food courts would be much cheaper for all concerned. Colleges and universities provide many rivals to the library when it comes to teaching, socializing, and conference spaces so the library needs to focus more on what it is uniquely well equipped to do, but avoid extremes. A study of school libraries in Norway discovered that most students used the library to socialize and did not think that using library resources was necessary to complete their schoolwork. The author Elisabeth Tallaksen Rafste argued against overreacting to what could be seen as a negative outcome for libraries. Librarians can co-opt the desire of students to socialize in order to develop a relaxed learning environment in the library that would complement more formal work conducted in the regular classroom (Rafste, 2005).

Changing services

Much of the current organizational plan of libraries in North America was developed during the 1970s when libraries first began to implement automation and computerization. For most libraries, an important underlying assumption was that print collections were the foundation of library collections and services. Most services could be organized into public or technical operations with a typical configuration for large libraries including the following departments or units: reference, circulation or access services, cataloging, acquisitions, serials, preservation, special collections, and systems. Some libraries also included dedicated units based on special material types or collections such as map libraries or AV materials. Public libraries also included divisions or groupings of employees around the age of user groups such as children, teen/young adult, and adult services.

Academic libraries have tended to lead the way in innovation, perhaps because of greater or more reliable funding, and scholarly expectations for some librarians. New positions have been created since the 1970s such as the systems librarian, electronic resources librarian, emerging technology librarian, copyright librarian, metadata librarian, and data management or digital services librarian. Exact titles and responsibilities vary, but libraries have tried with varying degrees of success to integrate such new functions as business negotiation, copyright expertise, digitization, the use of more complex forms of metadata, data management, as well as the evaluation of technology into libraries. For the most part, new technical services functions have been added with small numbers of personnel working alongside their counterparts in more traditional roles.

Public services, at least in academic libraries, has adapted somewhat more quickly with reference specialists increasingly replaced by subject specialists and liaison librarians, although their exact roles and functions continue to evolve. Overall, a greater emphasis on information literacy, instruction, and in-depth subject expertise now takes precedence over general reference. Furthermore, traditional deskbound reference services have been replaced by service at the point of need, especially online service such as reference chat. The University of Notre Dame Library offered a late night reference chat service from November of 2007 through May 2010. Overall, the number of online chat questions fielded during late night hours was comparable to regular business hours, but often the questions were more complex. Service was discontinued

because of staff shortages, not a lack of interest in what seemed to be a popular service with students (Kayongo and Jacob, 2011).

The central problem for libraries is how to complete the transition from print to electronic format in personnel and organizational structure, not just usage. The hybrid library demands a hybrid organizational structure that tends to contribute to confusion, administrative waste, and the protection of a built-in lobby that opposes further change and adaptation to an ever changing information environment. An electronic library will be organized somewhat like its nineteenth- and twentieth-century antecedents in that information is acquired, cataloged or documented, and made accessible to users, but the twenty-first century demands a wider range of highly skilled roles for both professional and paraprofessional staff. Relationships between the library and other institutions, as well as the rest of world, are also much more dynamic and require more careful consideration.

Digitization and electronic records

Leaving aside more complex issues about the library as publisher for the time being, it is safe to write that many libraries will become involved in the conversion of print documents to electronic format or digitization. Libraries may also become increasingly involved in organizing and developing archival systems for electronic records. While there are professional groups that compete with libraries, especially for the latter function, it makes a great deal sense for both academic and public libraries to invest in developing answers to manage electronic records that are created by the routine work and life activities of colleges, universities, businesses, non-profit organizations, and communities. Libraries have many decades of experience in collecting, organizing, and cataloging vast amounts of information received from many different sources. Arguably, libraries are also considered to be reliable stewards of the public record.

Digitization is a complex process that requires professional metadata specialists working in close consultation with subject experts, and sometimes other specialists, to determine how best to organize and document the electronic information products created from print materials. Once the correct metadata standards are applied, the actual process of digitization itself necessarily involves larger numbers of staff at different levels of training to scan sometimes fragile materials, apply quality control, and enter appropriate metadata into descriptive records. While some of the physical work is quite simple, managing metadata

and large projects is not. Knowledge of project management, as well as metadata, and other professional skills are required at the library level in order to conduct successful and cost-effective digitization efforts.

Managing electronic records will require metadata specialists and designated managers familiar with generally applicable laws, as well as any particular rules and regulations for particular sets of records. The technology infrastructure may vary depending upon the precise methods and locations of electronic storage systems, but some minimal number of local IT experts will be necessary, if only to talk intelligently to vendors or other third parties responsible for much of the actual work. Even if a library outsources storage of electronic institutional records, having local experts could help improve the metadata and technical standards for these systems.

Information literacy and beyond

Many librarians now study and teach information literacy to users, both to promote lifelong learning and to support research and education in subject disciplines. Ensuring that users can identify and evaluate information resources is extremely important and it would not be possible to do full justice to the wide range of activities going on in this important area of librarianship and information science. Nonetheless, libraries must also go beyond the work of information literacy as it is commonly understood and consider problems of numeracy and technology literacy.

Librarians need to help users adapt technology to their information needs and must be prepared to teach the use of technology. Furthermore, librarians need to take a proactive approach. All too often libraries are late adopters or struggle to catch up with users when it comes to the latest software, mobile devices, or tools. Again, once libraries and librarians shed the assumption that their primary role is to provide print collections the urgency of keeping up with technology will become more obvious. Recognizing the basic need, some academic libraries have created emerging technology librarian positions. Precise titles and responsibilities vary, but these specialists are generally charged with tracking changes in technology, recommending changes in service for the library, and also either providing direct instruction for technology literacy or working with other specialists to provide such training.

Creating solitary specialists or hiring a few experts is only a first step in adapting to the need for teaching about technology. The library as

a whole needs to change. Personnel responsible for different aspects of information service should integrate functionality and user experience testing into their routine work. Some possible examples would include having staff responsible for activating links to electronic resources also work on checking how the various electronic resources platforms work in practice. Are there new features? Can one download streaming media provided by the library to an iPad? Does this particular full text database work with highly used citation software programs? Subject specialists need to track how well information services are really working on behalf of research and educational programs in their disciplines. Both academic and public libraries need to have a sound grasp of what is being offered to users and make sure to update basic information in a timely fashion. Given the multiple responsibilities of many professionals, some of this work needs to be delegated to paraprofessional staff in order to make the more simple elements of testing and evaluation more consistent and routine.

Libraries, both public and academic, can provide great benefit to users if they ensure that some personnel are well versed in mathematics and statistics. Helping users to sort through data and make sense of the complex mathematics behind advanced scholarly research is a necessary part of information service in the twenty-first century. Librarians in public libraries can help consumers understand and evaluate information that impacts their everyday lives while the academic librarians can pursue even more complex roles in data management on behalf of users.

Librarians can create specialized portals that identify online government regulations and other resources for scientists, students, and other academics to use to increase convenience. Libraries can also help to store, manage, and apply metadata to data sets in order to increase the value of this information and make it accessible to other scientists. By making data sets more widely available, libraries can reduce the total amount of time necessary for other researchers to complete their work and also help to streamline the process of documenting and validating important new discoveries. By helping with the work of managing data, libraries can help promote good science.

Helping users to manipulate information and integrating library services with other services and programs is where the greatest value is to be found, however. Learning or information commons provide the infrastructure for many types of collaborative learning opportunities among students, faculty, staff, and librarians in modern academic institutions. Part of the benefit comes from the simple physical layout of having multiple types of space available in close proximity, thus

enabling students to move quickly from meeting rooms to group study rooms and onto more open social spaces. Technology allows students to receive or discuss ideas and then attempt to learn more directly through their own testing and experimentation. Technology also allows ready communication and collaboration with other users who are physically separated by considerable distance. The commons space within the library promotes organizational learning as the library works with other academic units to foster integrative learning among student users (Beagle, 2010).

Contributions to information management

Librarians are uniquely qualified among information professionals to have the broadest possible view regarding both the sources and value of information to different types of users. Librarians work in a wide range of settings including academic libraries, public libraries, special libraries, archives, museums, and other types of information centers. Leaving aside the question of information science as a separate professional group, there is no other body of information professionals that has quite the same scope that librarians have. Given rapid change in technology and the information explosion, librarians have to work differently than in the past, but the rewards could be tremendous both for librarians and, more importantly, for users.

Further research and improvements in practice are required for metadata, an ongoing and never ending process, but librarians are among the best equipped to manage information to meet the needs of both local constituencies and the wider public. Librarians organize institutional records according to proven methods and categories and help to ensure that documentation is accessible to the needs of a wide variety of academic disciplines in the future.

Librarians should reach out to the institutions and communities that they serve to catalog, store, and make accessible their electronic records rather than conceding this territory to other professional groups. Selected institutional email, electronic documents, and old web pages can be stored and documented by libraries working with IT specialists. Public libraries can offer to collect and store the growing body of community records that are born and live in electronic format. Librarians can also create procedures, in conjunction with legal and IT experts, for the donation and receipt of electronic records from non-profit organizations, community groups, and even private individuals for future storage and retrieval from the library. Many special collections and archival units

have well established procedures for receiving manuscripts and printed papers, but how to receive and store private electronic records is part of the work of libraries as well.

Distance education and more recent phenomena such as Massive Open Online Courses (MOOCs) constitute another potential opportunity and responsibility for libraries. MOOCs allow many thousands of students, virtually anyone with Internet access, to view previously recorded lectures and presentations while participating in asynchronous forums and discussion. Two professors at the University of Manitoba, Stephen Downes and George Siemens, developed the first MOOC, a course called *Connectivism and Connective Knowledge*, in 2008. Initially only open to tuition paying students, instruction was made available to students outside the university free of charge (Scardilli, 2013). Most courses are created on a standalone basis.

Important players in the world of MOOCs include Udacity, Inc., founded by Stanford University professors Sebastian Thrun, Michael Sokolsky, and David Stevens, and Coursera, founded by Stanford University professors Daphne Coller and Andrew Ng, as well as Amazon and Google, which owns YouTube, host to the Khan Academy among other things (Arnold, 2013). Criticism of MOOCs include problems with assessment, the lack of interpersonal interaction between students and instructors given both distance and the very large number of students participating in some courses, and the lack of accreditation. Kerry Wu of Portland State University has encouraged librarians to take MOOCs, learn more about platforms and best practices, explore new forms of pedagogy, and be ready for how MOOCs might impact libraries (Wu, 2013).

Librarians could definitely take many steps to enhance the quality of education provided by MOOCs, but license agreements for electronic resources would prevent widespread and systematic sharing of some services. MOOC students could be directed to open access or other freely available electronic resources, however. Librarians could also participate in and even help to teach MOOCs, volunteering to provide information services for subjects of interest. Of course, librarians can also help by revealing poor or inadequate instruction provided by some MOOCs and alert those who create MOOCs to other problems they might encounter while providing assistance to students. Like other changes and experiments in pedagogy developed with new technology, it is important not to exaggerate positive claims or distort what can and cannot be achieved through specific forms of distance education such as MOOCs. Librarians thus need to help contribute to those MOOCs that

provide positive benefits while helping to police or expose problematic MOOCs. Finally, librarians at academic libraries have a vested interest in reminding users of the benefits of accredited educational systems that have been carefully vetted and are known to provide lasting benefits to graduates. MOOCs can provide very beneficial and stimulating educational experiences, but it is very doubtful that it will replace formal educational systems entirely.

Mobile devices

An important and sometimes neglected area of service for libraries is mobile devices. As of May 2013, according to findings from a Pew Internet Mobile report, 91 percent of adult Americans have cell phones and 56 percent have smartphones. Also from the same report, as of September 2013, 24 percent of Americans aged 16 and older own an e-reader and 35 percent of Americans age 16 and older own a tablet computer (Brenner, 2013). Baker Evans stresses the need for librarians to catch up with how the Information Now Generation (ING) increasingly uses whatever device is ready to hand to access information. Evans found that most library mobile sites provided limited information such as hours, contact information, directions to the library, and the library's traditional catalog or OPAC, but more features for mobile enabled databases, search engines, and research tools were needed, along with the ability to use other library services such as checking real time availability of computer workstations and booking library discussion or study rooms (Evans, 2011). North Carolina State University and Ball State University were cited as having generally robust mobile websites. While Ball State's website required some scrolling on the small iPhone screen, a tremendous amount of information was available and intuitive to use because its interface was designed to closely resemble layout and graphics currently available on most mobile devices (Evans, 2011).

Kim Bohyun notes how user expectations for mobile library use have grown to encompass research that will require additional customization and personalization features. Bohyun presents a step-by-step process that addresses major issues in developing mobile services (Bohyun, 2013):

1. Create a mobile website if none yet exists – many resources such as WP Mobile Detector, WordPress Mobile Pack, and Mobile Press are available for this purpose, not to mention mobile functionality inherent in tools such as LibGuides.

2. Create a mobile version of the Library Catalog using tools such as Boopsie for Libraries and Library Anywhere.
3. Provide a search box on the mobile Home page, not a separate web page.
4. Add mobile-friendly databases and other electronic resources to the site.
5. Offer library account management functionality to the mobile site that allows users to check due dates, renew items, reserve study space, and check the availability of resources.
6. Experiment and test new ideas for improving service. Some examples include personalization options that allow users to pre-select preferred databases or customizable mobile web pages. Conducting beta testing of new services and collecting feedback from users is also very important.

Who works for the library?

Librarians in the twenty-first century must share professional space with other experts in order to provide the best possible service. This does not mean that libraries should no longer be led by librarians, but that greater acknowledgment and understanding must be given to the role of other professions within libraries. Attorneys, IT experts, and highly trained subject experts must all be free to contribute to service and decision making in libraries. Libraries will continue to vary in size, both in physical infrastructure and the number of personnel, so not all libraries will be large enough to include these important experts in their organizational chart. Nonetheless, even smaller libraries will have to be supported by outside experts either through outsourcing work, library consortia, or direct assistance provided by larger libraries.

Working with IT and other organizational units

Librarians are increasingly dependent on IT for routine library operations. As referenced earlier, print circulation continues to plummet while electronic usage is rapidly becoming the mainstay of information service. Improvements in educational programs will make most librarians more technically savvy and able to handle technology in ways appropriate to their work, but it is unlikely that the typical librarian will have the same

skill sets or the time to duplicate the work of an advanced computer programmer, web designer, or network specialist. Improving metadata, assisting users with research in subject disciplines, negotiating contracts, assessing user behavior, and providing instruction in information literacy should keep most librarians busy.

What is problematic is that many librarians will pursue new technology, software, or systems without fully consulting with IT. This is both a managerial and a political problem for libraries. As they are used to being considered experts in their own domain – the library collection – librarians are sometimes loathe to consider the expert opinions of others when it comes to plotting out a strategy for improving information services in libraries. Good systems librarians and other librarian administrators can sometimes bridge this gap, but there needs to be a reconsideration of decision making in libraries so that expertise and evidence are given full consideration.

As referenced earlier, librarians are a polyglot professional group somewhat like geographers, but there are limits to both the individual and collective expertise of librarians on many issues that directly impact libraries. IT is only one major area of concern. The law is another. Librarians must coordinate their activities with the best legal expertise that is available to them. While many electronic resources librarians and others who negotiate contracts are well equipped to handle routine matters, increasingly rapid and complex changes in technology and the law would likely require the knowledge of specialized information attorneys. If information attorneys are not available, librarians should consult with other expert counsel. Library vendors and other content providers have access to entire units of corporate attorneys, so it makes no sense for librarians to craft our policies in a legal vacuum as we address questions about online privacy, use permissions, mobile devices, private electronic records, and data management.

Fluid boundaries and shared workspaces

The emergence of electronic information is leading to a lot of experimentation in academia and in society as a whole regarding new tools, techniques, and new organizational forms. Libraries need to experiment as well, but there are aspects of organizational forms that are most important for libraries to consider in the twenty-first century. Librarians will need to consult with and coordinate their activities not only with experts in other areas, but also other types of information

professionals or at least units or administrative bodies that are charged with managing information. Librarians will also need to consider that they now work as part of a larger professional body that includes extra-institutional opportunities and responsibilities. Library consortia, reciprocal relationships between libraries, resource sharing, and the role of professional bodies in setting standards and disseminating information about new tools and techniques are just some of the many ways in which every library is now partly related to other libraries regardless of library type or other legal affiliations.

Delving more deeply into the first aspect of these fluid boundaries, academic libraries may have to cooperate with institutional archives that are not managed by librarians. Ideally, libraries will take over this role, but that is not necessarily going to happen for various reasons. Librarians should try to help institutional archives manage the overall complexity of electronic records to ensure that correct metadata and accessibility standards are maintained. Units that assist students, especially first-year and/or first-generation college students may be created that overlap with the library's efforts in teaching information literacy. Information commons, smart classrooms, and shared learning spaces have already led many librarians to work in cooperative arrangements with disciplinary faculty, other professionals, and IT personnel outside the library's reporting chain. There are no hard and fast rules about how to handle these arrangements. Libraries need to compete on some occasions while cooperating on others. Arguably, some of these other experiments in providing information service are partly the result of misunderstandings regarding the library's contemporary mission and partly resistance to change among librarians, but it is recommended that a thoughtful and positive approach be taken to new initiatives for the sake of users.

Public libraries may have overlap with government bodies or may enter long-term cooperative arrangements with non-profit agencies to retain their electronic records. Given constraints on funding and the need for libraries to garner additional support, shared workspaces and commonly held technology and other resources would not be unlikely. Sharing resources and even personnel may lead to more complex institutional structures. Perhaps more than academic or special libraries, public libraries will find it problematic to exist in an electronic information universe and may need to get creative in terms of how their public constituencies are defined. Local public libraries provide direct access to information professionals, which is a highly desirable and very valuable public good, but given scarce resources and stiff competition from centralized state or regional public libraries, local public libraries

will need to pursue new services and redefine their organizational footprint in order to keep their virtual doors open.

Outsourcing

Automation and IT permit a great number of routine tasks to be outsourced. Before OCLC and the emergence of other shared catalogs and knowledge bases, libraries wasted a lot of time and effort in cataloging the same materials over and over again. Unsupported locally created software, buggy programs, and unusual approaches to online search and discovery were some of the issues that have been addressed by outsourcing online catalogs to library vendors such as Ex Libris, Innovative Interfaces, and SirsiDynix. Outsourcing has benefited librarians and users in many ways and will continue to do so, but it is important to put service first. Outsourcing is almost always cheaper in the short term, but if important services are degraded then it is actually more expensive in the long term.

Librarians need to review outsourcing options on a case-by-case basis, but there are some best practices. Software or technology that cannot be updated and supported locally should be outsourced. Creating a flashy new service once that can then not be maintained in the future is a waste of resources.

Large libraries can and should invest in local IT professionals, but given the high cost of personnel and equipment, each library will have to adjust services and expectations based on a unique mix of resources and operational goals. Smaller libraries will still need IT support and may have to pool their resources together to hire local experts to serve consortia of small libraries. Smaller libraries may also develop reciprocal relationships with larger libraries, a relatively common practice now.

Metadata standards, some of which must be applied locally or created for unique local information sets, should be the work of local professionals if these are available, and outsourced only if the library is too small or cannot otherwise financially support them. Metadata production is complex and will likely benefit from a mixture of outsourcing, automation, and local expertise. Most libraries would benefit from the work of a professional metadata expert to consult with vendors and set up standards, along with paraprofessionals to do batch processing and other systems operations, but a room full of copy catalogers is no longer necessary when most commonly held journals, e-books, and databases are well represented in electronic knowledge

bases. Large academic libraries can and should support a team of professional metadata experts supported by a small group of advanced paraprofessional technicians, but copy catalogers will largely be replaced by outsourcing, student workers, or volunteers. Public libraries may require a somewhat different organizational plan, but similar principles apply.

Some training in information literacy and subject discipline support may be outsourced as well, although users will miss out on direct assistance from live librarians. Large academic libraries, consortia, as well as vendors can share or sell their training modules, research guides, and even online subject portals for users at smaller libraries. Local public libraries are likely to face competition for user support from large government agencies or larger regional public libraries that may increasingly pursue direct contact with users through large well supported online libraries. One could imagine state libraries in the USA deciding that licensing electronic resources at the state level, and organizing electronic government information, is best handled at one central location. State libraries may also pursue direct partnerships with schools and local community organizations that bypass local public libraries and school libraries, some of the latter having already fallen prey to recent budget cuts at the time of writing.

Accurate analytics and assessment are required for librarians to defend and extend their services. To be nimble, adaptive, and responsive to users requires large academic and public libraries that include locally available experts in metadata, information literacy, data management, special collections, numeracy, emerging technology, and electronic resources management. Librarians will need to continuously prove their worth, carefully manage scarce resources, and balance local services with outsourcing, but that is true of other professional groups in the twenty-first century as well.

Planning and administration

Libraries will need to make specific plans based on their own unique user populations, available resources, and institutional histories, but it is useful to consider what a reorganized twenty-first century library might look like in general. For the sake of simplicity and clarity, we can review the overall impact of removing print resources from libraries and then take an imaginary large academic library as an example of how

these changes might look in practice. Other types of libraries certainly exist and provide valuable services, but these variations are being left out temporarily in order to ensure that the most important features of this service model are clearly revealed for consideration. By examining a large academic library in more detail, most of the important changes can be captured, with variations for the other library types duly noted and mapped out whenever possible in the diagrams and charts that follow later in this chapter.

Impact of removing print resources, stacks, and workflows

A large academic library in the twenty-first century will eventually remove all print holdings, apart from special collections, to a remote climate-controlled storage facility. This print repository will be staffed by a specialized unit that will digitize requested items on demand, creating new electronic copies for distribution, rather than lend print materials. If applicable law permits, the repository unit will distribute the electronic copy to other library units in order to make it available in perpetuity to other users. Otherwise, a single electronic copy, perhaps with special digital rights protection, will be forwarded to the individual user. When creation of an electronic copy is forbidden by law, users will receive a newly printed copy rather than the original item. When an electronic copy can be permanently absorbed into the library's electronic collection, the repository item will be discarded.

The library proper will consist of office space, lounges or general purpose reading rooms, quiet spaces, conference and classroom space, and special collections. A café and other refreshments will be available on site. Other potential cohabitants of the library space might be an institutional welcome center, university archives, a store selling mobile devices and other electronics with an ever changing inventory as technology continues to change, and a print-on-demand station that can manufacture bound copies of books if desired by individual users or required by copyright. Other units on campus such as University IT may have a presence in the library. Similar configurations already exist at the time of writing, but the main difference is that there are no book stacks. Technology will be ubiquitous and significant investments will be made in trying to keep up with the most useful new innovations.

Circulation or access services staff will be replaced by roving attendants who are trained in basic troubleshooting and customer service. These

attendants will most likely be students and be an extension of facilities management. Facilities will be responsible for managing the physical library site, installing and removing furniture and equipment, monitoring user behavior, providing basic assistance, and assisting the disabled. IT support will also be present and would work in partnership with the facilities attendants as needed.

Customer service for users would be integrated on the front end with problems reported in person or online using various communication methods while distributed to specialized personnel on the back end. IT support would handle problems with computers or mobile devices while staff in electronic resources management would troubleshoot access problems with free and licensed information resources. Problems found to be outside the library's scope would be routed to University IT or other campus units as appropriate.

Library Systems or IT would be responsible for the overall management of technology in the library, including maintaining servers and other equipment, security, and interaction with University IT. Web design would be coordinated by Library IT, but routine work would be distributed to various units. Special Collections, Emerging Technology, and Electronic Resources Management would all have their own web designers or Web Design units. Subject specialists or other librarians would be supported by these Web Design units either directly through assistance in creating web pages or indirectly through the provision of specialized software such as LibGuides or other tools that permit the creation of web pages without IT skills. Emerging Technology and Library IT could include dedicated user experience specialists, both librarians and other professionals, but subject specialists also have a role to play in testing services that impact users in particular disciplines.

Most technical services functions, including acquisitions and cataloging, would be replaced by electronic resources management. Negotiation with vendors, activation of electronic resources, routine functionality testing, troubleshooting access problems, gathering usage statistics from vendors, and identifying freely available electronic resources would all be coordinated by one centralized group. Metadata services would replace traditional cataloging entirely and would be encompassed within the electronic resources management group.

Given a high level of automation and outsourcing, a small number of professional metadata specialists and a few advanced technicians should be able to handle most of the library's needs for routine metadata, but additional specialists will be required for special collections, archives, or online publishing. Batch processing, enhancement of records,

establishing standards and testing of metadata for discoverability will constitute the bulk of the metadata work of the e-resource specialists rather than original cataloging. One professional librarian supported by one or two advanced paraprofessionals should be able to handle most of the work even at very large libraries. However, institutions that make original contributions to STEM research or other advanced knowledge may find it useful to map out experimental or other new forms of metadata to track research progress and simplify the problem of disseminating complex information to large research teams. This would require additional personnel and perhaps the creation of a separate specialized unit that could be administratively associated with the electronic resources management group or assigned elsewhere.

Standalone digitization teams or units will no longer need to exist as distinctly separate units in the organizational structure of the library at large because print will be removed from routine operations entirely, but the off-site Shared Repository and Special Collections will require appropriately sized digitization units of their own, mostly like a few staff supplemented by student workers or volunteers as needed. Shared (Print) Repositories will implement digitization on demand while Special Collections will find it easier to integrate digitization functions into its own administrative apparatus rather than coordinate routine work with other units. Demand for digitization outside special collections will be greatly reduced as institutional records, textbooks, and other information become increasingly electronic over time.

Emerging technology, rather like electronic resources, has recently emerged as the solitary domain of a single librarian even in most contemporary institutions. Requirements for teaching technology literacy, user experience testing, identifying trends, and working as a liaison with stakeholders actually requires the work of at least a small team of specialists. One or more emerging technology librarians will be supported by advanced paraprofessional staff and students. Remedial instruction for first-year (and sometimes first-generation) college students, assisting the disabled with advanced technology, user experience testing, attending conferences and trade shows, and liaison work with technology stakeholders will keep these specialists increasingly busy. Technology instruction, including teaching about any unique tools or programs developed by the library, will be the routine responsibility of Emerging Technology, not subject specialists in large academic libraries.

Special Collections will continue to have print, as well as other physical artifacts, but organizational structures will vary considerably depending on the precise nature and scope of local collections. It

will usually be more efficient for Special Collections units to include their own digitization teams and preservation experts. Some metadata must be done in-house, but metadata services and coordination may extend beyond Special Collections personnel. While metadata work for electronic resources is iterative and recursive rather than the single pass cataloging of the print era, the precise number of metadata specialists needed is still related to the overall quantity of information that must be described or cataloged.

Subject specialists and experts in information literacy do very important work, but libraries in recent decades may have overinvested somewhat in these areas at the expense of other much needed services. The budgetary pendulum could swing against these groups to some extent, but not as much as it has against traditional technical services. Even large academic libraries may consolidate some of their subject specialists into groupings of similar disciplines and reduce the overall level of instruction to meet demand from academic units on campus. The disappearance of print stacks will also lead to the disappearance of branch libraries on some campuses, and this could also contribute to greater investment in centralized services that benefit all users, as well as applied information services such as GIS or bioinformatics that are not based on instruction, but the direct application of expertise to the complex needs of individual users.

Electronic libraries vs. hybrid libraries

What does the development of a fully electronic library look like in practice? How is it different from a hybrid library? First of all, one must admit that special collections and archival units will likely hold print manuscripts and rare books for some time, but even those materials will increasingly be digitized and/or removed to even more secure storage than most libraries can provide. Leaving aside special collections units, individual personnel that manage print will no longer be part of the library as it becomes more fully electronic. Large academic libraries, and perhaps some large public libraries, might benefit from a tripartite structure in which technical services functions are replaced by a more robust Information Services group that is more closely integrated with IT while public services functions are supported by an expanded and usually centralized Academic Services group that provides instruction and other services directly to users. A third arm of the library would focus on research and planning, initiating and coordinating the adoption

of useful innovations with other library units. Smaller libraries would not have this third arm, but might derive the same benefits from consortia or following the lead of larger organizations to adopt new services.

Some academic libraries already have complex structures with three or more divisions and most large and better funded institutions have already started experimenting with new roles for librarians. Many new types of positions have been created during the past 30 years, with some having more staying power and relevance than others. This discussion is not intended to reveal radically new or different ideas, but to extrapolate recent trends, identify what is important, and make suggestions for how libraries can combine many recent innovations and useful ideas into a coherent system for delivering information services that are appropriate both for contemporary users and users in the near future.

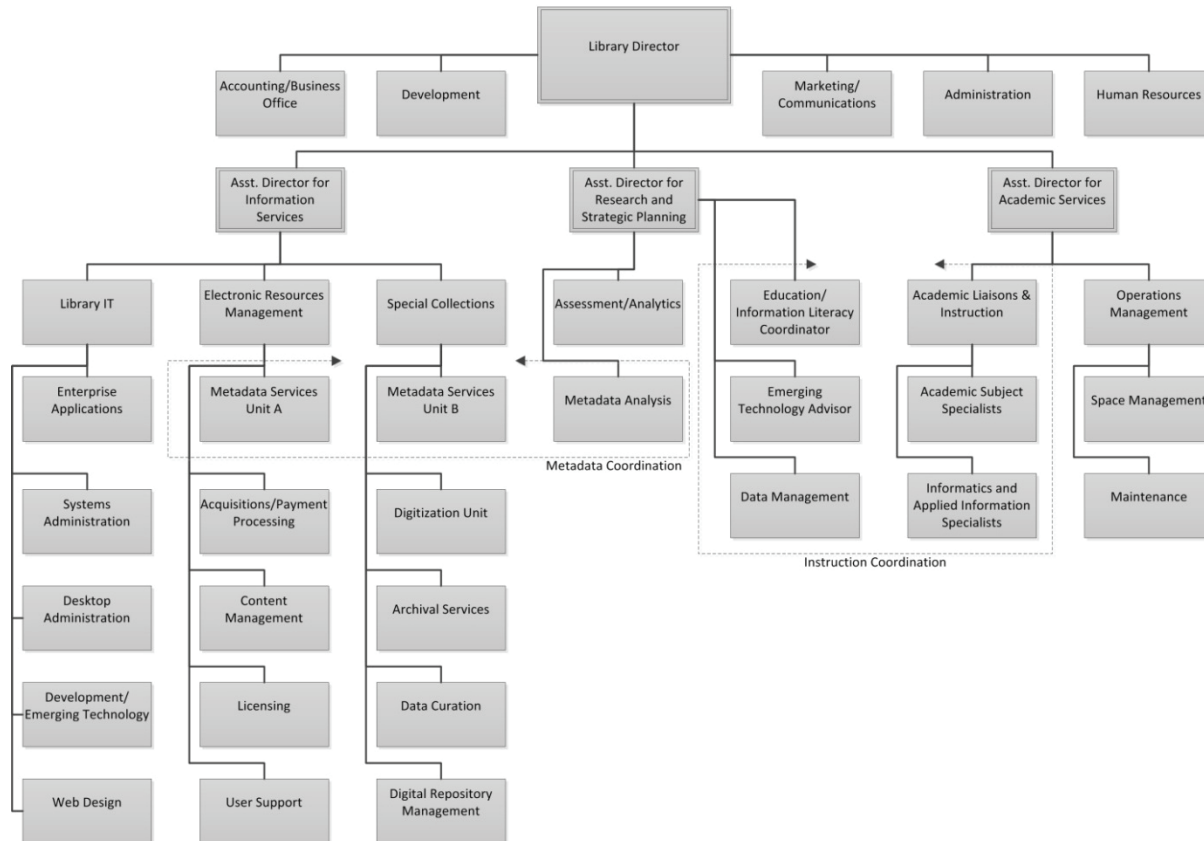
Organization plans for electronic libraries in the twenty-first century

There is no specific organizational plan that will fit all libraries, but it is useful to show how some of the assumptions in this book might impact organizational structure. Competition, information exchange, and a general desire to keep up with other institutions will likely create incentives for copying useful innovations while rejecting others, but considerable organizational diversity will likely continue. The sample organizational charts shown below constitute only one possible general model for what a fully electronic library might look like at some institutions. These charts do not show individual positions, but rather general types of position by function. Precise titles are not as important as actual responsibilities and skill sets. Considerable variation is possible as long as the overall organizational structure reflects the needs of fully electronic libraries.

Large academic libraries

The model shown in Figure 5.3 assumes a Library Director supported by Administrative Assistants, a Development office, an Accounting office, and Marketing or Communications specialists overseeing a tripartite structure of Information Services (roughly equivalent to technical services), research and strategic planning, and academic services (roughly equivalent to public services). Depending on local administrative

Figure 5.3 Large academic library with distributed metadata services



resources, organizational culture, and the autonomy of the library, it might also make sense to hold onto a separate Human Resources Unit given rapid change in library positions and some of the more unique work that librarians do. This model also includes distributed Metadata Services in which production and higher level analysis are separated into different reporting lines. This is one way to maximize the benefits of automation, outsourcing, and highly efficient production for specific types of metadata while also allowing some personnel to conduct more advanced and speculative metadata analysis without direct responsibility for production.

Large academic libraries in the twenty-first century are likely to be the inventors and implementers of new techniques and best practices that will influence other libraries, so there is an intentional division between research and practice in critical areas such as metadata, assessment, and emerging technology. This division is intended to foster creative thinking and experimentation without jeopardizing more routine operations. Information Services is responsible for technical services and infrastructure while Academic Services manages outreach and applied information services for individual users. Research and Planning is free to initiate new ideas, consult with other groups about experimentation and possible implementation, while providing the Library Administration with useful data and analysis of routine operations. It is hoped that a creative tension between these three arms of the library will lead to the right balance between innovation and conservatism.

Information Services as a whole encompasses three major divisions, Electronic Resources Management, an enlarged Special Collections, and Library IT. Physical processing tasks ranging from receiving to binding have all disappeared from routine technical services workflows. Special Collections, the only department to include any print collections still held by the library, retains some preservation and physical processing functions within an Archival Services Unit. The focus of Electronic Resources Management is electronic resources or providing access to externally created online information. Special Collections straddles the digital and print worlds because it is also responsible for the Digital Repository and other work regarding the preservation of digital information created locally. Library IT manages the hardware and software that constitutes the library's technological infrastructure.

The breakdown of Library IT is relatively straightforward. Experts in web design, systems administration, desktop administration and enterprise applications ensure that the library's overall IT infrastructure is maintained at a high level of professionalism. Development would

include programmers who could work on library applications and software. IT would also collaborate with other librarians and units to provide user experience and usability testing, data for assessment, and functionality testing. Having a significant IT presence within libraries is increasingly necessary to support and improve information services based on electronic resources. Maintaining a specific unit dedicated to user experience or usability testing would be another useful option for large academic libraries.

Before discussing Electronic Resources Management and Special Collections in more detail, it is necessary to consider how metadata work is handled. Both Electronic Resources Management and Special Collections have their own metadata units responsible for routine metadata production. The Electronic Resources Management Metadata Unit could be quite small with only one professional librarian and a few advanced paraprofessionals because work will be highly automated and many knowledge bases are available for use by libraries. Batching processing, improving existing metadata, and helping to troubleshoot complex problems with metadata that impact discovery systems will be the primary role of this unit, not creating original metadata. The Special Collections Metadata Unit may need to be larger depending on the overall scope of the collections. Both the Electronic Resources Management and Special Collections Metadata Units will coordinate more advanced work, research and planning for metadata with a Metadata Analysis Department that is purposefully set apart in a different reporting chain. The latter unit would consist only of professional librarians, but all three units would likely be small even at most large academic libraries. Very large academic libraries or institutions that contribute more original metadata or original cataloging work might consider developing a larger centralized and integrated Metadata Services Division or Department.

Apart from metadata, Electronic Resources Management is broken down into separate units responsible for Acquisitions/Payment Processing, Metadata, Content Management, Licensing, and User Support. Most of these functional areas are likely self-explanatory, but it is useful to note that Content Management handles the routine work of setting up online access, gathering usage statistics, and conducting functionality testing of electronic resources platforms and user devices. User Support would troubleshoot access problems, communicate directly with users, and coordinate customer service with other library units. License and other vendor data would be the responsibility of Acquisitions/Payment processing, but entry of other data not considered to be metadata would be entered by the Content Management Unit. Licensing would consist of

one professional librarian charged with negotiating contracts and other external relations with vendors, but could also include more personnel, depending on the amount of routine business handled by the library.

Interlibrary loan would not exist as a separate unit, but rather Electronic Resources Management personnel would receive appropriate training in resource sharing operations since interlibrary loan is simply another business model for electronic resources. Removing the physical aspects of interlibrary loan make overall operations much less complex. Improved methods for electronic resource sharing, including document delivery to users, make it less necessary to staff these operations with specialists whose only work is resource sharing. Electronic Resources Management requires more than one electronic resources librarian in order to function well and most managerial roles require professional librarians. The head of Electronic Resources Management, the licensing specialist or head of the small licensing unit, the head of the Metadata Services Unit A, and the head of Acquisitions/Payment Processing should all be professional librarians, but other positions and unit heads could be advanced paraprofessionals if necessary. The highly automated processes mean that the overall size of these units will usually be small in comparison to more traditional technical services, with one librarian leading a few advanced paraprofessionals supplemented by student workers. Lower level clerical service positions are increasingly awkward in a complex digital workplace that requires intellectually curious and highly adaptive workers.

Special Collections, apart from metadata, has separate units for managing print and digital resources, as well as large data sets. Over time the number of print resources such as rare books in Special Collections may decline, but preservation or conservation of information in digital form will increasingly be the preserve of these enlarged units as well. Instead of reinventing the wheel and paying for the duplication of expertise in other departments, a properly organized Special Collections Unit can provide leadership on preservation and long-term access to information in all formats. Certified archivists would preserve both print and digital institutional records, coordinating their routine work with other units as needed. Arguably, digitization has a natural home in Special Collections more than any other part of the library organization. The Digitization Unit would perform scanning, quality control, and apply metadata according to standards set by metadata specialists within Special Collections and/or Metadata Analysis. Digitization, Data Curation, and Digital Repository Management could be managed by

professionals or paraprofessionals depending on available resources, but the other units should be managed by certified professionals.

Academic Services, essentially public services, has no units dedicated to circulation or physical book stacks. Librarians could spend some time at learning commons or other public service areas, but routine staffing of facilities or sitting at public service desks is arguably not the best use of their professional time. The Operations Management Department would manage the library as place. The Space Management Unit would provide both desk and roving attendants, a combination of support staff or advanced paraprofessionals and student workers. These personnel would check to ensure that users on site are able to find their way around, access online networks or use technology, and provide direct assistance to disabled users. Maintenance would take responsibility for relocating equipment, moving furniture, and basic repairs. The Space Management Unit might be expected to assist with basic troubleshooting, but more complex technology support will be provided by University IT, Libraries IT or Electronic Resources Management personnel. Requiring library professional personnel with advanced skills to sit and wait at public service desks makes little sense. Highly visible employees with low to moderate skill sets can easily summon personnel with more advanced skill sets as necessary to provide assistance.

Subject specialists, GIS, bioinformatics and other academic professionals who work directly with disciplinary faculty, staff, and students will continue to work in an Academic Liaison and Instruction Department. Much of this work should already be familiar to most readers, but the library of the twenty-first century will likely balance the overall workload and number of these specialists with other priorities. Consultation with disciplinary faculty, advice on collection development, and instruction will still keep subject specialists busy, but growing emphasis will also be placed on direct and applied information services such as GIS and bioinformatics that can support informed and expert users. Rather than an emphasis on education and instruction, as important as these services are, both subject specialists and applied information specialists will provide advanced professional service for individual users, groups, and larger organizations for special projects that require complex information management. The Education/Information Literacy Coordinator, shown outside Academic Services on the organization chart, will track overall changes in higher education, learning, and pedagogy that could impact library services provided by multiple units and also coordinate instruction with personnel from Academic Services and other units in the library.

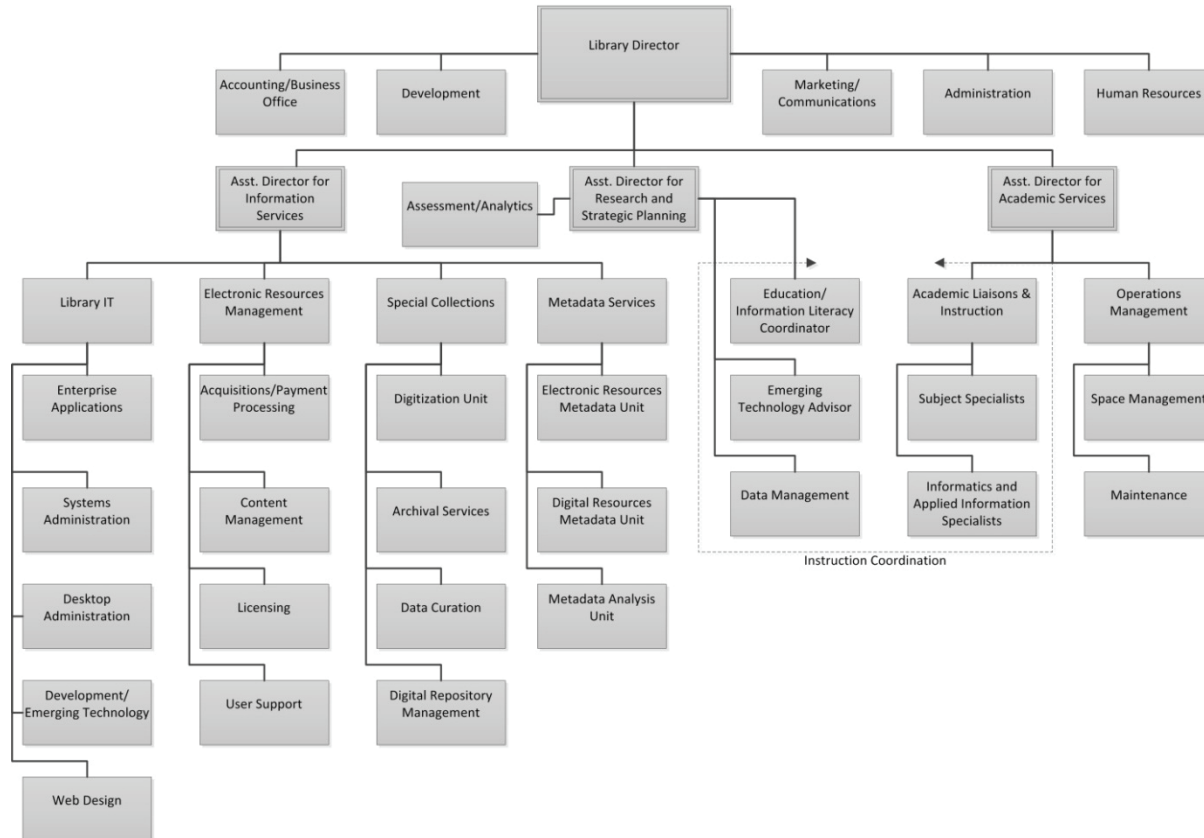
Collection development would be a responsibility shared between Electronic Resources Management, Special Collections, and subject specialists and other professionals and senior administrators. Increasing use of diverse business models makes it necessary for electronic resources specialists to have a voice in collection development while senior administrators will need to track overall costs and spending. Use of collection development committees or councils with representation across units could set overall policies, a system already in place in many libraries today, while routine decisions would be left to Electronic Resources Management for external electronic resources and Special Collections for internal electronic or “digital” resources. Some libraries might want to continue to support designated collection development officers or entire units. According to this model, such a unit would best be included in Research and Planning and work in coordination with Electronic Resources Management and other personnel.

Scarce resources, ever changing technology, and a dynamic higher education environment will make research and strategic planning increasingly important. Metadata Analysis, the Emerging Technology Advisor, Analytics, and the Education/Information Literacy Coordinator would all report to a separate Assistant Director in this model. This part of the library would be responsible not only for routine services and production, but also for planning and coordinating overall standards and objectives for metadata, instruction, and assessment. Data Management would consist of a small unit dedicated to investigating new ways to manage data, although their work would be coordinated with other units.

An Analytics Department would gather statistics and analyze data about the library, data about users, and data from the wider marketplace of ideas. The Emerging Technology Advisor would work closely with the Development/Emerging Technology Unit of Library IT. Together, these specialists would teach how to use technology, provide support in the classroom or for special projects, conduct some usability testing, and recommend changes in services provided by the libraries, and also have the capability to develop new applications and software to put new ideas into sustainable production. Travel, outreach, and professional development expectations for this part of the library would be higher than Information Services and Academic Services given their role in coordinating standards for other services and need to stay informed about innovation.

While the same general principles apply as referenced above, some large academic libraries that produce a great deal of original metadata

Figure 5.4 Large academic library with centralized metadata services



might need to develop larger centralized metadata services departments instead of distributed metadata. The organization chart in Figure 5.4 shows this important variation. A Metadata Analysis Unit could still consult with personnel in Research and Planning, but would be integrated into a somewhat larger Information Services group.

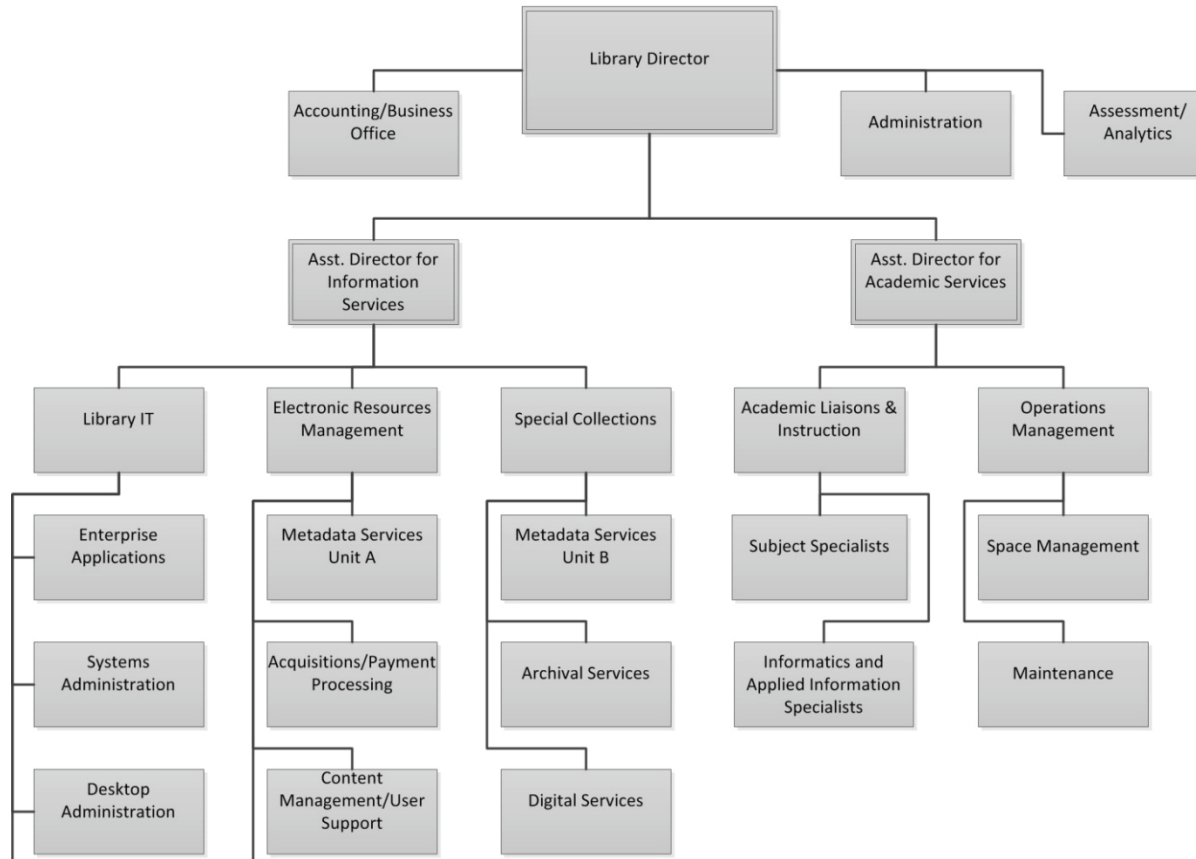
Large academic libraries or libraries that serve very large campuses might also prefer to maintain library facilities in multiple locations. Efficiency, cost control, and the growth in remote usage tend to favor consolidation of libraries into single facilities, but there is a variety of specialized academic units that might still prefer to have information service specialists located in close physical proximity. Research institutes, facilities with restricted access, museums, and some very large academic programs may continue to invest in branch libraries. Organizational structures will vary, but the general pattern shown in Figure 5.4 is arguably a more useful way than what exists in many libraries. An academic branch library in the twenty-first century would likely have its own subject specialists, experts in GIS, and other professionals who provide services directly to users. Circulation and traditional reference staff would be absent. IT and technical services would usually be provided by the central library with the exception of secure facilities and specialized information service providers such as museums.

Medium and small academic libraries

The same general model for an electronic library can be scaled down to fit small and medium sized academic libraries as well (Figure 5.5).

A medium academic library of 70 FTE would likely omit the research and planning arm and also consolidate and simplify the two remaining major divisions of the library. Specialized Marketing and Human Resources Units would also be omitted. It is assumed that smaller campuses will likely provide the latter services for the library. Special Collections would essentially be divided into those who work primarily with print or digital resources with a Metadata Unit taking care of those needs for both. Operations Management would be smaller, but still carry out the same basic functions as previously discussed for large academic libraries. IT would be considerably smaller, but it is possible that personnel who manage systems and enterprise applications might have to double as web designers and programmers, or at least provide some limited support to others engaged in such work. Given the importance of IT and technology for twenty-first century libraries, care must be taken to balance infrastructural and public service needs.

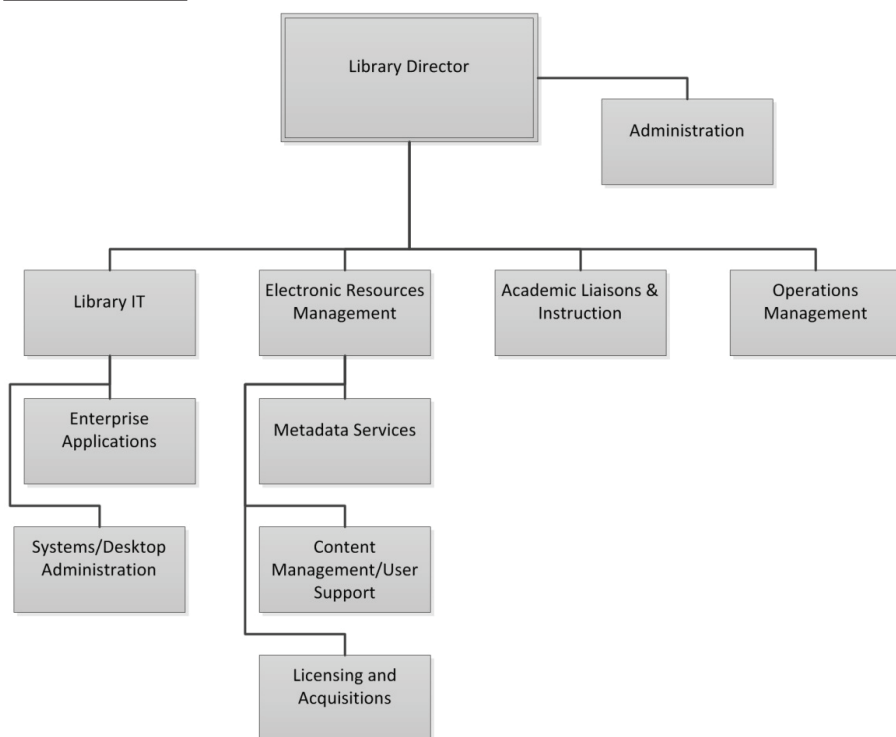
Figure 5.5 Medium academic library



Smaller academic libraries would continue the general pattern of consolidation and shedding more specialized personnel that only larger libraries will be able to afford.

An academic library with 20–30 FTE (Figure 5.6) might retain a separate Library Director, perhaps a part-time Administrative Assistant or two and might even share some personnel with other campus units such as Maintenance. Operations Management might be small or not need to exist if libraries have limited hours or if librarians take a more direct role in managing routine operations. Beneath the thin administrative layer, the library would consist of Electronic Resources Management, a very streamlined Library IT department, and a small department of subject specialists. Metadata specialists would serve in Electronic Resources Management exclusively, although outsourcing would be used even more intensively than in large and medium sized institutions. Special Collections and Archives is not shown in Figure 5.6 because it will become increasingly expensive to maintain for smaller libraries, but a small unit might be necessary if some physical materials

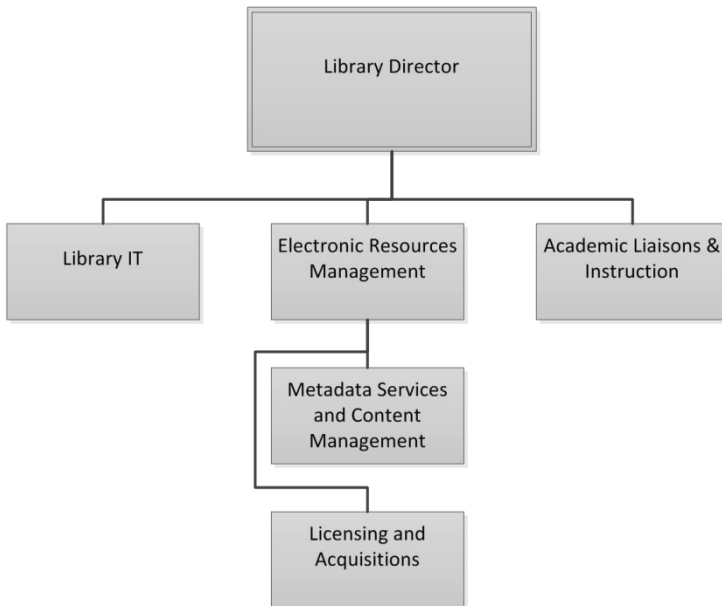
Figure 5.6 Small academic library, 20–30 FTE



or artifacts are housed by the library. Outsourcing digital preservation work might be the best solution for smaller academic libraries, but Library IT and Electronic Resources Management could carry out some of these functions as long as the impact on their routine duties was limited.

Academic libraries with only 6–10 FTE (Figure 5.7) would likely consist of a few professional libraries and paraprofessional staff with work supplemented by students, outsourcing, and shared services with consortia or other libraries. One or two librarians may provide direct customer service on site or serve as very general subject specialists, but most personnel would manage basic IT and electronic resources, depending on the level of external support for the library. Licensing electronic resources and having at least one or two specialists who understand how to manage modern metadata are arguably the most indispensable functions of the twenty-first century academic library carved down to its barest essentials, but this could be done by the consortium rather than the individual small library. If a library shares technical services with a consortium, it might work better to hire public services specialists.

Figure 5.7 Small academic library, 6–15 FTE



Other library organizations

Organizational plans for public libraries will likely differ from the models described above in the following significant ways:

- additional specialized units to assist different types of users, for example, children;
- General Reference Unit;
- Resource Sharing Unit;
- retention of a bipartite division between public and technical services (or Information and Academic/User Services) rather than having a third division focused on research and strategic planning.

Like academic libraries, public libraries will need to invest more in IT and Electronic Resources Management, but special collections and archives will be dependent on local needs and resources. Resource sharing will be more important because of financial constraints and the fact that public libraries will occasionally have users request items that are not likely to be accessible to any public library. Some public libraries will also have to provide different types of computer technology to users and place additional emphasis on backwards compatible websites, software, and other tools, as some users, particularly the elderly and underprivileged, may not have the latest version of new technology. Some very large public libraries may have emerging technology units, developers, and informatics specialists, but learning, research, and information-based entertainment will continue to follow different patterns from academic libraries.

School libraries and media centers in the USA are also changing rapidly and entirely electronic services will require a different approach, but staffing will remain small for libraries that remain open. The future for school libraries in other parts of the English-speaking world looks somewhat brighter, at least at the time of writing. Special libraries will likely continue to develop along the lines of the ISIC model in which information specialists are more closely embedded in professional teams. Greater emphasis will likely be placed on subject specialists and applied information specialists who have at least some formal training in the professional disciplines of their users. This is already the case with many law and medical libraries, but will probably develop in other specialized subject libraries as well.

It is likely that IT and technical support for special libraries will be shared with or provided by the parent organization so the special library may become one of the few remaining workplaces in which librarians possess similar training and skills.

Solving the problem, part 3: adapting to scarcity

Abstract: The chapter considers the constraints under which libraries in the twenty-first century need to work in order to be successful. Economic constraints are among the more obvious ones, but also the sheer size of the information explosion is a formidable constraint in and of itself. Finding how to work with other libraries, especially consortia, vendors, publishers, and other organizations is considered as an important way of handling the limitations of the single library's resources. The importance of assessment and developing sustainable services is also discussed.

Key words: assessment, cooperative collection development, information explosion, just-in-time information, library consortia, library vendors, marketing and public relations, scarcity.

Libraries must operate successfully despite increasing competition for scarce economic resources, but librarians must also address other problems of scarcity. The continuing information explosion will force libraries to be more selective in identifying what information should be included in or defined as part of their own unique collections and what should be left to other information service providers. Scarcity of time, both for users and for librarians, will make it more necessary for libraries to cultivate efficient services. Scarcity of information about information will make it necessary for libraries to pay special attention to metadata in different and seemingly contradictory ways; sometimes libraries will need to apply metadata to some types of information over and over again while outsourcing or accepting externally created metadata for some resources.

Economic considerations will put pressure on libraries to rationalize business models to fit the specific needs of their defined constituency of users. Academic and public libraries will need to make permanent or long-term investments only in those resources that are most pertinent to the unique user populations that they serve. Other resources will increasingly be made available through resource sharing, document delivery, or other just-in-time services. Reliance on consortia, buying groups, cooperative collection development, and resource sharing will continue to grow. Economic reality will also push print out of libraries in the most developed economies due to low usage, personnel costs for support staff who manage print, increasingly robust and more convenient electronic alternatives, and generational change.

The information explosion, a cliché yet still the most descriptive phrase, will continue unabated. Human reliance on the computer for tracking weather patterns, organizing agricultural production, managing transportation systems, organizing robotic factories, and making sense of the other myriad bits of data created by, about, and on behalf of us makes this growth inevitable. Some of this data can be manipulated and processed without any kind of intervention by librarians or similar information specialists. Most communication in the world today is between machines, but some information must still be sorted, labeled, and categorized according to particular human needs. Most metadata will not require active work by librarians and many different types of IT specialists, other knowledge workers, and non-specialists will be able to take care of their routine business without assistance from librarians. Yet, some information will need to receive not just one, but many iterative applications of metadata by librarians. An example of new metadata that is needed includes efforts to establish standards for open access content such as NISO's Open Discovery Initiative and Open Access Initiative (Hutchens, 2013). Products of scholarship such as e-books and peer-reviewed articles, but also grey literature, blogs, web pages, electronic correspondence and social media exchanges, and data sets may require multiple treatments of metadata. Librarians can use metadata to promote discovery by researchers who know what they are looking for, at least more or less, but also to enhance the research process by suggesting discovery paths leading to other information objects entirely unknown to the researcher and associations between seemingly unrelated objects, and reducing the overall amount of time necessary for routine and advanced research processes.

Acquiring access

Providing access to electronic resources is more complex than providing access to physical materials such as books, microfilm, or DVDs. Most electronic information is actually leased, not owned, by libraries and precise rights are defined in complex license agreements. Permissions are defined for different types of users, downloading, printing, scholarly sharing, interlibrary loan, inclusion in course packs, embedding links in course management software, and archival rights, just to name a few examples. As technology continues to change, some vendors look for ways to include more stringent rules and ever more detailed provisions such as more stringent limitations on printing e-book content or additional fees for usage on mobile devices. Licenses of this complexity did not exist in the print era and acquisitions librarians and staff did not have to negotiate much, if at all, with vendors.

To provide access to electronic resources, libraries must consider license terms and also different approaches to negotiating with vendors and multiple business models for the same content. Depending on cost, other terms, and user needs, libraries may want to negotiate directly with a vendor or partner with other libraries in buying groups or consortia. If the latter path is chosen, libraries may not need to negotiate directly with vendors, but some consultation and compromise with other libraries may remain. Cooperative collection development arrangements can also be used in which Library X acquires a resource in exchange for access to another resource that Library Y agrees to acquire, and vice versa. Finally, all libraries are unable to afford acquiring *all* information resources that might be needed in the future by their users, so resource sharing or interlibrary loan is another important method for providing information. All of these business models include costs, both in money and staff time. Adding and maintaining access to free electronic resources to library collections also incurs costs.

The wants and needs of users

As organizations that provide information services, libraries must pay special attention to the various wants and needs of users. Services must be created that suit the unique needs of particular user groups. To a great extent, libraries already do this. A large ARL library known for its science programs may favor chemistry and physics in collection development, while a small liberal arts college library may favor a more

balanced collection that omits highly specialized databases and other expensive STEM offerings. Advocates of library as place have brought cafes, comfortable furniture, and spaces for socializing into the library. Some public libraries collect only those fiction genres that local patrons enjoy reading. Some facilities include large music and video collections, while others do not.

Catering to the needs of users is nothing new and twenty-first century libraries will need to continue work already in progress, but invest more in assessment and be even more responsive, depending on the overall mission of the library. Local public libraries facing stiff competition from online state and regional libraries will likely have to cater to user preferences even more than academic libraries. The educational mission of some academic libraries will continue to require that investment be made in collecting rare information for posterity as well as current users.

An important aspect of catering to user needs is finding ways to decrease the amount of time spent on finding the right information. While information literacy, instruction, and pedagogy are very important, libraries must be careful not to let their own goals and preferences detract from the purposes of the user in seeking information. Instruction at the point of need should not lead to inordinately long and overwhelming attempts to demonstrate the special knowledge of the librarian.

A visitor to a fish market is not likely to want to learn how to fish right at that moment; it is more likely that they want to find something for dinner and then leave. Sometimes librarians should teach and help users to learn that there is a better way of doing things, but at other times, more subtle and less obtrusive methods are preferable.

Information literacy programs can bore students and fail to impact their ability to find useful information. Approaches that incorporate problem-solving and personal meaning to the user are more likely to succeed. Catherine Riehle at Purdue University introduced students, many of whom were future scientists, to Dr. Ben Goldacre's "Bad Science" column in the *Guardian* online in which he discusses flaws in scientific claims, research methodology, and communication. Asking students to select articles and to write and discuss their observations engaged their higher-order thinking skills as per constructivist learning theory (Riehle, 2012).

While it is important to experiment with new technology and applications, librarians need to accept that users will not be responsive to all innovation. Librarians at the UK's University of Huddersfield discovered that QR codes for library materials were seldom used, partly due to the need to download a free QR code reader. The information

provided ranged from contact information for librarians to detailed tutorials, but even the chance to win a £100 prize was insufficient to lure large number of students (Walsh, 2010). Making users work harder or take extra steps in the information seeking process when the rate of expected return for effort is low is not likely to work in most cases.

Web design for libraries, especially any content that is visible to users, should be created and maintained for their benefit. Marketing and communication is important. Libraries need to brand all of their electronic resources and remind users what libraries are doing on their behalf, but web pages should not reflect the self-expression of the librarian. Library web pages are tools for finding and making use of information. Updates should be timely, and dead links removed. Library web space needs to be free of broken links, unnecessary clutter, and well organized with intuitive pathways for navigation. Gathering feedback from users, user experience and usability testing, as well as professional expertise will go a long way in helping libraries to improve their web pages. Many libraries already follow these best practices, but it is surprising how many still do not. For twenty-first century libraries, web space is more important than physical space since online access is the primary service point for users. Having a website that is down is worse than having closed doors.

Role of free electronic resources

Freely available electronic resources still require investment in staff time to identify, vet, and maintain access, but can save a considerable amount of money for libraries. Tracking free electronic resources by libraries can also save time for users. The universe of freely available online content is dynamic and constantly changing, so librarians will need to revisit their policies and procedures again and again in order to keep up with what is available.

Some freely available content, especially information provided by governments and non-profit organizations, is often repackaged by vendors and then leased or sold to libraries. Sometimes freely available content is included in full text databases while at other times the database itself is little more than a rebranded government information resource, perhaps with a few additional bibliographic records thrown in. Overlap analysis, careful review of databases, user experience and functionality testing should be undertaken systematically by libraries in order to cancel subscriptions to paid content that is actually freely

available. Judicious choices must be made, however, as sometimes the free version of a resource is poorly organized, inconvenient to access, or has other features that make it less valuable than the paid equivalent. Furthermore, the inclusion of free content in a paid resource is not necessarily a reason to cancel and the addition of the free content is actually a convenience to users.

Apart from helping to control costs, some content is only available for free. Gray literature, pre-prints, blogs, wikis, and other online resources sometimes contain cutting edge information or useful ideas that inform ongoing research, teaching, or consumer interest. Tracking this content may be difficult for libraries that rely on knowledge bases and other outsourced tools to track online content, but many vendors will add new content to their knowledge bases if libraries inform them of its value. Research guides, library web pages, and homegrown knowledge bases can also be developed to extend access to content that might otherwise be hidden or not easily discovered.

Twenty-first-century libraries will need to develop coherent collection development policies for free electronic resources, determining how content is identified and tracked in the library's web presence. Libraries may want to assume different levels of responsibility and provide different levels of support for various types of free electronic resources. An academic library might provide links to some potentially useful blogs in a research guide with the disclaimer that the library cannot provide technical support. Conversely, an open access journal is tracked in the library's knowledge base, made available through all online catalogs and discovery tools, and library personnel will troubleshoot access problems and/or contact the content provider if users encounter access problems.

Government information is a problematic area for libraries, especially in the USA, in that the federal depository program designed to ensure public access to information was a product of the print era. The US Government has been one of the primary advocates for electronic information and one of the first to shift resources toward online information. While considerable information is available online and publicly accessible websites have been improving, much is still difficult for users to find on their own. Also, public libraries constitute one of the few remaining free public access points for Internet services in the USA (Jaeger and Bertot, 2011). Libraries will need to review what is available and explore providing direct links to key databases, reports, data sets, and other online publications. Any changes in availability will need to be tracked and reflected in discovery tools, the overall web presence of the libraries, and instruction.

Role of library vendors

Vendors have the primary objective of making money, but provided that the library understands its own objectives, is free to make judicious choices regarding scarce resources, and has the correct tools to assess its own needs accurately, vendors can actually save money and staff time for the library.

Many simple and repetitive tasks should not be done locally, but are more efficiently provided by vendors that can achieve economies of scale by selling their services to multiple libraries simultaneously. Creating MARC records for widely held materials, foundational metadata for proprietary knowledge bases, and the development of subject specific indexes should all be left to vendors whenever possible.

Systems management software is usually left to vendors as well, but there are examples of homegrown systems such as Evergreen, the open-source integrated library system developed by the Georgia Public Library Service (Hyman and Walker, 2008), and CORAL, the open-source ERM developed by the University of Notre Dame in Indiana (Imre et al., 2013). Libraries that have limited IT support may also want to explore the use of vendors for web design and technology support.

Automation and outsourcing must always be considered whenever the twenty-first-century library considers implementing a new service or project. What is the cheapest and most efficient way to achieve the library's objectives? Is the library only able to provide current service at a mediocre level that could be improved if vendors were used to extend the library's capabilities in key areas? Is there any work that library personnel are doing that is actually available at a lower cost from vendors?

The precise mixture of automation, outsourcing, and internal work will vary from library to library, but using vendors to control costs and promote efficiency will be necessary for most libraries.

Working with content providers

Working with vendors can provide many valuable benefits to libraries, but also raises important challenges that have to be addressed. Libraries must keep abreast of changes in copyright and other law that could impact license agreements and other contracts. Complex business transactions and negotiation processes require the library to have access to specialized

expertise. Decision makers will require sufficient discretion to shop around among vendor offerings, form partnerships with other libraries, and take advantage of special deals and time-sensitive discounts. Many libraries already do this, but maintaining efficient business transactions can be difficult. Libraries have struggled to meet the demand for online content at great cost. As one example, health science libraries have faced decades of rising serials subscription fees while suffering stagnant or declining materials budgets (Butter et al., 2012).

Aggregators and publishers

Much noise has been made about the “big deal” or special arrangements to subscribe to all of a publisher’s online offerings and/or large packages. Librarians have argued that these packages are no longer affordable and are requesting more flexibility from publishers. Meanwhile, publishers continue to place embargoes on their journal content that is included in large full text databases or aggregators such as EBSCO Academic Search Premier or ProQuest Research Library. Obtaining the most recent content for many high quality titles requires a current subscription.

Some have argued that what really matters to libraries is the unit cost for information. This makes a great deal of sense and while librarians should pursue different options from publishers, including more flexible packages, it makes no sense to take an inflexible moral position on the big deal as a business model. University of Illinois at Chicago (UIC) librarians have developed metrics based on successful full-text article requests (SFTAR) or COUNTER JR1 reports to compare the cost of Big Deal packages with subscriptions to individual journals (Blecic et al., 2013). Not-for-profit organizations and publishers, not to mention society as a whole, continue to explore new methods for deriving economic value from information. It is more likely that multiple business models will proliferate given the complexity of the information marketplace rather than consolidate into just one or two ideal models.

To reward them for their work, some individuals in our society must be paid, one way or another, for the information that they create. There are serious flaws in the academic publishing model and how academics are compensated, or not, for their efforts, but authors, editors, and publishers require some kind of compensation for the work that they do in writing, editing, web design, and making information accessible online or this information could disappear or at least decline in quality. Of course, academics who publish in academic journals

receive compensation from their employers who in turn have funded or otherwise facilitated their research. That all of the profit from expensive subscription fees goes to the publisher, especially when the need for advertising and other overhead costs is likely minimal strikes many observers as absurd, especially when the very same academic institutions that support academic contributions end up having to buy back access to content that some of their own employees produced.

Open access

Open access is worthy of serious exploration and libraries should experiment with publishing their own content as well. While it seems unlikely that these efforts will eliminate for-profit publishing altogether, some types of academic works, especially physical science journals, could become predominately open access. The open access initiative is a product of the twenty-first century and a reaction to the rising costs and usage restrictions imposed on electronic resources by copyright holders, publishers, and other content providers. Open access content is freely available online to anyone anywhere, with no charges imposed for access, (Joshi et al., 2012, p. 2). There are three types of open access. Green open access occurs when the author self-archives a publication at the time of submission and makes content available through an institutional repository or by other means in parallel with, but not as a substitute for, online publication. Green open access articles also exist in published form that still require subscription fees for accessing content. Gold open access occurs when a publisher is paid a fee at the time of publication in order to make the content freely available. Hybrid open access or paid open access occurs when journals make individual articles freely available within titles that otherwise require subscription fees (Joshi, et al., 2012).

David W. Lewis, Dean of the Indiana University–Purdue University – Indianapolis (IUPUI) University Library, argues more broadly that open access, especially gold open access in which articles are made freely available at the time publication, will disrupt existing business models to the point that 90 percent of published academic articles will be open access sometime between 2020 and 2025 (Lewis, 2012). Economic analysis of academic publishing models “suggests that unless external mandates or other pressures are brought to bear, standard market forces will likely leave room for both traditional and OA pricing models” (McCabe et al., 2013, p. 17). For-profit publishing is likely to survive

in some form because submission fees for open access are still relatively high. Online publishing still costs money and if the author does not pay to make content accessible, someone else has to pay (McCabe, et al., 2013).

Some research funders have created open access policies or mandates that encourage or require grant recipients to make the product of their research available through open access channels.

Since 2008, the NIH in the USA requires that researchers deposit their materials into PubMed Central within 12 months of publication, although only a portion of this freely available content meets all standards for open access. Research councils and other funding bodies administered by the government in the UK also have open access mandates. While many institutions in the UK have institutional repositories, Charles Pinfield has recommended that additional steps be taken, especially the creation of institutional policies with dedicated open access funds, provisions for cost recovery, established formal procedures for administration, and an extension of open access policies to cover researchers and academic areas that have not previously been as involved in open access (Pinfield, 2010).

There are also some problems that must be addressed for any freely available electronic resource to be sustainable, let alone successful. Many paid resources, including online journals such as *Nature* and *Journal of the ACM*, have achieved a high level of academic prestige. High rejection rates for submissions, high impact factor, wide readership, and other characteristics combine to increase the value of publishing in specific titles for academics seeking promotion and tenure. It is difficult for new journals to compete with prestigious older journals for the best content unless senior academics with established reputations decide to contribute articles, serve as editors, or provide support in other ways. Much less difficult, but still a factor, is the quality of copy-editing and online publishing services available to manage freely available online journals. Some organization has to take responsibility for making online content available to users, both now and in the future.

Part of the problem in getting open access off the ground has been created by somewhat scattered advocacy and disagreements among various proponents. Journals such as *Plos One* that serve the scientific community and apply rigorous peer review have made real headway, while advocates of open review sometimes compromise the open access movement. While the concept of open review has developed for many reasons, it is at least partly inspired by current fascination with social media. Altmetrics, including some type of open review process, can be very useful and are worthy of inclusion in the total kit used by academics

to make sense of the importance of particular content and information delivery systems, but the overall value of social media and its related communication processes to science is easily exaggerated. Social media is useful to all sides in public discourse and freed from academic constraints can all too easily become propaganda. Even an open review process that is carefully managed to include only acknowledged experts seems rather unwieldy and impractical. Consider how difficult it is to find reviewers who understand cutting edge research, have time to provide a thorough critique, and are sufficiently self-aware to consider their own biases when evaluating the ideas of others. Social media, and other forms of electronic communication, will not solve all human problems. When the electrical telegraph first appeared in the nineteenth century, there was considerable literature of a utopian character about its transformative properties, so one has to be careful about exaggerating the benefits of new technologies.

Instead of opening the door to radical innovations that may be no more than distractions, advocates of open access should concentrate on developing a viable system by combatting commonly held misconceptions about open access. Walt Crawford's helpful *Open Access: What You Need to Know Now* discusses an extensive number of problematic myths and misunderstandings, but some of the most glaring include (W. Crawford, 2011):

- open access necessarily weakens peer review;
- author-side fees must come out of the author's pocket;
- open access advocates claim that online publishing is free;
- the costs of open access will reduce overall available funds for research;
- researchers already have all of the access to information that they need;
- the public has ready access through public libraries;
- scholarly communication is not intended for a large audience anyway;
- open access weakens copyright;
- open access reduces incentives for authors to produce content; and
- publishers need to acquire copyright in order to protect scholarly integrity.

To debunk these myths requires only a general understanding of academic publishing models and the impact of electronic resources on

access to information. Peer review is entirely dependent on the policies and overall quality of individual journals, so just like paid journals, some are good and some are bad. Employers and others can pay author-side fees on behalf of authors. Grant money can also be used for this purpose in some cases. For a variety of reasons, not least of which is personnel costs, online publishing still costs money and open access journals that meet professional standards will obviously not be able to provide content without cost. It is important to make the distinction between free and freely available.

Open access author-side fees, while substantial, are relatively low compared to other research costs such as personnel, laboratory, IT, and other research equipment. Researchers and the public at large increasingly face the risk of losing access to information as formerly low-cost print journals are replaced by higher-cost electronic versions. While the latter are admittedly superior in terms of convenience and overall access, the economic barrier is often greater than the technical barrier for accessing electronic resources. Authors of scholarly content receive wages and benefits from their employers in academia, private industry and other sectors, but have never received any royalties for articles published in peer-reviewed journals. Royalties for most academic books tend to be quite small because usually only libraries purchase these titles and most users will occasionally make use of library copies rather than buying their own. Admittedly some authors do require royalties as incentives for production and some providers must recover their costs by selling their services, but these concerns do not apply to most academics who routinely publish articles in scholarly journals. Copyright protections are legally the same regardless of the holder, so it is not necessary for a publisher to hold rights in order to defend academic work against plagiarism or other abuses.

Limitations on what is freely available

While open access titles and other freely available content will be available, libraries still need to deal with vendors for other content. If nothing else, even the most ardent open access advocates anticipate a transition that takes place in scholarly publishing rather than an instant change. Also, some vendors have what is in effect a monopoly on content; some journals are only available from one source, the publisher. Other journals may be included in multiple aggregators. To the extent possible, libraries need to consider different options and negotiate the lowest possible rates for content. Positive working relationships

are extremely important and libraries need to be careful in relating to vendors because their help will also be needed for technology support and the library may want to acquire other items from various vendors in the future. Nonetheless, those who negotiate on behalf of libraries need to remember that vendors are pursuing their own interests and libraries need to do the same. Publishers that have successfully made the transition to electronic information will probably need to charge reasonable rates in order to survive in the long term, but it is more likely that an ever changing combination of for-profit and not-for-profit entities will coexist in the online information universe rather than the emergence of a single dominant model for online publishing.

Patron driven acquisitions (PDA)

Some libraries have experimented with PDA programs in recent years. PDA enables users to search for and select books for purchase in the library's online catalog or discovery tools. Some PDA programs have arisen out of the practice of purchasing items submitted for interlibrary loan requests rather than attempting to borrow materials from other libraries. The University of Mississippi found that its initial PDA program based on the purchase of interlibrary loan requests led to the acquisition of content not normally collected by subject specialists for specific academic domains, thus revealing the interdisciplinary nature of the research process (Herrera, 2012). The University of Iowa has successfully experimented with PDA for e-books since 2009, but noted concerns about the potential marginalization of highly specialized monographs when users are left to make selections and the need to balance priorities in collection development for different subject areas because a minority of users tended to be responsible for the most purchases (Fischer et al., 2012). As many librarians know, e-book vendors have also provided an increasing number of different business models to access content, such as short-term loans with lower fees that ultimately trigger purchases if usage is high enough. One example was a program developed by ebrary that would charge libraries 30 percent of the regular purchase price of an e-book for a one or two week checkout period (*Library Journal*, 2011).

Just-in-time information

Somewhat analogous to just-in-time manufacturing, libraries will need to consider reserving some of the scarce funds in their annual budgets, if circumstances and institutional rules allow, for acquiring information on demand rather than attempting to guess what users might need in advance. This information may be acquired from vendors as pay-per-view transactions paid for by the library. Permanent acquisitions of e-books, as discussed in the section on PDA above, are another option. Purdue University Libraries, an early implementer of buying books on demand in addition to traditional interlibrary loan, found that many items were selected by graduate students and enhanced the overall quality of the collection (Anderson et al., 2010). The library may also reserve some funding to acquire data sets or other information as the research needs of users evolve. Resource sharing with other libraries will likely continue in some form, but traditional interlibrary loan will continue to decline in favor of electronic document delivery methods that will provide information to users (almost) instantaneously.

Libraries will also need to explore how to cooperate with and receive funding from research grants for library materials. As librarians and paraprofessional personnel continue to rationalize and improve their information services, most academic institutions will be loath to waste money on duplications of effort. Institutions will prefer to use the library's capacity to manage data and other information rather than fund other units. Librarians will increasingly provide direct support services for large research grants and libraries will temporarily or permanently acquire information and sometimes even equipment necessary to promote discovery and preserve information gathered as part of the larger research process.

This final point is somewhat philosophical, but important. Libraries will no longer provide access to information that is mostly held in the library, but facilitate access to information regardless of how, by whom, or on what terms that information is made available. Metadata will be applied to information in collections, but also materials that are not held in the library so as to facilitate seamless discovery and access by users. Informing users of specific rights and permissions for information will become normal, as it will vary depending on how the library is providing access to information, but most of the complexity will be on the back end of library operations rather than the front end that the user directly experiences. Some of the most important metadata may never be seen by users in its raw form.

Managing multiple models

Multiple business models will coexist in the twenty-first century rather than a return to one simple business model as in the late nineteenth and early twentieth centuries. Careful assessment of analytics data such as cost-per-use, as well as measures of value such as accreditation requirements, the importance of library materials for cutting edge research lines, and the needs of gifted students will be required to select among different possible models for acquiring the same content. Some materials might require or merit subscription while others can be acquired just in time or on demand. Resource sharing or other forms of document delivery will need to be considered.

As a practical matter, libraries will still have annual budgets subject to review by the library administration and others responsible for collection development, but gathering data about what business models to use will be the responsibility of the centralized Electronic Resources Management Unit because its personnel will have knowledge of available alternatives, access to analytics data on cost and usage, and direct access to vendors. Depending on how the library is organized, some decisions may be made by different librarians about how to use particular funds or resources, but selection among different business models will involve applications of data and assessment of value in respect to the particular library's unique clientele and information management mission. A library serving a world leader in nanotechnology may subscribe to key academic journals in this area regardless of cost, whereas a medium academic library might resort to pay-per-view because of astronomical local cost-per-use.

Access to accurate usage data and other analytics may increasingly become terms that libraries identify in license agreements rather than wait for general trends or external pressures to impose changes on vendors and content providers. When an electronic resource is otherwise desirable, but does not include certain types of analytics information due to cost or technical infeasibility, Library IT or other units may explore creative ways to track visits various types of usage. Libraries may want to find ways to the usage of freely available electronic resources that are not counter compliant, as well as other resources such as blogs, wikis, and less formal web pages. Balancing what is freely available in terms of staff time is another measure of cost to account for when selecting among various free and paid alternatives for content. After all, nothing is actually free. Whatever exists in the electronic information universe has been created through some kind of human or machine input, an

expenditure of time and energy that could have been directed elsewhere. Libraries need to consider how access to freely available content is provided and what is made freely available to other libraries and users.

How consortia and other organizations can help

Libraries support other libraries and have been doing so for a long time. This has occurred partly due to the social mission of librarians, but also as a practical matter to control costs and provide access to information that is too costly or rare for some librarians to acquire. Skyrocketing costs for electronic resources have also forced libraries to form buying groups and even more formal consortia to control costs. Many consortia were initially formed to share the cost of implementing ILS or other technologies, but information costs are now the single most important reason to belong to consortia for many libraries.

A consortium need not be large to deliver great benefits to member libraries. The University of Colorado (CU) system consists of three universities on four campuses with five libraries: the University Libraries and the William A. Wise Library at Boulder, the Kramer Family Library at Colorado Springs, and the Auraria Library and Health Sciences Library both located in Denver. By pooling resources together, the CU consortium has managed to save money on acquiring electronic resources in packages. The Auraria Library alone was able to acquire access to information that cost \$6,940,215.51 by paying a share of only \$851,043.76 with an estimated return on investment of 715 percent (Pan and Fong, 2010, p. 191).

Consortia also enable libraries to pool expertise and pay for skill sets that individual libraries, especially smaller organizations, simply cannot afford. Some libraries that serve liberal arts colleges share systems or IT personnel along with their ILS. Libraries are also increasingly sharing the costs of implementing and maintaining discovery tools, ERM, and newly developed library management systems.

Some consortia are investigating how to share larger technical services functions and this might make sense for smaller libraries. ERM, information attorneys, some aspects of emerging technology, and systems might be centralized rather than distributed to local libraries in an advanced and well integrated consortium. It is likely that actual results

will vary depending on how well funded these bodies actually are, which can vary quite a bit.

Examples of consortia working together to manage technical services and IT infrastructure include a Collaborative Technical Services Team developed by the Orbis Cascade Alliance. The team manages a shared ILS and collaborates on several technical services functions. Some specific initiatives for the team include establishing common guidelines or best practices, improved management of e-books, the cataloging of foreign language materials, and the identification and cataloging of government information published before 1976 (Orbis Cascade Alliance, 2010). The Private Academic Library Network of Indiana (PALNI) has implemented a shared discovery tool, Ex Libris Primo (Brubaker et al., 2012). Both the Orbis Cascade Alliance and PALNI provide services by having centralized staff work with staff in member libraries, but some very small libraries might rely entirely on consortia for IT and technical services.

Public libraries might find that keeping up with technology and providing electronic information services is beyond the ability of thinly funded local branches to maintain. State or regional libraries might take over most technology and business functions while freeing up local librarians to provide direct customer service. Public library and academic library careers are likely to diverge even further as a result with public librarians retaining some of the functions of a general practitioner, while academic librarians that support disciplinary faculty will tend to specialize with a greater emphasis on technology and information management. Large academic libraries will want to retain considerable independence in technical services and technology for various reasons and will generally resist the trend of shared services and personnel.

Buying groups and cost control

Buying groups within or outside consortia require shared commitment of resources among libraries. Even if librarians do not have to negotiate directly with vendors, some investment of time must be made in reviewing offers made available by consortia and staying engaged in the affairs of the buying group. Libraries need to make use of buying groups whenever possible, but cannot be passive or uniformed members. It is recommended to scrutinize terms, especially how costs are shared or distributed among libraries, and precise rights and usage permissions for content. Consortia should have license agreements on file and make these

available for members. Librarians should also make suggestions about what offers should be pursued by consortia. Finally, whenever libraries are pursuing electronic resources on their own, every effort should be made to exhaust the potential discounts of buying groups first.

Services for libraries

Depending on how consortia are staffed, they can provide assistance with IT support or ERM. Legal advice from information attorneys or other counsel might be made available to member libraries, even for those contracts that only apply to individual members. Some consortia offer training for libraries and consultants to help reorganize space, rationalize collections, and give advice on the development of new information services. Given the growth of large interstate consortia such as Lyris and Amigos in North America, not to mention national consortia in smaller countries around the world, a large and growing range of services will be available to libraries at varying levels of participation. The same consortium may provide technical services for some libraries, arrange buying groups for other members, and even sell their own developed software in place of offers from commercial vendors. It is likely that some experimentation may take place and, just as multiple business models will coexist in a complex environment, consortia will likely pursue multiple objectives and ever more complex relationships as well. Training and professional development opportunities for library staff are important services that are already provided by many consortia.

Advocacy and political influence

Academic and public libraries face a number of difficult challenges in the twenty-first century: restricted or declining budgets, the perception that some services are becoming obsolete, calls for censorship of controversial information, and rising costs for some information. Individual libraries have limited clout and cannot afford to alienate stakeholders who provide funding. Resisting calls for censorship is made easier when users learn that other libraries do not restrict access to banned books or controversial information. Consortia can provide member libraries with expertise and resources to solve difficult problems. Large groups of libraries can also pursue advocacy through consortia, especially in particularly difficult relationships with vendors, as well as in the wider political sphere.

Managing perceptions of libraries

Libraries are still closely associated with the printed book in the popular imagination of many users and stakeholders. Previously, this was helpful to libraries, but it is a liability in the twenty-first century with the widespread emphasis on the development and improvement of electronic information. Banks, insurance companies, employers, and even nonprofit agencies are going paperless. Libraries cannot afford to be the last refuge for economic investment in the printed word.

All of the changes initiated by librarians will come to naught if they do not succeed in convincing both users and those who provide funding that the twenty-first century library is a truly dedicated and efficient provider of electronic information services. Most aspects of this problem can only be solved by genuine reform, including internalization of new professional norms, changes in education, and reorganization of libraries, but it is also important to communicate these changes to users and convince society that libraries have changed.

Cooperative collection development and shared repositories

Given the high cost of collection development, the need to shift print materials to repositories, and the general problem of long-term preservation for materials not yet digitized, most libraries will need to share repositories with other institutions. Some very large libraries, academic and public, will be able to afford their own institutional repositories for print, but these are increasingly likely to be remote locations. Over time, low usage and the cost of maintenance will make it likely that even large libraries will prefer to participate in regional shared repositories rather than develop separate facilities. Truly rare or unusually valuable books may be retained on site in special collections or archives, but print materials will be increasingly stored in purpose built remote facilities, not unlike the Center for Research Libraries (CRL) located in Chicago, Illinois. CRL acquires both physical and digital materials from a wide variety of international sources, but mostly from outside the USA and particularly Latin America, Africa, the Middle East, South Asia, and Southeast Asia. Governed by a Board of Directors drawn from higher education, CRL honors requests from member libraries to purchase information resources via interlibrary loan requests (up to \$2000 per year per user), accepts proposals regarding

its own acquisitions, offers cost-sharing agreements with libraries, and increasingly arranges electronic resource offers as well (Center for Research Libraries, 2013).

The UK Research Reserve (UKRR) is a partnership between the British Library and the higher education sector in the UK. Established in 2007, UKRR is an effort to develop a distributed national research reserve that will permit the de-duplication of low-use print materials and allow member libraries to repurpose stacks or shelf space. By 7 June 2012, over 61,000 meters of shelf space were freed up for other uses such as study areas, social spaces, and computer labs. This represents more than £18 million in capital savings and more than £5 million in recurrent estate management costs. UKRR members pay annual subscription fees to participate, but can recoup costs associated from de-duplication processes from UK funding councils. The 29 member libraries also enjoy full access to materials in the shared collection (Yang, 2013).

Managing a large-scale transition from print to electronic resources across the USA, let alone the rest of the developed world, will require a much larger network of shared regional print repositories than what is currently available. Developing this network will require substantial resources and the Council on Library and Information Resources (CLIR) has advocated chronological or subject specialization among libraries along with national coordination to ensure that no American imprints are lost to posterity (Nichols and Smith, 2001). Suzanne K. Clement has argued that research libraries have been loath to discard their print collections and the reassurance that content will remain accessible through shared print repositories is essential for large-scale de-accession of print (Clement, 2012).

Many countries already have shared print repositories that can be enhanced or further developed to facilitate access to content after libraries remove their print materials, but similar programs do not yet exist in the USA or Canada. Nonetheless, there are movements along these lines in the USA, including the Western Regional Storage Trust (WEST), a distributed archive based mainly on member libraries from the University of California system, and efforts to develop a distributed program for archiving monographs among member libraries of the HathiTrust (Clement, 2012). Other regional efforts, often based on consortia, are likely to emerge in the USA and Canada.

How libraries are misunderstood

Most users seem unaware of the overall impact of electronic resources on libraries. Having given presentations to disciplinary faculty, I have been struck by how little information gets out about rising costs, the need to negotiate complex license agreements, or the pace of change in platforms and services provided by vendors. It is rather doubtful that the work of newer types of librarians such as the electronic resources librarian, emerging technology librarian, GIS specialist, or expert in bioinformatics is clearly associated with libraries in the minds of most stakeholders. To be fair, it is probably not easy for most of us to imagine what a nanotechnologist does on a typical day, but no one is questioning whether the work of the nanotechnologist is obsolete. Unfortunately, librarians do face this question and need to offer a clear response.

Libraries are primarily information service providers in the twenty-first century, but that phrase must be explained in order to represent the work that most librarians actually do. Librarians must sometimes act as teachers, as well as guides, to information. Teaching basic information literacy, as well as more sophisticated strategies for evaluating the quality of complex information, is work that librarians must share with other academics, but it is an important specialization within librarianship. Metadata, sometimes described as data about data and often thought of as just a modernized form of cataloging with more schemas, will become increasingly more complex and important. Metadata will increasingly become critical in the long-term preservation and access to the majority of information created by human and machine intelligence in the future. When one considers other areas of specialization in libraries such as electronic resources or licensing librarians, emerging technology librarians, GIS librarians, and bioinformatics specialists, the twenty-first century library is arguably more complex than its twentieth-century counterpart by several orders of magnitude. As information continues to grow and evolve, more specialists will likely emerge.

Twentieth-century libraries, at least the very large ones, were not really well understood by most users either. Most users in public and academic libraries would have been surprised to learn that there were specialized experts in collection development, cataloging, reference, and preservation on the premises.

Sometimes, little distinction was made in the minds of some users between professional librarians at the reference desk and clerks at the circulation desk. There were many reasons for this ongoing ignorance, but it was not as problematic then as it is now. Given increasing competition

among information service providers, the ongoing misperception of libraries needs to be cleared up in the popular imagination in order to secure ongoing support from stakeholders. Librarians need not only to reorganize libraries, promote useful services and shed obsolete functions, and reform education, but also change their image.

Building support for librarians and information service providers

Philosophical argument and appreciation for reading will only take libraries so far in gaining support from users. While it seems inconceivable that higher education would dispense with libraries, many K–12 institutions in the USA have done just that. As other competitors continue to improve their services it is not entirely unlikely that libraries may receive reduced support. Clear demonstrations of value are required to convince growing numbers of skeptics that libraries, increasingly based on electronic resources, are still valuable services in the twenty-first century.

Some of this value can be demonstrated by showing how libraries can effectively subsidize access to otherwise expensive information. Good customer service and efficient delivery of service are other selling points. Measuring and showing how libraries can save valuable research time by focusing the limited resources of users on the best and most useful information should also go far in showing how libraries are still needed in an online universe inhabited by Google, Yahoo, Wikipedia, and a host of other reliable online tools.

Sustainability and assessment

Controlling costs, keeping up with ever changing technology, and adapting to the complex and ever changing preferences and needs of users requires a continuous investment in assessment. Libraries need to know more about how library services are being used, likely to be used, and could be used than ever before. Organizational culture will need to place high value on the efficient use of scarce resources while continuing to promote excellence in academic work and customer service. Embracing change and the need to make constant revisions in services will also be important and must be informed by reliable information about institutional performance and user behavior.

Again, many libraries have tended to approach this problem by assigning a single new specialist librarian to manage assessment and coordinate the activities of other existing units to provide data, evaluate services, and conform to new standards. Given that assessment is also the natural preserve of administrators, managers, and other professionals this approach is problematic. Assessment techniques can only be successfully employed in ways that directly impact services when integrated into the routine operations of all units. Specialists in statistics or personnel assigned to managing and working with data that informs the process of assessment, for example an analytics support unit, would be useful and likely invaluable for large academic libraries and consortia. Ongoing changes in assessment techniques and the perpetual need to develop new metrics makes it necessary to assign a sufficient number of personnel to specialize in this important work. Instead of being a lone voice in the wilderness, the assessment librarian would lead a dedicated unit that would carry on its activities in coordination with the administration and other decision-making bodies within the library.

Having reviewed LIS literature about assessment published from 2005 through 2011, Jon R. Hufford has noted a trend toward the use of more qualitative information and attempts to measure student learning outcomes in information literacy and other instruction sessions. Use of traditional input and output measures such as gate count have declined, along with the formerly ubiquitous annual reports, although greater emphasis is now being placed on usage statistics of electronic resources and other metrics based on online research activity (Hufford, 2013).

Assessment of information literacy and instruction requires the evaluation of student performance on such tasks as selecting relevant information resources from database search results or constructing appropriate queries using Boolean logic. Whitlock and Nanavati have argued that assessment is a recursive iterative process and suggested a five step method for information literacy that includes: (1) learning outcomes; (2) designing learning activities and assessments; (3) establishing evaluation criteria; (4) deploying activities and implementing assessments; and (5) reflective and revising (Whitlock and Nanavati, 2013).

Developing a culture of assessment that enables libraries to demonstrate value to users and other stakeholders is vital to the long-term success of libraries. The Brooklyn Campus of Long Island University used five- and six-question instruments in 2011–12 to measure students' understanding of how to conduct research before and after library instruction sessions for two introductory undergraduate courses. Somewhat disturbingly,

12.5 percent of students in a freshman composition course correctly cited the library's online catalog as the correct source for finding books held by the library prior to receiving instruction while the number increased to only 40.95 percent after instruction (Stowe, 2013, p. 264). Google and other popular online search tools can provide instant results, but "rigor, methodology, source authority, and critical thinking" remain necessary for academic success (Stowe, 2013, p. 274).

Driven by data

Personal judgment informed by professional knowledge, experience, and intuition remains important in the work of librarians, but decisions about how to improve library services will be increasingly driven by data. Usage reports, statistical assessment of business models for providing information to users, analysis of web traffic, and other measures of user behavior are already commonly employed to inform the processes of collection development, web design, space management, and other investments in technology and software. Twenty-first century libraries will have access to more measures of user behavior, more information about the wider culture served by libraries, and more information about their own internal processes than ever before.

It will be important and increasingly difficult to balance privacy and other values with this increasing amount of data about user and personnel behavior, but there will likely be many more opportunities to improve services for different user types and unique individuals. Personalized recommendations, common in the commercial world, will become increasingly common in library information services, and will be supplemented by more detailed suggestions for academic search and discovery. Entire lines of inquiry, consisting of complex clusters of related research articles, e-books, multimedia, and databases can be suggested with improved metadata and responsive discovery tools, not just small or large sets of single items. This process has already begun, but will intensify and more libraries will be free to pursue local customization to suit their specific mission and clientele.

There are many types of information that successful information service providers, including libraries, will need to gather about the unique user community or clientele whom they serve. Table 6.1 lists some of what will be needed, but is by no means exhaustive.

Libraries will need to gather detailed demographic information about their respective user communities in aggregate form while being careful not to infringe on the privacy rights of individual users. Librarians

Table 6.1 Information about users

Users of academic libraries	Users of public libraries	Users of special libraries
Demographics: age, race, gender, nationality, income, language, religion, disabilities, education	Demographics: age, race, gender, nationality, income, family size, language, religion, disabilities, education	Demographics: age, race, gender, nationality, income, language, religion, disabilities, education
Academic requirements	Fiction genre preferences	Professional requirements
Current research projects	Nonfiction genre preferences	Current work projects
Consumer technology preferences: Internet browsers, e-readers, other hardware and software	Consumer technology preferences: Internet browsers, e-readers, other hardware and software	Technology provided for use by staff or employees: hardware and software
Social media usage and preferences	Social media usage and preferences	Social media usage and preferences
University technology infrastructure and policies	Community technology infrastructure and policies	Institutional technology infrastructure and policies
Current technology in use for pedagogy: hardware and software	N/A	N/A
Usage of library services	Usage of library services	Usage of library services
Assessment of information and technology literacy	Assessment of information and technology literacy	Assessment of information and technology literacy

will also need to take active steps to gather information about the overall level of information and technology literacy among the user populations that they serve. Precise methods will vary and selection will be based partly on user consent or cooperation, but librarians cannot afford to assume what their users know about information resources or technology. Methods for gathering this information might range from the use of commonly available tools such as Google Analytics to formal surveys of users. Some information is widely available from government agencies and many libraries already take demographics into account when planning or adapting their services. While some methods of the private sector might not be directly applicable to libraries, librarians will increasingly need to become familiar with how to use big data to analyze user behavior as well as more traditional methods.

All types of libraries need to undertake a more systematic collection and review of how users are behaving online so as to design websites, applications, and tutorials for hardware and software that their users prefer. Finding out what e-reader is currently preferred by users or what social media websites are actually frequented will help libraries to improve information services and communication with their users. Keeping track of applicable policies that impact libraries, whether enforced by parent institutions or local communities, should be intuitive, but needs to take place more systematically. Many libraries measure usage, but online activity, everything from counter-compliant usage statistics to data harvested from local server logs, needs to be collected more thoroughly and better integrated into routine assessment and strategic planning.

Academic libraries will need to make special efforts to analyze not only overall trends among students, but also specific needs for academic disciplines and interdisciplinary research programs. Great care must be taken to identify and investigate any differences between the research needs and information seeking habits of faculty and students, but also differences between faculty members who are at different stages of their academic careers (Bauder and Emanuel, 2012). Sometimes services rejected by senior faculty are deemed essential by early career faculty.

Finally, libraries need to gather more information about what users' intentions are. What work or pleasure are they in pursuit of when they are using the library? Many public libraries try to gather information about user preferences, often based on usage and interlibrary loan activity, but additional methods must be employed to get at what users are trying to do. Surveys, requests for feedback, and suggestions for improvement can be employed. A quick short survey asking one or two questions that

receives a large number of responses is often better than long elaborate surveys that are taken by a few users. The guidelines recommended here are very general, however, and the actual need for information will vary depending on the size of the library and unique characteristics of the user population. An information specialist embedded in an NIH research team may be able to learn most of what they need to know from direct interpersonal interaction with principle investigators while a large academic library may need to employ a very wide range of techniques to evaluate routine services and sometimes create entirely new measures to evaluate special projects or experimental services.

New bridges and silos for information

Libraries in the twenty-first century can only hope to own a portion of the information resources that their users might need. This has been true for all types of libraries for quite some time, but the problem is only likely to become more acute as growth in the sum total of information and advances in human knowledge continues unabated. Providing access to information and helping users to discover what is needed are fundamental problems for libraries, not the development collections per se. Google's search algorithms, not to mention Bing or Yahoo, are very useful and only likely to improve, but it is doubtful that even large organizations will hold a monopoly on how information should be described or discovered. Understandably, freely available search engines require funding and economic incentives can also distort discovery or lead users to content or a service that someone would like them to buy rather than simply the precise information that they need. Libraries, library vendors, and other groups will continue to play a role in identifying, labeling, and making information available to users.

Some imagine, and some developers of online search engines encourage the view, that the Internet is one seamless ocean of information, but it is not. Rather it is an ocean that includes many large and small islands that contain all kinds of proprietary, sensitive, or highly specialized information resources. Is it really safe to assume that a high energy physicist at CERN (the European Organization for Nuclear Research) is adequately served by Google? Libraries and librarians still have a lot of work to do, arguably much more work than ever, when it comes to applying metadata to old and new information objects. The assumption of MARC cataloging is that metadata only need be applied once, whereas it sometimes makes sense to apply new metadata to old

information objects in the twenty-first century. Partly this due to the technical problem of ever changing electronic formats, but it is also due to the fact that some information might be used in ways that those who originally gathered or developed it would not or could not have conceived of, especially considering the demands of interdisciplinary research and the emergence of entirely new of disciplines over time.

Given the fact that some information is economically valuable or otherwise contributes to wealth and power, human civilization and libraries will likely be dealing with information silos for quite some time. Librarians need to attempt to break down silos, but this work will never be complete. Building bridges between information silos in terms of technical and/or legal access is only one problem for libraries, but libraries also need to address breaking down information silos that naturally emerge from differences in concepts and understanding about particular information sources. Sometimes, a physicist might not know that an interesting research line in a highly specialized sub-discipline of engineering might be useful to them. Libraries can help with this problem in terms of how metadata is applied to information objects. Librarians need to work with members of academic disciplines, but they cannot afford to restrict their perspective about information to that of other actors in society that create these information objects. Being apart from other disciplines as true information specialists gives librarians a unique perspective. Metadata specialists with a high level of general education, advanced training in LIS and other relevant disciplines, dialogue with or access to subject specialists, and the freedom to do advanced research and develop innovative techniques will be needed to serve libraries and users in the twenty-first century.

Project management and library innovation

All too often many good ideas for improving service are proven to be unsustainable or simply fail to be developed at all. Libraries need to study the methods that other types of organizations have used successfully to develop and evaluate projects, including established methods for successful project management. Academic libraries in particular are sometimes constrained by complex governance structures, especially various systems of faculty governance, but additional steps can be taken to integrate best practices into most organizational cultures.

Frank Cervone describes the System Development Life Cycle (SDLC) in eight steps that can be applied to library digital projects: “1) Preliminary

Investigation, 2) Problem Analysis, 3) Requirements Analysis, 4) Decision Analysis, 5) Design, 6) Construction, 7) Implementation, and 8) Operation and Support” (Cervone, 2007, p. 348). Librarians must consult with multiple constituencies to understand the nature of problems to be solved and whether proposed solutions are feasible based on time, cost, technical requirements, and operational logistics such as available personnel and skill sets. Information must be gathered from multiple sources, cross-referenced, and evaluated. Analyzing problems and proposing solutions is very much an investigative process. Realistic project plans require a lot of information, including detailed analysis of how the actual work might be performed at all levels.

Personalization and privacy

Many commercial websites and online information services provide a number of personalized services. Toolbars, widgets, and facets increasingly abound on the Internet that enable users to refine search results, include or exclude customizable features, and automatically link to news or other information. Many libraries have already adopted RSS feeds, email alerts, and other features originally developed by or associated with the commercial world, but further customization and personalization of online information services will likely become more important for libraries in the future.

Arguably, libraries will be best served by providing both standardized and customizable services depending on the unique needs of each user. Discovery services and other comprehensive search tools will have to be balanced with subject databases, specialized websites, and other types of search portals because it is unlikely that metadata will ever be universally shared among all types of content providers or that every user will want to search using the same tool in the same way.

Increasing efforts to capture the value of personalization will also require libraries to balance the right to privacy with improvements in service. Recent revelations about widespread government surveillance of electronic communications, as well as other types of information security concerns, remind us of how the electronic library is part of a larger online system in which any information gathered by libraries could be put to various uses, both positive and negative. To the extent possible, libraries will need to protect users from the abuse of their information while recognizing that the task is extremely difficult, if not impossible in some cases.

The digital divide

Abstract: The chapter reviews the complex problems that contribute to the digital divide including uneven distribution of IT infrastructure, disparities in education, poverty, and disabilities. It includes suggestions for how libraries can work to assist disadvantaged users. The role of the library in providing access to government information in the information age is also discussed.

Key words: accessibility, digital divide, digital preservation, government information, impact of poverty on information access, users with disabilities.

Despite the great promise of electronic resources and the wide range of new services that libraries can provide in the twenty-first century librarians need to consider that some user populations are at risk of being left behind. Much has been written about the digital divide, effectively a line that separates those who are able to take advantage of innovation in IT and communications and those who cannot because of cultural, political, economic, and sometimes physical barriers. While this line is admittedly imprecise and shifts considerably over time and space, it does seem a safe argument that some populations are at risk of losing access to information as libraries continue to modernize and develop new services. Librarians need to address the complex interrelated problems represented by the digital divide in all plans for transition and also consider new ways to provide information services to reach these disadvantaged populations.

Fundamental problems

Survival for human beings, let alone success, in the information age requires access to information. Those who have sufficient means for

access, plugged into the online world, and savvy about the impact of new technology on the law, finance, education, professional careers, and consumer safety will do well in the future, or at least have a better chance, than those who are effectively excluded from vast and growing global information networks. The poor, persons with disabilities, those who are ideologically or culturally opposed to innovation, and other people who find themselves cut off for various reasons will have a hard time keeping up with rest of the world.

Historically, libraries, especially public libraries, have invested a great deal of effort into ensuring that information is widely accessible to the public. While electronic libraries will need to change their strategy to suit different times, the same mission remains. Librarians need to take on the responsibility of helping those who lack access to join the wider world. Precise methods for solving these problems will depend on diverse local needs and resources, but a broad discussion of the dilemma can provide some suggestions for getting started.

The Library of Congress National Library Service for the Blind and Physically Handicapped (NLS) has ensured that at least one library in each state in the USA would be required to provide braille and audio books to users who were blind, had low vision, or other disabilities that prevented them from using print materials. The Americans with Disabilities Act (ADA) has also impacted libraries with provisions for ADA compliant websites, but libraries need to do more to advertise what is available. Jill Lewis has called for systematic gathering of information about the specific needs of disabled people in local communities by public libraries, along with additional staff training and greater investment in more adaptive equipment. Libraries need to advertise large-print collections and the accessibility features of commonly used technology such as adjusting font size for iPads. Electronic resources will likely expand overall accessibility, but only if such needs are taken fully into account when selecting e-readers, software, and other library materials (Lewis, 2013).

Awareness

Understanding the scope of the problem and making sure that stakeholders and funding agencies also do is perhaps the first step in helping to bridge the digital divide. Libraries will need to focus their attention on the constituencies they serve in order to gather precise information about users. Questions to be answered range from the socioeconomic to the technical, including what in the private sector might be called

consumer preferences. What is the economic and cultural background of the specific user population served by the library? What is their level of education? How do they access the Internet? What devices do they use? Do they have unique preferences in terms of browsers, particular websites, or other online information-seeking habits? How do they receive local news? What do they like to read for recreation? All types of libraries need to know the answers to these questions in order to build a comprehensive profile of their users, but the problem is particularly acute for public libraries in the twenty-first century.

Some information can be gathered from national and international studies conducted by government agencies, nonprofit entities, and consumer reports generated by the private sector, but libraries will have to start surveying their own users, conducting usability studies, and partnering with other local stakeholders in order to get a more complete picture of what is going on in their neighborhood. Information gathered by libraries can be used to improve information services, but also to inform the work of locally active charities, churches, government agencies, private companies and other entities that would like to help the public.

Public libraries can act as advocates for their local communities and help other groups provide important information to their users. Libraries should continue and broaden their efforts to keep local users informed about new technology, freely available information resources, career opportunities, consumer safety and product recalls, health and wellness, and important changes in the law that may impact their access to information or other aspects of their lives. Librarians can partner with other professional specialists to help users obtain information that libraries are not equipped or legally sanctioned to provide.

Bridging the digital divide is arguably more difficult and more complex than many realize. Jeffery James has argued that the digital divide consists of several interrelated problems that are not easily addressed in isolation. Poverty, skills deficits, and lack of infrastructure act as multipliers to reduce the ability of disadvantaged users to participate in the online world. All of these problems must be addressed simultaneously in varying degrees in order to make real lasting progress, but analysts need to identify the most critical problem for particular user communities (James, 2008). Librarians serving an impoverished rural community in the USA might need to focus on information literacy and other skills deficits, while librarians in developing countries might need to make tough choices about allocating scarce resources for different types of IT infrastructure.

Infrastructure

Public libraries will need to consider developing Internet cafes and other methods for reaching users who cannot afford their own computers and mobile devices. Prices have gone down tremendously for many electronic devices in recent years, but average incomes have also dropped and, at the time of writing, the entire world continues to endure a fragile economy. Providing online access with reasonably decent infrastructure is an invaluable resource to the unemployed and other economically struggling members of the population. A national impact study of public library use conducted by the University of Washington and funded by the Bill & Melinda Gates Foundation indicated that 77 million people, nearly one-third of Americans age 14, used public libraries to access the Internet, and 44 percent of people living below the federal poverty line (\$22,000 annual income for a family of four) relied on libraries as their sole method of accessing the Internet (Becker et al., 2010). The report recommended that libraries be included in economic and workforce development strategies, the dissemination of public health information, and as partners for developing broadband networks and promoting student success in K–12 education. Public libraries were also encouraged to take a more active role as community information commons by advertising volunteer opportunities, providing tools to maintain social connections, and working with civic and government organizations (Becker et al., 2010).

Disabled members of relatively wealthy households often have access to technology and services, but those who are poor and disabled may not know what is available to them, let alone have the means of securing services. Libraries can offer technology on site that provides information services to the blind and deaf, as well as instruction in how to use such technology. Text-to-speech can be very useful to the blind, but reading with Braille has also proven quite useful to many blind individuals. While the development of some type of tactile e-reader is not out of the question in the future, especially with nanotechnology, Braille materials are one exceptional area in which libraries should consider maintaining alternative print services. Centralized or regional print repositories for Braille materials or, even better, the ability to print Braille items on demand from e-books, could be an invaluable service for blind users. As these materials would be held off site and shipped around as needed or printed on demand, this would not require libraries to retain separate facilities and personnel for managing print. Search and discovery of these materials would remain problematic, however, and libraries will need to

provide direct assistance or text-to-speech options for library databases and other discovery tools.

Somewhat like the bookmobile that is still used in some communities in North America and likely still has some analogues elsewhere, electronic public libraries can also bring services directly to disadvantaged users when no other means will suffice. Kentucky still maintained a large fleet of 112 bookmobiles in 2007, mostly traditional vehicles, but also two “cybermobiles” with Internet access (Gibbon, 2007). The idea of the cybermobile is not new, of course, and was described in detail as a public access tool by John E. Drumm and Frank M. Groom in the late 1990s. Much of the technology described in their article such as Pentium computers, is dated, but it is interesting to note that their design included a wheelchair lift and every effort was made to provide accessibility to persons with disabilities (Drumm and Groom, 1997). Vans outfitted with computers and mobile devices could visit public schools, churches, and community centers that lack these resources and make information temporarily accessible to disadvantaged user populations. Given the worldwide distribution of mobile phones a cybermobile may seem quaint, but outreach includes not only technology but also instruction in how to use it properly. Hopefully, the need for cybermobiles will disappear entirely with time, but taking technology and bringing online access to users may still be necessary in some cases. Librarians can also provide assistance to schools that have lost their libraries and media centers either through institutional arrangements or by volunteering their personal time.

An estimated 41,260,000 million people could be considered disabled, or 15.1 percent of the entire civilian non-institutionalized population of the USA according to data gathered in a 2006 American Community Survey by the US Census Bureau and later published in a 2008 report on disability status (Brault, 2008). The visually impaired, including the legally blind, can use digital or electronic libraries, but additional investments in technological infrastructure are required. Text-to-speech, fingertip sensors for reading computer screens, and special mice that can enable the blind to read web pages in Braille by providing physical feedback are among some of the useful tools that are available. More recently, tools have been developed that can inexpensively change plain text format into Braille, effectively an online Braille generator (Jeong, 2008).

The NLS has long made Braille and audio cassette versions of library materials available for use across the USA, but launched the Braille and Audio Download Reading (BARD) service on 30 April 2009. As

of 2010, 15,000 of the 800,000 registered patrons of NLS had signed up for this digital delivery service (Library of Congress, 2010). The Integrated Digital Library System (IDLS) of the Canadian National Institute for the Blind (CNIB) Library makes digital content, mainly audio files, available to users across Canada. The IDLS is organized into three broad divisions, an integrated library system for managing traditional print resources, a production and sales management system that manages the production of digital assets and schedules work, and finally a digital handling system that stores and distributes electronic content. Many private companies partnered with the CNIB to develop the software and other infrastructure necessary to make these services available, including Microsoft, IBM, OpenText, Geac, Navantis, and Corus Entertainment (McGrory et al., 2007). The China Digital Library for Visual Impairment (CDLVI) is another example of an online library digital library service developed entirely to serve the needs of the visually impaired user that includes simplified website design and hot key functionality for greater ease of navigation, screen reading software, as well as contact information and detailed instructions for accessing library materials in person (Wei et al., 2012).

Again, there is a lot that libraries can and must do apart from these larger collective efforts in order to make online content more accessible to persons with disabilities. Applying the principles of good web design such as avoiding the use of tables in web pages, using cascading style sheets (CSS), and deploying content management systems such as Drupal, Red Dot, WordPress, Plone, or Estrada will not only create a more consistent and professional virtual library, but will also assist users with visual impairments and other disabilities. Dave Comeaux and Axel Schmetzke recently conducted a review of academic library websites in North America from 2002 through 2012. Using Bobby 3.1.1, a tool for evaluating compliance with the Web Content Accessibility Guidelines (WAGE) 1.0, Comeaux and Schmetzke found that the number of errors per library web page or barriers to access has declined significantly from an average of 4.8 barriers per page in 2002 to 1.7 in 2012, but 39 percent of web pages on average were not “Bobby-approved” in 2012 (Comeaux and Schmetzke, 2013).

Online accessibility is a global problem, especially access to government services, which are increasingly shifting to electronic format. A study of e-government access in Jordan revealed that 47 percent of sample tasks on e-government and educational websites could not be completed by the blind or visually impaired (Abu-Doush et al., 2013, p. 282). The absence of a keyboard alternative for many functions, the high number of tabs

required to complete some tasks, and the general absence of a skip to content feature were some of the most difficult problems identified by disabled users and web design experts. Solving these extensive problems would require formal government policies and guidelines, changes in higher education to include more course material about web design for users with disabilities, and the integration of criteria relevant to users with disabilities in commercial software development, as well as web design by libraries, colleges, universities, and government agencies (Abu-Doush et al., 2013). Users with disabilities also benefit from specialized instruction by librarians in how to use adaptive technologies and access information. Librarians in the National Capital Region (NCR) of India surveyed 375 users with disabilities and discovered a high level of interest in such services (Kumar and Sanaman, 2013).

Libraries will need to keep track of important developments in law and technology that impact users with disabilities. Despite the proliferation of e-readers and formats for e-books, options for users with disabilities are somewhat limited. S. G. Ranti Junius has reviewed various formats and discovered that DAISY, EPUB, and TXT are the most accessible formats while PDFs and simple HTML formats are also generally accessible. Handheld Apple devices outfitted with iBooks include a number of useful features for users with disabilities, but Blio and Kindle apps with text-to-speech functionality can also provide access to disabled users provided the right features are enabled both in the apps and the corresponding devices (Junus and Booth, 2012). While librarians can review the literature and conduct occasional in-depth usability testing, it is advisable to have personnel in ERM or Library IT units conduct routine functionality testing of resource platforms, devices, apps, and other software.

Assessing what is available from larger entities, including government agencies and private vendors, and then filling in any gaps with local services would seem like a regional strategy for most libraries, but recent economic problems and cuts in government spending may adversely affect key programs. Reaching out to other local organizations that serve the disabled and finding alternative sources of funding for technology to supplement or replace reduced offerings from other sources may also be necessary. Libraries should integrate consideration of services for those with visual impairments and other disabilities into routine strategic planning and assessment. While it may not be feasible to create alternative versions of every web page, some key online resources offered by libraries could be made more accessible. Simplified web pages for

digital repositories and other locally created or curated digital collections could make online content more accessible to the disabled.

Divided communities

Libraries have played an important role in developing Western culture. Almost as long as books have existed, the wealthy and powerful have had access to libraries, but only with the development of a dense network of public libraries have similar resources become available to the average person. While a large percentage of the population is able to enjoy access to information resources through academic libraries, there is no replacement for public libraries and public access to information in a robust and healthy democracy.

As society and its information production have grown ever more complex, it is not really possible for even educated lay people to follow the intricate complexities of new research in disciplines outside their own personal training and knowledge. The Renaissance man is a cliché, but it was possible in earlier centuries for relatively intelligent people with adequate time and resources to become adequately versed in a wide variety of disciplines. That is not true now. Even individuals who hope to stay relatively well informed of the most important innovations of our own time require very extensive help from others. Libraries are required to foster both a culture of lifelong learning and provide the raw materials for that culture.

Public libraries can also serve as extensions of programs for remedial education or basic skills. Library personnel can be trained to help identify, assist, and modify service for emergent readers or users who are attempting to improve their general level of literacy. Formal policies, training, and partnerships with experts in other organizations are necessary to provide appropriate levels of service for users with different levels of knowledge and abilities to process information (Train, 2003).

Without libraries, the poor will not have enough information to achieve social mobility or participate in the economic life of modern society, but the wealthy will also suffer from not having the work of professional librarians who identify, acquire, organize, describe, and provide access to content. Librarians are very good at identifying good sources and what is essentially useful to know about many subject areas without having fully mastered them. This is indispensable in the twenty-first century and few users of online resources realize the true extent to

which they have become dependent on this ubiquitous but often hidden work of organizing information.

Outreach and organizational culture

All libraries, but especially public libraries in these tough economic times, need to conduct extensive and continuous outreach efforts. Learning about the unique needs of the local clientele as well as considering the role of the individual library as part of a large information network is critical to long-term success and relevance. Public libraries need to know not only what their users are reading, but demographic statistics, online browsing habits, what kind of technology they are using, hobbies, and other general interests, as information services must be constantly reshaped and improved to serve particularly important local needs. Funding is scarce and local public libraries face many competitors, including larger public libraries that serve larger regions.

Libraries also need to advertise their services and how they can provide information that is relevant to the consumer, the disabled, the unemployed, the concerned citizen, and, of course, those who are seeking information-based entertainment in a safe environment. Partnerships with other community organizations can help to get the word out, as well as enable libraries to track important issues and concerns that impact the local community served by the library. Academic libraries can also partner with other groups in the community, especially through special collections, by offering to develop or curate local collections of academic interest. Academic special collections librarians, partly to secure funding and broad support, need to engage in a wide range of outreach activities that include not only exhibits, but also digitization of content whenever possible, active use of social media, instruction and partnership with local secondary schools, and good customer service (Harris and Weller, 2012).

Of course, special collections units can also attract positive attention to the library as a whole and bring in much needed funds from donors. An online survey of 146 distance education students conducted in 2009 by librarians at the University of Illinois at Urbana-Champaign discovered that most students learned about the library from their instructors, but 71 percent of respondents would like to learn more about the library via email, while 59 percent would like to learn more from the library's website (Hensley and Miller, 2010).

Web design, as well as other library information services, must be developed with semantic, cultural, and logical constraints taken fully into account, as referenced in Donald Norman's classic *The Design of Everyday Things* (Norman, 2002). This is impossible without having considerable knowledge regarding the habits, preferences, and general level of information literacy of specific user groups served by the library. Library resources need to provide information and service in ways that most users would find intuitive, familiar, and convenient, but what goes on behind the scenes is a different story. Simply because a search box looks like Google and is easy to use does not mean that it must or should work like Google. Libraries need to attract users and make it as simple as possible to use information services, but libraries also have a very different mission than Google does. Google, Bing, Yahoo, and other search engines are all excellent tools, but do these tools really work that well for doing a thorough literature review in preparation for research in chemistry or astrophysics?

The problem of keeping up

Previous sections of this book have stressed the need for libraries to keep up with trends, to initiate innovation rather than waiting for it to happen, but libraries also need to keep up with problems that arise among specific user groups. Just as private corporations and well managed nonprofits track changes in demographics and funding sources, libraries need to start tracking changes in demographics and user needs, and begin planning ahead rather than waiting to be told to expand or cut back on services.

Public libraries should constantly engage with users regarding their reading preferences and information needs without making assumptions. Services should be altered as the user population served by the library changes. Some of this is quite obvious and libraries are already taking steps in this regard. Examples include expanding Spanish language collections and English language training tools in areas served by growing Hispanic populations in the USA, including more workstations accessible to persons with disabilities in areas that include high numbers of wounded veterans, or developing new children's collections in regions with expanding workforces and young families.

Electronic resources make it possible for libraries to be much more nimble in terms of collection development and the overall response rate to changes in user demographics.

Librarians should take full advantage of GIS and freely available government statistics to map out their user populations, identifying geographic locations of persons who use the library, and then correlate that information with their publicly available demographic characteristics. Librarians can also use software embedded in library websites, as well as judicious harvesting of server logs, to track user activity. Great care should be taken to respect individual privacy and every effort should be made to avoid the long-term retention of information about individual users, but aggregate information about user populations should be thoroughly analyzed and permanently retained.

Support for users

Libraries not only provide information services to users, but also teach users how to find and use information on their own. Users often need to find out how to separate reliable information from what is unreliable, especially in subject areas outside their personal expertise. Users, especially young users, also need training in how to obtain information and engage in other online information-seeking behavior safely. This does not mean that librarians should take the political or legal risk of acting as nannies or otherwise trying to model politically or morally correct behavior, but teaching users to understand the potentially negative consequences of sharing or seeking information online seems reasonable. Libraries can also partner with other agencies and groups to make additional training available.

Some examples of services that public libraries can provide, and many already do, include searchable databases for employment, public health information with local alerts and product recalls, free onsite access to high-quality online newspapers and journals, and government information. Those without Internet access at home, including some elderly pensioners, often find that the local public library is their only available option for participating in the online world that many of us increasingly take for granted. Computer workstations in small private rooms would enable those without ready access to technology to check their accounts, pay online bills, or apply for jobs in a secure online environment with physical privacy from other users. The Entrepreneurship Bootcamp for Veterans with Disabilities (EBV) was established in 2001 to assist US veterans with establishing their own businesses. Eight universities, along with private corporations, have supported this national program. Business librarians from the participating institutions have made library

resources available to veterans during campus visits, but also created LibGuides and other tools to help users find content available to them from local libraries (Hoppenfeld et al., 2013).

Public libraries might consider closer formal partnerships with local news organizations and other groups that sometimes find themselves equally challenged by rapid changes in technology and the emergence of a new virtual information environment. Libraries can volunteer to digitize print copies of local newspapers, even defunct ones, or archive new online content for local newspapers that have successfully transitioned to an online version. Somewhat similarly, public libraries could assist local public schools with the digital preservation of yearbooks, school newspapers, and other materials of unique local interest. Librarians could also leverage their role as educators in information literacy and instructors in the use of technology to help local communities overcome problems of access. Programs to help the elderly manage their bills online, use social media, and take advantage of free government information might be beneficial in most communities. Librarians can also offer both courses and temporary online or on-site information displays that provide additional means to staying informed about current events or important issues in the news that impact local users.

Library as defender of the public record

Library users in the USA have benefited from a robust federal depository program that ensured that legally accessible government information was widely distributed to libraries around the country. Naturally, this program was originally developed using print materials and no electronic substitute has yet emerged that will fully replace the wide range of documents that were previously made available. While many government agencies provide excellent websites and the US Government has served as a pioneer in electronic resources, some of the safeguards of the print program have not been copied for electronic resources. The wide geographic distribution of holdings and the stewardship of libraries that characterized the print program do not have an obvious analog in the electronic era.

Problems of preservation

To ensure that electronic government information remains widely accessible in its original form, libraries will need to investigate the

development of new programs for storing, cataloging, and retrieving electronic government information, but important efforts are already underway. A group of 11 libraries, mostly Canadian but including US-based Stanford University, has leveraged the LOCKSS program to develop their own network for preserving Canadian government information. The Canadian Government Information Private LOCKSS Network (CGI-PLN) includes over 110,000 PDFs and member libraries are committed to regularly maintaining and updating content (Jacobs, 2013). The Digital Federal Depository Library Program or the “USDocs” private LOCKSS network is supported by a number of large academic libraries, state libraries, the Library of Congress, and the Government Printing Office (GPO). Geographically distributed across the USA, including Alaska, “USDocs” is an important step in the right direction for long-term distributed digital preservation of government information, but more effort is arguably needed (Digital Federal Depository Library Program, n.d.).

While academic libraries will need to find a new role in serving as electronic repositories for government information or at least sponsor or manage other entities engaged in preservation of the public record, there are also some notable government efforts underway. The US National Archives and Records Administration (NARA) has developed an Electronic Records Archives (ERA) program to preserve electronic government information. ERA encompasses four major functions: submission, repository, metadata, and access. As of January 2012, the program held over 131 terabytes of information, including records from multiple federal agencies, Congress, and the White House (<http://www.archives.gov/era/about/status-accomplishments.html>). Efforts such as this are to be applauded, but do not address all public needs for long-term preservation and access, especially given budget cuts, not to mention the temptation to remove, change the classification, or otherwise alter government information by interested parties.

Public access

Preservation is only part of the problem of managing electronic government information. Libraries will also need to make it accessible to the users. Even academic libraries, if they are preserving content on behalf of the wider public, need to consider how public users will discover and use such information. Large academic libraries might consider investing in reading rooms that are physically separate from the

rest of the library with their own entrance rather than including publicly accessible computers. Links to existing government websites only solve part of the problem, especially for long-term access to digital content. Academic libraries may need to invest in online search portals and other discovery tools that are developed separately from their other services in order to ensure that the public's right to access government information is preserved without compromising any license agreements that apply only to authorized users.

Librarians, working in cooperation with legal experts, also need to explore how changes in law may help to address unforeseen issues and problems with access, use permissions, copyright, and other problems in the information marketplace. Some user rights may require formal legislative protection rather than simply good license language. Also, there are a number of complex business relationships among vendors that are arguably problematic for promoting competition, affordable costs, and access rights. When the body responsible for accrediting an academic program also sells content required for accreditation to academic libraries that would seem like a conflict of interest. Also, the rights of libraries to access and control their own data has been periodically threatened from time to time by vendors who provide various kinds of technical support services. Overall, vendors play a very important and positive role in supporting information services and overly burdensome or complex regulation would be counterproductive, but carefully targeted legislation may be needed to address some specific problems when proprietary interests conflict with the public interest.

Information for the poor: managing social responsibility

Access to information is a critical component of social mobility. How can anyone lift themselves up out of poverty without basic information about educational opportunities, employment, consumer credit, and other aspects of modern life taken for granted by the middle classes in developed economies? Informed participation in democracy, not to mention the overall health of the democratic system of government itself, depends on access to information by users from the entire socioeconomic spectrum. While some users have only themselves to blame for their ignorance, the picture is more complex for most people. Discouraged by lack of access and essentially illiterate about information, some users

have not been given the opportunity to learn about the world around them.

It is important to note that there many types of online access. A mobile phone cannot deliver the full range of online information services that a desktop computer or even a good tablet can provide.

Susan P. Crawford, a professor at the Benjamin Cardozo School of Law and a former special assistant to President Obama for science, technology, and innovation policy, recently wrote about how a new digital divide has emerged between those who can afford reliable high-speed access connections and those who have only restricted access to the Internet. Only four out of ten American households with annual incomes less than \$25,000 had wired Internet access at home in 2010 compared to over 93 percent of households with incomes over \$100,000; 72 percent of whites had access with numbers considerably lower for African-Americans at 55 percent and Hispanics at 57 percent (S. P. Crawford, 2011). As both local and global news, shopping, employment postings, education, and other communication increasingly goes online this will put disconnected populations at an ever great disadvantage.

Avoiding dystopia

Libraries have played a critical role in providing access to information that would otherwise be entirely denied or unknown to most users. Libraries have also helped users to find information that is reliable and pertinent to their unique research needs. Changes in technology, the law, and culture are currently combining to reduce the total amount of useful information that is available to most users. Arguably, access is being greatly expanded for a small number of users, but still reduced for most users when one considers rising subscription costs, the lack of provisions for electronic resource sharing, and the general limitations placed on access to electronic resources.

Given the rise of infotainment in mass media, including major news outlets, most college educated graduates who do not continue to have an affiliation with academic institutions will likely lose access to cutting edge information about health, science, medicine, and expert opinion in other subject areas that impact their lives. Government information is increasingly accessible online, but most users are not well versed in how to access it and preservation efforts lag behind the production of new information, unlike the print repository program in which libraries received government documents in strategic locations across the USA. As

society grows more complex, information sources outside libraries are not smarting up, but seem to be dumbing down instead.

How we might help

Librarians cannot change wider social trends and economic forces that impact everyone, but they must take responsibility for the impact of these trends on access to information. Providing access to the largest amount of information possible to the user is what libraries need to focus on, as well as helping users make sense of and use that information. These tasks are made altogether more complex and difficult due to changes in technology, law, and economic constraints.

Physical libraries have included accessibility features for quite some time and most librarians are at least somewhat familiar with applicable law and best practices of their respective jurisdictions regarding the need for ramps, handrails, elevators, accessible restrooms, appropriate height and configuration for accessible computer workstations, and so on, but additional care must be taken with making the virtual library fully accessible. Libraries need to review all of their online resources, but first start their own web page. Unfortunately, too many libraries test accessibility to their homepage only and do not review information on other web pages with sufficient thoroughness (Hackett and Parmanto, 2009).

As previously mentioned, libraries generally need to take a more proactive approach to electronic resources management that includes functionality and usability testing. Rebecca Power and Chris LeBeau have urged that additional efforts must be made to test overall accessibility for persons with different types of disabilities. The results of testing should also be used to improve service whenever possible, for example, selecting basic search as the default search screen for databases instead of the advanced search because screen reading technology often works better with the simple search. Comprehensive testing should include all types of electronic resources from streaming media to research databases. Most libraries can also invest in creating and maintaining at least one web page that summarizes services for persons with disabilities (Power and LeBeau, 2009).

While information services are not based on collections per se, subsidizing access to expensive information resources and technology useful for manipulating information is of critical importance to most users. Also, the knowledge and skill of librarians in identifying the

most useful information also remains important. Teaching users about information, especially new information resources, and how to use technology will also continue to grow in importance. Librarians must also address the needs of the economically disadvantaged, those who lack technology literacy, and users with disabilities.

Conclusion

Abstract: The concluding chapter of this book summarizes the argument for a transition from print and hybrid libraries to fully electronic libraries in order to meet the needs of users in the early twenty-first century. Changes in higher education, library organization, and adaptation to new business models will be necessary to ensure success for contemporary libraries. A general transition plan with some suggested adaptations is included.

Key words: change management, electronic library, electronic resources, role of libraries, transition plan.

Information in the twenty-first century exists predominately in electronic format. The computer, in all its many forms, now manages almost all of our non-interpersonal communication. Electronic textbooks, online billing, email, e-readers, smartphones, electronic medical records, MP3s, electronic performance evaluations, and digital photographs are just some of the many technologies that have become almost seamlessly integrated into the lives of most people living in the more economically developed parts of the world. More information is being created now than at any previous time in the recorded history of human beings and most of that new information is created in some type of electronic format. The thought that libraries can or should resist these broader trends is untenable.

The question for libraries is not whether to become fully electronic, but how? There are valid reasons for not discarding all existing print information, and libraries, museums, and archives must take careful assessment in order to ensure that potentially valuable information is not lost to posterity. Users, however, have already decided by their actions that they prefer electronic resources to print and have largely stopped using print in academic libraries. Usage of print is also in decline at

many public and special libraries. Recognizing that some print materials cannot be discarded is not the same thing as maintaining increasingly anachronistic open book stacks, public service desks, and positions for managing materials that are seldom used. Libraries need to move a small portion of print into special collections, what is most rare and valuable, and move the rest into strategically placed shared repositories.

Successfully transitioning a profession that is derived from the need to classify, store, and retrieve books is going to be difficult, especially as society increasingly leaves print books behind.

Great care must be taken to reorganize work, retrain vulnerable employees, and plan for the systematic but careful removal of print and other physical items from libraries. Partnerships with other institutions will be necessary to create the dense network of shared repositories that will be required to manage declining print collections and protect against the loss of information. Removal of print and other physical materials from libraries will need to be undertaken in phases.

Print and other physical materials need to be removed from libraries, as well as the positions that exist primarily to manage physical materials. Recently developed electronic libraries have shown that these are not necessarily more expensive to manage than print libraries, but hybrid libraries likely are becoming too expensive, especially when print is increasingly seldom used at all. Too many well established libraries have work forces that are predominately focused on managing shrinking and less important print collections while lacking sufficient numbers of well trained personnel to manage electronic resources.

Circulation, traditional interlibrary loan services based on print, old-fashioned reference and technical services, not to mention loading docks, shipping costs, shelving and re-shelving increasingly dusty books, and opening and discarding boxes and containers, is no longer an option. Print libraries lack essential electronic services, while hybrid libraries are a financial liability, but fully electronic libraries can meet the needs of contemporary users. Electronic resources management that takes an integrated approach to fiscal management and working with library vendors and other third parties can bring modern professionalism appropriate for the twenty-first century to technical services, while existing innovations in information literacy, data management, emerging technology, and applied information services like GIS should be further developed. Freed from the reference desk, subject specialists can also live up to their full potential as academic liaisons and guides to researchers, teachers, and students.

Developing new skill sets and improving service will require different approaches to training librarians and support staff. Higher education for librarians must become more rigorous and provide detailed instruction in areas most relevant to contemporary practice. Ten broad areas for concentration are suggested for experimentation by LIS programs: (1) licensing and copyright; (2) library administration; (3) subject preparation in arts and humanities, the physical or social sciences; (4) applied information preparation in informatics; (5) GIS; (6) special collections; (7) library systems and ERM; (8) metadata; (9) human-computer interaction and usability; and (10) assessment and analytics. Again, partnerships will be required with other academic units to ensure that areas in which many LIS programs have been traditionally lacking such as administration, management, and applicable law for licensing and using electronic resources are well covered.

While there are promising developments in other related professional areas such as informatics instruction, librarians need to experiment with methods for improving their own higher education sooner rather than later if they hope to survive as a distinct professional group in the twenty-first century. One suggested course of action is to recognize that LIS higher education should reflect the complexity and diversity of actual work rather than assume that all librarians require essentially the same education. Requiring all librarians to share a similar, if not identical, foundation in coursework makes sense, but beyond that, librarians need to have specialized training. Ten modules are recommended for experimentation: requiring all librarians to take these specialized modules with certification exams to complete their degrees could go a long way toward developing a better prepared work force.

Recognizing the need for dual degrees and additional academic instruction in other disciplines also makes sense for some types of positions, especially in the most advanced academic libraries that provide services to highly specialized users. Reaching out to provide LIS instruction to IT professionals and others who work in libraries also makes a great deal of sense. Helping to train attorneys that specialize in questions regarding information usage and privacy, as well as intellectual property, would help libraries and society at large to address increasingly complex questions not previously considered before the proliferation of Internet surveillance and lifelong preservation of information about formerly anonymous individuals.

Librarians need to preserve and enhance their commitment to public access and protecting the intellectual heritage of humanity, but must be prepared to adapt to new tools and methods as required. Accepting and

embracing positive change is necessary. Libraries as organizations have to become more nimble and able to assist vulnerable users in keeping up with new technology and information delivery methods. Finding new ways to preserve electronic information, especially government information, will be critical to this effort. Libraries will also need to keep up with changing law and best practices for assisting persons with disabilities, those in need of remedial instruction, and other groups who require special assistance to access and manage information.

Libraries are part of the information infrastructure of modern societies and their continued survival is necessary in order to ensure an informed public and to help protect pathways of social mobility that are dependent on access to information. Academic, public, and special libraries have developed over time in close relationship to the needs of specific user communities as these communities have also changed. If librarians fail to adapt or change libraries under their management to meet the challenges of electronic resources it is possible that other information service providers will assume these functions. Yet this process would likely take even more time, could provide less access than libraries do, and ultimately lead to reduction in overall public access to information.

Leveraging programs such as LOCKSS, libraries need to take a stronger role in preserving and providing access to electronic government information. It is not a matter of conspiracy theories, but a simple need for distributing long-term preservation in order to ensure retention of vulnerable electronic records. It is always possible, however, that some information might be suppressed or altered that citizens have a right to see because that information could be deemed politically sensitive, a threat to special interests, or evidence of incompetence or illegality. Keeping multiple digital copies of some types of government information makes practical sense just as the distributed Federal Depository system previously made print government information more secure and widely available .

The undisputed power of commonly available tools such as Google, Yahoo, or Bing should not be taken as a substitute for the better targeted, carefully vetted, and academically rigorous information that is available through libraries. Finding appropriate information in the midst of this ongoing explosion of data is just as important as having direct access. Libraries at their best are constantly revising and improving their methods for identifying, acquiring, classifying, and providing access to information required by specific user communities. Unlike Google, Yahoo, or Bing, libraries are not trying to make any money off users, directly or indirectly, and exist solely to provide information and services

derived from information. It would be a great loss to society if libraries failed to make a successful transition to the electronic world.

Public libraries constitute an invaluable resource in a democratic society. Citizens benefit from the work of libraries in managing government information so as to stay informed. Libraries also help users to overcome barriers to access because some information is simply too expensive for individuals to afford on their own. Without libraries, information services for the poor, the unemployed, and persons with disabilities will become prohibitively expensive or otherwise less accessible. Educational services for users from disadvantaged user populations will also help them to become more adept at finding useful information and using new technology. Public and school libraries, especially in the currently financially challenged K–12 educational sector of the USA, can also derive mutual benefit from partnerships. Children can learn to appreciate what public libraries have to offer while public libraries can provide services that are disappearing from some cash strapped programs.

Academic libraries have served colleges and universities for generations and are actually more important for academic success in the twenty-first century than in the twentieth century when one considers the impact of virtual libraries or electronic resources provided by libraries. More information is being created now than at any previous time in recorded human history and while computers can manage most of this data independently, a broad variety of specialized professional personnel is needed to analyze, organize, classify, preserve, and make this information accessible to users. Librarians also provide assistance by assessing the quality of information, sorting, classifying, and making both positive and negative qualities of information resources known to users. Librarians can also help users, especially students, to use social media wisely, discount unproven or unfounded sources, and at least to the extent possible in the twenty-first century, protect their own information.

While it is possible that new and better organized institutions will emerge that take the place of the libraries, the essential functions of providing information services will continue in some form or another. Academic libraries provide not just access to virtual collections, but a wide range of educational and technology support services that greatly enhance the overall quality of research and teaching. Reforming and reorganizing existing academic libraries would be much more cost-effective than trying to develop new units. While libraries need to go farther in making changes, the essential groundwork of developing IT, public, and technical services has already been done and librarians can

draw on considerable knowledge and experience in adapting service to changing academic programs.

Implementing change in the library

Libraries should be reorganized to provide electronic information service. While a transition phase is usually going to be necessary for libraries, every effort should be made to make the process a transparent path to an obvious destiny. Librarians, other professionals, and staff should have no doubt that the hybrid library is just a phase, not the ultimate rationale for library services. Users should also be informed and minority opinion that resists change should only be accommodated when no other choice is available.

Plans should be made and followed that lead to the full de-accession of all print and physical materials held outside special collections and archival units. Developing and funding print repositories should be undertaken in partnership with other libraries. These repositories should have separate staffing and management structures from contributing libraries. Care must be taken so that information does not disappear, but even surviving print materials sent to repositories should be considered temporary in that digitization will eventually replace most of these physical items as well. Some truly rare, valuable, or remarkable books should be kept forever, if possible, as artifacts. However, it is natural to wonder if the printed book or codex is just as likely to be rare as the scroll is today at some future time. Users will no longer check out print or any other physical materials for temporary loan from libraries. Users will either have some form of electronic access or receive print or physical items that they can permanently retain, thus freeing the library from the entire burden in staffing and infrastructure that accompanies print materials.

Lower skilled positions, especially clerical or support staff jobs, will continue to disappear in libraries with most of the work being performed by professional employees, advanced paraprofessionals who have at least some college education, student workers, volunteers, or other temporary and project-based employees. Automation of simple work combined with outsourcing will be the norm. If a task requires minimal training, creativity, or thought, a computer or low-paid part-time human labor will likely be tasked with performing it. Full wages and benefits for most clerical staff are simply becoming too expensive for most libraries to afford, especially when those with minimal education or intellectual

curiosity are often difficult to train, fearful or resistant to change, and unable to provide assistance to increasingly demanding users.

Becoming nimble organizations that integrate information technology with cutting edge information science will require a different organizational balance. Libraries will have to pay for more IT positions and make use of their professional expertise in decision making regarding technology. Paying for these additional IT support positions will require reducing the aforesaid support staff positions made redundant by change and maintaining a careful overall balance between technical and public services. Traditional technical services with its many copy catalogers who do piecemeal work and clerks who pass items through acquisitions makes little sense now either. Electronic resources management organized into small but competent units makes more sense than retaining outmoded structures.

Public services positions need to be reorganized as well. Circulation positions and all jobs related to physical processing need to go. Retraining should be made available to staff and most change should be made through attrition whenever possible, but 20 support staff employees with minimal skill levels cannot be retained if there are only five positions. Busy work wastes time and money, but also good will that is necessary for libraries to keep because constant change will require ongoing improvements in service and new investments in technology, training, and other infrastructure. Having professional librarians sit and observe users makes no sense in a fully electronic library either. Judiciously organized operations management groups can manage smaller but useful library spaces while directing to users to more advanced services as needed.

Subject specialists need to do more work in gathering information about user groups for which they are responsible and continue to serve as liaisons between the library and those groups. Care must be taken not to expand the ranks of these specialists too much, however, and money must be reserved to pay for technical services positions as well as informatics and other applied information specialists who can provide specialized professional services. As an example, in most cases, employing two liaisons for the earth sciences would not help users as much as having one liaison and one GIS librarian.

Very large academic libraries should consider developing a third arm of the library that would be free to conduct long-term research and planning. Rapid change and the vested interests of other library units would make having a third group with a different perspective useful to many library administrators. Assessment and analytics will be of

growing importance, especially when new services are implemented that are outside the experience of most librarians. Collecting better qualitative information is very important, but libraries need to continue gathering quantitative information and improve how it is used for assessment.

Managing a fully electronic library will require assembling and delivering access to virtual collections from multiple sources using multiple business models, constant functionality and usability testing, skillful web design, troubleshooting problems and user support, along with modifications to service for persons with disabilities. Education about information, including all forms of information literacy, will also be expected. Applied information services such as GIS and bioinformatics will make it necessary for librarians to hire more specialists who provide complex extended professional consultation to individual users and groups. Smaller libraries will need to partner with larger libraries or consortia in order to keep up with demands for new services based on electronic resources, but resource sharing will increasingly become a concept applied to services, not just collections, as libraries learn to pool their collective intelligence to provide better service.

Libraries of all types, including academic libraries, will need to improve their management of IT and other technical services infrastructure to match the expectations of twenty-first century users. Provisions will be necessary for emerging technology, usability testing, and functionality testing of online services offered by libraries. As the technological savvy of the average user continues to increase, most users will become less patient with interruptions in service, poorly designed websites, or other organizational barriers to streamlined information service.

Greater flexibility, professional project management, and the ability to manage, improve, and alter services with greater efficiency in less time will also be important to libraries. Just as the previously static (or mostly static) physical stacks need to be removed, institutional, organizational, and cultural barriers to innovation also have to be removed. Twenty-first century libraries will have to provide quick, efficient, and increasingly personalized service to users. Community boards and committees that govern public libraries, as well as faculty governance procedures for academic libraries, will need to find ways to speed up or otherwise alter the pace and scope of their decision making in order to allow libraries to compete successfully with other information service providers.

Making all of these changes will not be easy, but libraries have faced many challenges over the years and enriched the lives of many people all over the world. Given sufficient dedication, energy, and creativity, all of these problems can be considered opportunities. Some of the

hardest work has already been done in that new services, positions, and organizational structures have often already been developed in parallel with existing library units. Even higher education reform is within reach if the community of practice engages in robust dialogue with educators and if alumni are willing to use their money and clout to influence programs. Once the fully electronic library is accepted as the appropriate goal by decision makers, a library should be able to make a successful transition.

Some practical recommendations for transition

Having discussed de-accession plans, organization charts, the need for alternative staffing, and more educational training, it may be useful to consider how an existing library actually might make a transition from its current operations to a fully electronic library. Developing fully electronic service depends partly on what librarians and other personnel want, the opinions of users, as well as the desires and goals of major stakeholders, but the surrounding environment also has to support these changes. Somewhat like blazing a trail in the forest, librarians will have to stay alert and make adaptations to suit their environment while still making general progress in the direction they wish to go.

Generally speaking, librarians need to reduce the cost of existing operations and use any savings, whenever possible, to pay for highly noticeable improvements in service. Funding change and gaining trust and buy-in from sometimes dubious stakeholders will not be easy. Shedding the legacy of outmoded print operations will require partnership with other libraries, but also a careful move away from more traditional resource sharing operations such as interlibrary loan to more modern document delivery, pay-on-demand, or other alternative business models when subscriptions and purchasing content is not economically feasible.

Information literacy efforts must involve more proactive assessment of user needs and the development of comprehensive programs that include components that require partnership with other entities, but also efforts that libraries can control entirely on their own. Communication and outreach about new service is of vital importance. Tried and true advertising techniques can be borrowed from other sectors, but libraries also need to gather information about their own unique user communities and craft services to their particular needs and interests.

Applied information services, including bioinformatics, chemistry informatics, and GIS, must be more robustly developed and fully integrated with other library services. For example, a GIS librarian who can provide consultation with users is made even more helpful when the library can provide appropriate hardware such as electronic mapping tables and software such as ESRI ArcGIS, not to mention academic literature relevant to GIS. Having a few highly developed services is better than providing a wide range of incomplete services that can mislead and frustrate users, who may increasingly select other information service providers.

General transition plan to the electronic library

Each library will have to develop its own unique transition plan, but here is a general outline for consideration.

- I. Optimization: improvement of existing services and cost reduction
 - A. Collections
 1. De-duplication of physical materials (phases I–III of the de-accession plan in Chapter 5).
 2. Cancellation of subscriptions with low use and/or value to local users.
 3. New acquisitions (if possible, savings from de-duplication and cancellation applied to new and more appropriate information resources that might improve service).
 - B. Discovery and systems management
 1. Assessment of existing system with the goal of improvement or replacement.
 2. Special emphasis on improving ERM capability with new system or other available tools.
 - C. Operations/personnel
 1. Systematic review and improvement of existing workflows for all personnel.
 2. Cessation of redundant or unnecessary work.
 3. Reclassification of positions as appropriate with opportunities for retraining for personnel in redundant positions.

- D. IT infrastructure
 - 1. Assessment of technology needs of local user population.
 - 2. Development or improvement of mobile services.
 - 3. Assessment of web design for users with disabilities and/or low information literacy.
- II. Coordination: development of new resource sharing partnerships
 - A. Collections
 - 1. Share information about collections with resource sharing partners.
 - 2. Consider shared electronic collections.
 - 3. Consider cooperative collection development plans to collect in specific areas while leaving collecting other materials to partners.
 - 4. Develop shared print repository with other libraries.
 - B. Discovery and systems management
 - 1. Evaluate whether discovery and systems management needs can be met best with local resources or in partnership with other libraries.
 - 2. Share information about best practices and/or develop new shared systems with other libraries.
 - C. Operations/personnel
 - 1. Consider how existing personnel can contribute to the success of other libraries; how can other libraries help your institution?
 - 2. Consider developing shared staffing among other libraries, especially for smaller libraries, or coordinated investment in personnel with rare or advanced skill sets.
 - D. IT infrastructure
 - 1. How can knowledge, expertise or equipment be shared with other libraries?
 - 2. Consider purchasing and sharing new equipment with other libraries.
- III. Intensification: development of new electronic information services
 - A. Collections
 - 1. Removal of commonly held physical materials and processing of local collections (phases IV–VII of the de-accession plan in Chapter 5).

2. New acquisitions of specialized information resources that address local needs.
3. Provisions established for rapid acquisition of other electronic resources at the point of need.
- B. Discovery and systems management
 1. Develop ILS and ERM or Library Management System (LMS).
 2. Create both general and specialized search portals for different types of users.
 3. Review discovery services to ensure that subject indexes and other specialized tools remain discoverable.
- C. Operations/personnel
 1. Replacement of technical services by Electronic Resources Management Unit.
 2. Integrate remaining interlibrary loan personnel into Electronic Resources Management Unit.
 3. Hire applied information specialists if possible.
 4. Make provisions for emerging technology services if not already available.
 5. Integrate digitization services into Special Collections or Archives.
- D. IT infrastructure
 1. Review and improve wireless network.
 2. Acquire e-readers and other mobile devices popular with local users.
 3. Acquire new hardware and software, making sure to address users with disabilities.
- IV. Reorganization: removal of remaining physical materials and consolidation of services
 - A. Collections
 1. Complete de-accession of physical materials (phases VIII–IX of the de-accession plan in Chapter 5).
 2. Acquire new electronic resources if possible.
 3. Make provisions for the preservation and long-term access to e-books and other electronic resources owned by the library.
 - B. Discovery and systems management
 1. Review and improve metadata for electronic resources.

2. Experiment with enhanced metadata for electronic resources to accommodate the specific needs of local users.
- C. Operations/personnel
1. Replace remaining circulation or public services units with operations management.
 2. Review and improve technology support and just-in-time information services.
- D. IT infrastructure
1. Develop digitization and print-on-demand services for the library and external shared print repository.
 2. Investigate additional personalized services for users.

Governance structures vary among libraries, so it may not be possible for librarians to draft a single comprehensive plan, let alone develop an understanding among all stakeholders that the library needs to develop fully electronic services. Progress may occur in fits and starts, but the general trend toward electronic information in society is overwhelming. Library administrators and other planners need to be mindful of these trends and consider how their every activity contributes to or detracts from the ultimate goal of developing a fully electronic library. Libraries exist to serve specific user communities for which individual libraries or parent institutions have what are effectively contractual obligations, but also to serve the global community of information seekers. While libraries must undergo a number of changes in order to remain relevant, a fully electronic library needs to uphold the ethical legacy of traditional libraries in specific aspects of service such as providing access to government information, information that is rare or valuable, and other information considered to be part of the public interest in democratic societies.

Finding the right balance in infrastructure and personnel

Underlying this book is the central assumption that the primary professional activity of the librarian is the management of information so that users can develop the knowledge that they need for their own purposes. The work of specialized librarians, whether information literacy instruction or negotiating complex license agreements, is ultimately derivative of this primary function. The library has an important role

to play in educating users about information and fostering all manner of inquiry and scholarly collaboration, but to emphasize this role at the expense of other critical functions will weaken overall service to users. Librarians have many productive roles to play, but becoming known exclusively as teachers will put the professional librarian in direct competition with experts in education and subject disciplines, and thus weaken the overall rationale for the existence of the librarian as a separate profession. Someone has to bridge the gap between IT and the ever growing ranks of subject disciplines. This role is best left to information science, or the practitioner of applied information science, the librarian.

Developing the diverse skills necessary for negotiating contracts, providing remedial information literacy instruction, managing data, as well as providing GIS or informatics services will require more education. Some specialized courses are available in top LIS programs, but more work is needed in developing a coherent body of relevant specializations. A formal certification process dependent on successful completion of examinations would help to measure and perhaps ensure a minimal level of preparation that many programs do not currently require.

Libraries as organizations need to balance aspirations for faculty status, at least in academic libraries, and the unique role of librarians in positive student learning-outcomes with the infrastructure and skill sets necessary for managing information. Increasing use of automation does make a lot of lower skilled positions, especially clerical or support staff, redundant. This does not mean that the library can afford to be cheap when it comes to IT or ERM. Poor IT infrastructure can undercut the library's mission as an information services provider and inspire users to seek information from other sources. Whatever one's position on particular programs or organizations, no twenty-first century organization can afford to ignore its fundamental infrastructural or technological needs.

Organizational rosters in the contemporary library, especially the fully electronic library, need to balance the number of subject specialists, ERM specialists, IT, and applied information specialists such as GIS and experts in informatics necessary to provide the full range of information service required in twenty-first century libraries. Consolidation and rationalization of some specialized librarian positions may be necessary in some cases in order to permit libraries to hire more specialized professionals in other areas. Libraries also need to integrate experts in business, accounting, the law, and especially IT, more closely into routine decision making in their respective areas of expertise in order to improve

how libraries manage scarce resources, invest in appropriate hardware and software, and to take a more assertive role in helping to shape rather than simply react to changes in the information marketplace.

Libraries must adapt to scarcity. Preservation is still an important function of the library, but each library will have varying levels of responsibility in this regard. Not everything can be kept or is worth keeping. Some information should not be acquired until it is demonstrably needed and perhaps discarded after a single use. Mike Kestelc has argued that as technological problems of digital preservation are increasingly resolved, especially with redundant backup of information, the most important constraints for libraries are non-technical such as access, law, and selection, but above all, cost (2012).

Partnerships with other libraries are important, especially in formal consortia, but relations must be conducted with an eye toward mutual interest as well as the abstract greater good. Collaborative collection development activities, such as sharing the cost of acquiring, delivering, or even preserving electronic content, can make good economic sense. Regarding other types of partnerships such as the general sharing of materials between libraries, resource sharing should be pursued as feasible, but the interlibrary loan practices of the print era are sometimes unavailable for electronic information because of copyright and other legal limitations. Open access, the delivery of content by electronic means, and new business models for acquisitions also make some sharing between libraries less efficient, more costly, or simply unnecessary in some cases.

Libraries should be managed so as to secure the maximum possible benefit of time, money and energy saved on behalf of the user. Libraries subsidize access to expensive information that members of specific user communities cannot afford on their own, gather information about freely available resources in order to save users' time, provide professional services for individual advanced users such as assistance with GIS, and help society manage a potential information overload through continuous applications of metadata to data organized at every conceivable level of complexity. This does not mean that economic efficiency should become the sole criterion for measuring library operations, but it does mean that whatever libraries do must be economically feasible and operationally sustainable. Wasting users' time or creating any kind of artificial or unnecessary barriers to access and service compromise the mission of the library and open the door to competing information service providers.

After the Book: Information services for the twenty-first century is not intended to serve as a detailed blueprint for libraries for the next

one hundred years, but as a transition or bridge from current services to a more fully electronic library. Duderstadt reminds us that we tend to overestimate the impact of technological change in the short term and underestimate the impact in the long term on social and organizational structures. Digital technology challenges the overall system of higher education, not just the library as we know it (Duderstadt, 2009). One can only speculate regarding the fate of libraries in 20 or 30 years, but professional relevance and survival in the near term require librarians to embrace fully electronic service and abandon nineteenth- and twentieth-century ideas and practices. A fully electronic library is much better equipped than print or hybrid libraries to provide excellent information service to specific user communities and help the wider public develop the knowledge that they will need to be successful in the twenty-first century.

References

- Abu-Doush, I., Bany-Mohammed, A., Ali, E. and Al-Betar, M. (2013) "Towards a more accessible e-government in Jordan: An evaluation study of visually impaired users and Web developers," *Behaviour & Information Technology* 32(3): 273–93. DOI: 10.1080/0144929X.2011.630416.
- Anandasivam, K. and Cheong, C. (2008) "Designing a creative learning environment: NTU's new Art, Design and Media Library," *Electronic Library* 26(5): 650–61. DOI: 10.1108/02640470810910675.
- Anderson, K. J., Freeman, R. S., Herubel, J. M., Mykytiuk, L. J., Nixon, J. M. and Ward, S. M. (2010) "Liberal arts books on demand: A decade of patron-driven collection development, Part 1," *Collection Management* 35(3/4): 125–41. DOI: 10.1080/01462679.2010.486959.
- Anderson, R. (2011) "Collections 2021: The future of the library collection is not a collection," *Serials* 24(3): 211–15.
- Arnold, S. E. (2013) "Gadzooks, it's MOOCs," *Online Searcher* 37(1): 10–15.
- Arthur D. Little, Inc. and Giuliano, V. (1978) *Into the Information Age: A Perspective for Federation Action on Information*. Chicago: American Library Association.
- Baker, N. (2002) *Double Fold: Libraries and the Assault on Paper*. New York: Vintage Books.
- Bates, M. J. (2006) "Fundamental forms of information," *Journal Of The American Society For Information Science & Technology* 57(8): 1033–45. DOI: 10.1002/asi.20369.
- Bates, M. J. (2007) "Defining the information disciplines in encyclopedia development," *Information Research* 12(4): 1–13.
- Bauder, J. and Emanuel, J. (2012) "Being where our faculty are: Emerging technology use and faculty information-seeking workflows," *Internet Reference Services Quarterly* 17(2): 65–82. DOI: 10.1080/10875301.2012.718316.

- Beagle, D. (2010) "The emergent information commons: Philosophy, models, and 21st century learning paradigms," *Journal Of Library Administration* 50(1): 7–26. DOI: 10.1080/01930820903422347.
- Becker, S, Crandall, M., Fisher, K. E., Kinney, B., Landry, C. and Rocha, A. (2010) "Opportunity for all: How the American public benefits from Internet access at US libraries" (IMLS-2010-RES-01), Institute of Museum and Library Services. Washington, DC.
- Bennett, E. and Simning, J. (2010) "Embedded librarians and reference traffic: A quantitative analysis," *Journal of Library Administration* 50(5/6): 443–57. DOI: 10.1080/01930826.2010.491437.
- Birdsall, W. F. (1994) *The Myth of the Electronic Library: Librarianship and Social Change in America*. Westport: Greenwood Press.
- Blair, A. M. (2010) *Too Much to Know: Managing Scholarly Information before the Modern Age*. New Haven: Yale University Press.
- Blecic, D. D., Wiberley Jr., S. E., Fiscella, J. B., Bahnmaier-Blaszczak, S. and Lowery, R. (2013) "Deal or no deal? Evaluating big deals and their journals," *College & Research Libraries* 74(2): 178–93.
- Block, C. (2012) "If books are our brand ...," *Public Libraries* 51(1): 8–10.
- Bohyun, K. (2013) "The present and future of the library mobile experience," *Library Technology Reports* 49(6): 15–28.
- Bonfield, B. (2011) "Is the United States training too many librarians or too few? (Part 1)," *In The Library with the Lead Pipe* (21 September): 1–9. Library, Information Science & Technology Abstracts, EBSCOhost, viewed 2 January 2014.
- Boone, M. D. (2003) "Monastery to marketplace: A paradigm shift," *Library Hi Tech* 21(3): 358–66.
- Brault, M. (2008) *Disability Status and the Characteristics of People in Group Quarters: A Brief Analysis of Disability Prevalence Among the Civilian Noninstitutionalized and Total Populations in the American Community Survey*. Available from: <http://www.census.gov/people/disability/files/GQdisability.pdf> (accessed 15 October 2013).
- Brenner, J. (2013) *Pew Internet: Mobile*. Available from: <http://pewinternet.org/Commentary/2012/February/Pew-Internet-Mobile.aspx> (accessed 10 October 2013).
- Brubaker, N., Leach-Murray, S. and Parker, S. (2012) "Implementing a discovery layer: A rookie's season," *Computers in Libraries* 32(3): 12–19.
- Bryant, J., Matthews, G. and Walton, G. (2009) "Academic libraries and social and learning space: A case study of Loughborough University

- Library, UK,” *Journal of Librarianship & Information Science* 41(1): 7–18.
- Bundy, A. (2012) “Better, more accessible, libraries for all in Australia: Progress and potential,” *Aplis* 25(3): 138–44.
- Butter, K., Taylor, A., Cryer, E. and Thibodeau, P. (2012) “The growing crisis: Scholarly publishing pressures facing health sciences libraries,” *Journal of Library Administration* 52(8): 672–98. DOI: 10.1080/01930826.2012.746873.
- Carlson, S. (2001) “The deserted library,” *Chronicle of Higher Education* 48 (16 November): A35–A38.
- Centre for Research Libraries (2013) “About CRL,” *Center for Research Libraries*. Available from: <http://www.crl.edu/about> (accessed 8 October 2013).
- Cervone, H. (2007) “The system development life cycle and digital library development,” *OCLC Systems & Services* 23(4): 348–52. DOI: 10.1108/10650750710831484.
- Clement, S. K. (2012) “From collaborative purchasing towards collaborative discarding: The evolution of the shared print repository,” *Collection Management* 37(3/4): 153–67. DOI: 10.1080/01462679.2012.685413.
- Combes, B., Hanisch, J., Carroll, M. and Hughes, H. (2011) “Student voices: Re-conceptualising and re-positioning Australian library and information science education for the twenty-first century,” *International Information & Library Review* 43(3): 137–43. DOI: 10.1016/j.iilr.2011.07.007.
- Comeaux, D. and Schmetzke, A. (2013) “Accessibility of academic library web sites in North America: Current status and trends (2002–2012),” *Library Hi Tech* 31(1): 8–33. DOI: 10.1108/07378831311303903.
- Corrall, S. (2010) “Educating the academic librarian as a blended professional: A review and case study,” *Library Management* 31(8): 567–93. DOI: 10.1108/01435121011093360.
- Cottrell, M. (2013) “Paperless libraries,” *American Libraries* 44(9/10): 11–12.
- Crawford, S. P. (2011) “The new digital divide,” *The New York Times*, 4 December, p. SR1.
- Crawford, W. (2011) *Open Access: What You Need to Know Now*. Chicago: American Library Association.
- Crowley, B. (2008) *Renewing Professional Librarianship: A Fundamental Rethinking*. Westport: Libraries Unlimited.

- Davidson, S. and Mikkelsen, S. (2009) "Desk bound no more: Reference services at a new research university library," *Reference Librarian* 50(4): 346–55. DOI: 10.1080/02763870903143591.
- Demas, S. and Miller, M. E. (2012) "Rethinking collection management plans: Shaping collective collections for the 21st century," *Collection Management* 37(3/4): 168–87. DOI: 10.1080/01462679.2012.685415.
- Dennie, D. (2010) "The provision of bioinformatics services in Canadian academic libraries," *Journal of the Canadian Health Libraries Association (JCHLA)* 31(3): 99–107.
- DeRosa, C., Cantrell, J. Carlson, M., Gallagher, P., Hawk, J. and Strutz, C. (2011) *Perceptions of Libraries, 2010: Context and Community*, ed. B. Gauder, contributors D. Cellantini, T. Dalrymple, L. Olszewski. Rep. Dublin, OH: OCLC, 38–9.
- Digital Federal Depository Library Program (n.d.) Available from: <http://www.lockss.org/community/networks/digital-federal-depository-library-program/> (accessed 1 October 2013).
- Doan, T. and Kirkwood, H. (2011) "Strategically leveraging learning space to create partnership opportunities," *College & Undergraduate Libraries* 18(2/3): 239–48. DOI: 10.1080/10691316.2011.577692.
- Drumm, J. E. and Groom, F. M. (1997) "The Cybermobile: A gateway for public access to network-based information" (cover story), *Computers In Libraries* 17(1): 29.
- Duderstadt, J. J. (2009) "Possible futures for the research library in the 21st century," *Journal of Library Administration* 49(3): 217–25. DOI: 10.1080/01930820902784770.
- Duncan, R. (2011) "Ebooks and beyond: Update on a survey of library users," *Aplis* 24(4): 182–93.
- Eaton, A. (2013) "Modern spaces, changing light," *AALL Spectrum* 17(7): 15–17.
- Edelson, R. (2010) "Stanford: Engineering a digital library," *Information Today* 27(10): 1–42.
- Evans, B. (2011) "The ubiquity of mobile devices in universities – usage and expectations," *Serials* 24(3): S11–S16.
- Evjen, S. and Audunson, R. (2009) "Do the public's attitudes represent a barrier to institutional change in public libraries?," *New Library World* 110(3/4): 161–74. DOI: 10.1108/03074800910941308.
- Fearn, H. (2009) "Off-the-shelf solutions," *Times Higher Education* (1902): 36–9.
- Fischer, K. S., Wright, M., Clatanoff, K., Barton, H. and Shreeves, E. (2012) "Give 'em what they want: A one-year study of unmediated

- patron-driven acquisition of e-books," *College & Research Libraries* 73(5): 469–92.
- Fish, C. (2010) "UTSA opens nation's first bookless library on a university campus," *Unabashed Librarian* (156): 26–7.
- Francis, M. (2012) "Weeding the reference collection: A case study of collection management," *Reference Librarian* 53(2): 219–34. DOI: 10.1080/02763877.2011.619458.
- Fu, V. D. (2013) "CEAL statistics, 2012 with multi-year summary and comparison," *Journal of East Asian Libraries* (156): 39–63.
- Gibbon, J. (2007) "Out and about: Kentucky's spirited bookmobile program," *Kentucky Libraries* 71(2): 20–1.
- Glasser, S. and Arthur, M. A. (2011) "When jobs disappear: The staffing implications of the elimination of print serials management tasks," *Serials Librarian* 60(1–4): 109–13. DOI: 10.1080/0361526X.2011.556447.
- Gosling, W. A. (2000) "To go or not to go? Library as place," *American Libraries* 31(11): 44.
- Grefsheim, S. F., Whitmore, S. C., Rapp, B. A., Rankin, J. A., Robison, R. R. and Canto, C. C. (2010) "The informationist: Building evidence for an emerging health profession," *Journal of the Medical Library Association* 98(2): 147–56. DOI: 10.3163/1536–5050.98.2.007.
- Groth, D. P. and MacKie-Mason, J. K. (2010) "Education: Why an informatics degree?" *Communications Of The ACM* 53(2): 26–8.
- Hackett, S. and Parmanto, B. (2009) "Homepage not enough when evaluating web site accessibility," *Internet Research* 19(1): 78–87. DOI: 10.1108/10662240910927830.
- Han, N. and Kerns, R. (2011) "Rethinking electronic resources workflows," *Serials Librarian* 61(2): 207–14. DOI: 10.1080/0361526X.2011.591042.
- Hardawar, D. (2011) "A milestone for e-books: Amazon sells more Kindle books than print," *Mediabeat*, 19 May. Available from: <http://venturebeat.com/2011/05/19/Kindle-books-surpass-print/> (accessed 18 May 2014).
- Harris, V. A. and Weller, A. C. (2012) "Use of special collections as an opportunity for outreach in the academic library," *Journal Of Library Administration* 52(3/4): 294–303. DOI: 10.1080/01930826.2012.684508.
- Hemminger, B. M., Losi, T. and Bauers, A. (2005) "Survey of bioinformatics programs in the United States," *Journal of the American Society For Information Science & Technology* 56(5): 529–37. DOI: 10.1002/asi.20141.

- Hensley, M. and Miller, R. (2010) "Listening from a distance: A survey of University of Illinois distance learners and its implications for meaningful instruction", *Journal Of Library Administration* 50(5/6): 670–83. DOI: 10.1080/01930826.2010.488946.
- Herrera, G. (2012) "Deliver the ebooks your patrons and selectors both want! PDA program at the University of Mississippi," *Serials Librarian* 63(2): 178–86. DOI: 10.1080/0361526X.2012.700780.
- Hodge, G. (2005) "Metadata for electronic information resources: From variety to interoperability," *Information Services & Use* 25(1): 35–45.
- Hoffman, S. (2011) "Embedded academic librarian experiences in online courses Roles, faculty collaboration, and opinion," *Library Management* 32(6/7): 444–56. DOI: 10.1108/01435121111158583.
- Hoppenfeld, J., Wyckoff, T., Henson, J. J., Mayotte, J. N. and Kirkwood, H. P. (2013) "Librarians and the entrepreneurship bootcamp for veterans: Helping Disabled veterans with business research," *Journal Of Business & Finance Librarianship* 18(4): 293–308. DOI: 10.1080/08963568.2013.825227.
- Hufford, J. R. (2013) "A review of the literature on assessment in academic and research libraries, 2005 to August 2011," *Portal: Libraries & The Academy* 13(1): 5–35.
- Hutchens, C. (2013) "Open access metadata: Current practices and proposed solutions," *Learned Publishing* 26(3): 159–65. DOI: 10.1087/20130302.
- Hyman, B. and Walker, J. (2008) "Case study: The Evergreen Open Source Integrated Library System; its origins and significant implementations in the USA and Canada," in *World Library and Information Congress: 74th IFLA General Conference and Council: "Libraries without Borders: Navigating towards Global Understanding,"* 1–6. Available from: http://archive.ifla.org/IV/ifla74/papers/159-Hyman_Walker-en.pdf (accessed 9 January 2014).
- Igwe, K. N., Oyewo, R. O. and Yusuf, S. M. (2013) "The importance of open access initiatives to the serials crisis in Nigerian academic and research libraries," *PNLA Quarterly* 77(3): 55–62.
- Imre, A., Hartnett, E. and Hiatt, C. (2013) "CORAL: Implementing an open-source ERM system," *Serials Librarian* 64(1–4): 224–34. DOI: 10.1080/0361526X.2013.760414.
- Indiana University School of Informatics and Computing (2013) "Graduate." Available from: <http://www.soic.indiana.edu/graduate/index.shtml> (accessed 4 October 2013).
- Jacobs, J. (2013) "Libraries work together to preserve Canadian Federal Government publications," *Free Government Information*

- (FGI). Available from: <http://freegovinfo.info/node/4003> (accessed 23 September 2013).
- Jaeger, P. T. and Bertot, J. (2011) "Responsibility rolls down: Public libraries and the social and policy obligations of ensuring access to e-government and government information," *Public Library Quarterly* 30(2): 91–116. DOI: 10.1080/01616846.2011.575699.
- James, J. (2008) "Re-estimating the difficulty of closing the digital divide," *Journal Of The American Society For Information Science & Technology* 59(12): 2024–32.
- Jeong, W. (2008) "Touchable online braille generator," *Information Technology & Libraries* 27(1): 48–52.
- Joshi, A. N., Vatnal, R. M. and Manjunath, G. A. (2012) "Open access initiatives: A boon to academic libraries," *Library Philosophy & Practice* (August): 1–12.
- Junus, S. and Booth, C. (2012) "E-books and e-readers for users with print disabilities," *Library Technology Reports* 48(7): 22–8.
- Kastellec, M. (2012) "Practical limits to the scope of digital preservation," *Information Technology & Libraries* 31(2): 63–71.
- Kayongo, J. and Jacob, E. (2011) "Burning the midnight oil: Librarians, students, and late-night chat reference at the University of Notre Dame," *Internet Reference Services Quarterly* 16(3): 99–109. DOI: 10.1080/10875301.2011.597632.
- Keller, M. A. (1992) "Moving toward concrete solutions based in fundamental values," *Journal of Academic Librarianship*, 18(1): 7.
- Kelley, M. (2011) "New book industry survey shows robust ebook sales," *Library Journal* 136(14): 12–14.
- Kumar, S. and Sanaman, G. (2013) "Orientation/training programmes in NCR libraries for people with disabilities: A study of the user's perspective," *Library Philosophy & Practice* (April): 1–15.
- Kuzyk, R. and Fialkoff, F. (2011) "Shifting spaces," *Library Journal* (Spring): 18–21.
- Kyrillidou, M. and Morris, S. (2011) *ARL Statistics, 2008–2009*. Washington, DC: Association of Research Libraries.
- La Barre, K., Roberto, K. R. and Leibowitz, F. (2012) "The common gaze: Conversations with cataloging instructors about teaching online at the Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign," *Cataloging & Classification Quarterly* 50(2/3): 127–43. DOI: 10.1080/01639374.2011.650840.
- Lancaster, F. W. (1982) *Libraries and Librarians in an Age of Electronics*. Arlington: Information Resources Press.

- Larsen, G. (2007) "Preparing library staff for reference and information work in the hybrid library – the need for skills and continuing professional development," *IFLA Conference Proceedings*, 1–12.
- Lewis, D. W. (2012) "The inevitability of open access," *College & Research Libraries* 73(5): 493–506.
- Lewis, J. (2013) "Information equality for individuals with disabilities: Does it exist?" *Library Quarterly* 83(3): 229–35.
- Library of Congress (2010) "Talking-book landmark: Service delivers 1 millionth download," *Library of Congress Information Bulletin* 69(5): 1.
- Library Journal* (2011) "Ebrary short-term ebook loans triggered by use," *Library Journal* 136(10): 20–1.
- Maatta, S. L. (2010) "Stagnant salaries, rising unemployment," *Library Journal* 135(17): 22–9.
- Manley, H. and Holley, R. P. (2012) "History of ebook: The changing face of books," *Technical Services Quarterly* 29: 292–311. DOI: 10.1080/07317131.2012.705731.
- Martell, C. (2008) "The absent user: Physical use of academic library collections and services continues to decline 1995–2006," *Journal of Academic Librarianship* 34(5): 400–7.
- Martin, A. M., Westmoreland, D. D. and Branyon, A. (2011) "New design considerations that transform the library into an indispensable learning environment," *Teacher Librarian* 38(5): 15–20.
- Mathews, J. M. and Pardue, H. (2009) "The presence of IT skill sets in librarian position announcements," *College & Research Libraries* 70(3): 250–7.
- Maybee, C., Doan, T. and Riehle, C. (2013) "Making an IMPACT," *College & Research Libraries News* 74(1): 32–5.
- McCabe, M. J., Snyder, C. M. and Fagin, A. (2013) "Open access versus traditional journal pricing: Using a simple 'platform market' model to understand which will win (and which should)," *Journal of Academic Librarianship*, 39(1): 11–19. DOI: 10.1016/j.acalib.2012.11.035.
- McGrory, M., Williams, M., Taylor, K. and Freeze, B. (2007) "The impact of the integrated digital library system on the CNIB library," *Library Trends* 55(4): 973–93.
- Morgan, J., Farrar, B. and Owens, I. (2009) "Documenting diversity among working LIS graduates," *Library Trends* 58(2): 192–214.
- Muir, L. and Hawes, G. (2013) "The case for e-book literacy: Undergraduate students' experience with e-books for course work," *Journal of Academic Librarianship* 39(3): 260–274. DOI: 10.1016/j.acalib.2013.01.002.

- NEA (2009) *2008 Survey of Public Participation in the Arts*. Washington, DC: National Endowment for the Arts.
- Nichols, Stephen G., and Smith, A. (2001) *The Evidence in Hand: Report of the Task Force on the Artifact in Library Collections*. CLIR Report 103. Washington, DC: Council on Library and Information Resources.
- Norman, D. A. (2002) *The Design of Everyday Things* (1st paperback ed.) New York, NY: Basic Books.
- Nov, O. and Chen, Y. (2009) "Resistance to change and the adoption of digital libraries: An integrative model," *Journal Of The American Society For Information Science & Technology* 60(8): 1702–8. DOI: 10.1002/asi.21068.
- Nyren, K. (1978) "The online revolution in libraries," *Library Journal* 103(4): 439.
- Oppenheim, C. and Smithson, D. (1999) "What is the hybrid library?" *Journal Of Information Science* 25(2): 97.
- Orbis Cascade Alliance (2010) "Collaborative Technical Services Team." Available from: <http://www.orbiscascade.org/index/ctst> (accessed 15 October 2013).
- Ozioko, R. E. and Nwabueze, A. U. (2010) "Justification for reform in library and information science education in Nigerian universities," *Library Philosophy & Practice* (October): 1–6.
- Pan, D. and Fong, Y. (2010) "Return on investment for collaborative collection development: A cost–benefit evaluation of consortia purchasing," *Collaborative Librarianship* 2(4): 183–92.
- Partridge, H., Menzies, V., Lee, J. and Munro, C. (2010) "The contemporary librarian: Skills, knowledge and attributes required in a world of emerging technologies," *Library & Information Science Research* (07408188) 32(4): 265–71. DOI: 10.1016/j.lisr.2010.07.001.
- Pilgrim, M. and Dolabaille, A. (2011) "Our journey from print to electronic resources: An acquisitions perspective at a Caribbean academic library," *Serials Librarian* 61(1): 90–104. DOI: 10.1080/0361526X.2011.582618.
- Pinfield, S. (2010) "Paying for open access? Institutional funding streams and OA publication charges," *Learned Publishing* 23(1): 39–52. DOI: 10.1087/20100108.
- Power, R. and LeBeau, C. (2009) "How well do academic library web sites address the needs of database users with visual disabilities?" *Reference Librarian* 50(1): 55–72. DOI: 10.1080/02763870802546399.

- Profera, E. and Stamison, C. M. (2010) "An agent's perspective on issues and best practices when shifting from print to electronic resources," *Serials Review* 36(1): 3–9. DOI: 10.1016/j.serrev.2009.12.003.
- Price, A. C. (2009) "How to make a dollar out of fifteen cents: Tips for electronic collection development," *Collection Building* 28(1): 31–4.
- Raber, D. (1995) "A conflict of cultures: Planning vs. tradition in public libraries," *Rq* 35(1): 50.
- Ranganathan, S. R. (1963) *The Five Laws of Library Science*, 2nd edition. New York: Asia Publishing House.
- Reid, C. and Milliot, J. (2012) "Tablet use, e-book sales grow beyond Amazon, Nook," *Publishers Weekly* 259(48): 3–4.
- Riehle, C. (2012) "Inciting curiosity and creating meaning: Teaching information evaluation through the lens of 'bad science'," *Public Services Quarterly* 8(3): 227–34. DOI: 10.1080/15228959.2012.702598.
- Rizzo, J. C. (2002) "Finding your place in the information age library," *New Library World* 103(11/12): 457–66. DOI: 10.1108/03074800210452987.
- Roper, A. (2012) "Bridging the gap: Developing professional education for music library staff in the United Kingdom and Ireland," *Fontes Artis Musicae* 59(2): 168–78.
- Rosati, K. (2006) "The decline of print: Ten years of print serial use in a small academic medical library," *Acquisitions Librarian* 18(35/36): 107–17. DOI: 10.1300/J101v18n35•08.
- Rosen, J. (2011) "After Borders," *Publishers Weekly* 258(36): 18.
- Scardilli, B. (2013) "MOOCs: Classes for the masses" (cover story), *Information Today* 30(8): 1–34.
- Scharnberg, K. C. (2013) "Nation's first bookless library on university campus is thriving at UTSA," *UTSA Today*, 25 March. Available from: <http://utsa.edu/today/2013/03/aetlibrary.html> (accessed 15 October 2013).
- Schiller, A. (1981) "Shifting boundaries in information," *Library Journal* 106(7): 705.
- Scott, R. (2012) "The Forbes article has a point," *North Carolina Libraries (Online)* 70(2): 1.
- Searing, S. E. and Greenlee, A. M. (2011) "Faculty responses to library service innovations: A case study," *Journal of Education For Library & Information Science* 52(4): 279–94.
- Smith, J. (2012) "The best and worst masters degrees for jobs," *Forbes*. Available from: <http://www.forbes.com/sites/jacquelynsmith/2012/06/08/the-best-and-worst-masters-degrees-for-jobs-2/> (accessed 27 May 2013).

- Sorensen, C., Harkema, C. and Tharani, K. (2011) "Transcendental metadata: A collaborative schema for electronic resource description," *Collaborative Librarianship* 3(3): 130–9.
- Stachokas, G. (2009) "Electronic resources and mission creep: Reorganizing the library for the twenty-first century," *Journal Of Electronic Resources Librarianship* 21(3/4): 206–12. DOI: 10.1080/19411260903446170.
- Stanley, D. J., Meyer, J. P. and Topolnytsky, L. (2005) "Employee cynicism and resistance to organizational change," *Journal Of Business & Psychology* 19(4): 429–59. DOI: 10.1007/s10869-005-4518-2.
- Stone, P. and Farrington, J. (2013) "Print decline slows in 2013," *Bookseller* (5584): 4–5.
- Stowe, B. (2013) "Designing and implementing an information literacy instruction outcomes assessment program," *College & Undergraduate Libraries* 20(3/4): 242–76. DOI: 10.1080/10691316.2013.829363.
- Su, I. (2010) "Our library, their space: The Dunedin City Library Teen Space," *Aplis* 23 (2): 61–6.
- Tallaksen Rafste, E. (2005) "A place to learn or a place for leisure? Students' use of the school library in Norway," *School Libraries Worldwide* 11(1): 1–16.
- Toshimori, A., Mizoue, C. and Matsumoto, M. (2010) "Curriculum reform in library and information science education by evidence-based decision making," *Education For Information* 28(2–4): 305–14.
- Train, B. (2003) "Building up or breaking down barriers? The role of the public library in adult basic skills education," *Library Review* 52(8): 394–402. DOI: 10.1108/00242530310493806.
- Trussell, A. (2004) "Breaking the mold: Building a new engineering branch library focused on electronic delivery of information," *Science & Technology Libraries* 24(3/4): 239–50.
- UCMerced Library (2013) "Library facts." Available from: <http://library.ucmerced.edu/about/library-facts> (accessed 7 October 2013).
- Walsh, A. (2010) "QR Codes – using mobile phones to deliver library instruction and help at the point of need," *Journal of Information Literacy* 4(1): 55–63.
- Wei, Z., Lirong, S. and Chunming, L. (2012) "An analysis of the development of China Digital Library for Visual Impairment website," *Electronic Library* 30(6): 756–63. DOI: 10.1108/02640471211282082.
- Weise, F. (2004) "Being there: The library as place," *Journal of the Medical Library Association* 92(1): 6–12.

- Whitlock, B. and Nanavati, J. (2013) "A systematic approach to performative and authentic assessment," *Reference Services Review* 41(1): 32–48. DOI: 10.1108/00907321311300866.
- Wright, A. (2007) *Glut: Mastering Information through the Ages*. Washington, DC: Joseph Henry Press.
- Wu, K. (2013) "Academic libraries in the age of MOOCs," *Reference Services Review* 41(3): 576–87. DOI: 10.1108/RSR-03-2013-0015.
- Wu, L. and Mi, M. (2013) "Sustaining librarian vitality: Embedded librarianship model for health sciences libraries," *Medical Reference Services Quarterly* 32(3): 257–65. DOI: 10.1080/02763869.2013.806860.
- Yang, D. (2013) "UK Research Reserve: A sustainable model from print to E?" *Library Management* 34(4/5): 309–23. DOI: 10.1108/01435121311328654.
- Youngok, C. and Rasmussen, E. (2009) "What qualifications and skills are important for digital librarian positions in academic libraries? A job advertisement analysis," *Journal Of Academic Librarianship* 35(5): 457–67.

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