
Research Questions for the Digital Era Library

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ABSTRACT

THE CHANGING INFORMATION ENVIRONMENT and the changing expectations and demands of library users are forcing libraries to reassess their role in the digital age. Amidst this change there is a fundamental constant—the need for access to high-quality research materials. Success in the new environment will require learning much more than we now know about the use of digital resources, their preservation, and the training needed for operating the library of the future. This article examines three essential questions and suggests areas for research in each:

1. How are digital resource users best served: What resources will they want? How will they want to use them? And, what services will most enhance use?
2. What elements are required for a coherent preservation strategy covering resources both digital and traditional?
3. What kinds of education will “librarians” of the future need?

INTRODUCTION

What is a library? This seemingly simple question underlies all the others I pose in this essay. It is important to ask what shape and form the library may assume in the digital age because many observers question whether the traditional library can move into the new environment successfully. Librarians have been challenged to imagine a library that does not demand that the user come to it physically to take advantage of its services. In response to that challenge, they have actively promoted a vision of a library that allows faculty, students, and the broader public to identify and use

needed information wherever they happen to be and at any time. Yet, the reality of moving to something more fluid than a physically bounded space, containing collections built in response to local demands, is harder to deal with than most librarians care to admit. Libraries have begun to serve audiences unknown to them, but these new patrons' appetites for electronic resources seem hard to satiate.

As librarians think about users who are not part of their traditional constituency, they increasingly ask—Whom do we serve? And, what exactly do we offer them? Local libraries have unique cultures. Local librarians have worked hard to learn the preferences, special needs, and requirements of their users. Collections have been built with care and attention reflecting the close connections that exist between the library and those who depend upon it for information, insight, and pleasure. Adding a layer of users we do not know—and probably never will—raises important new questions about libraries' roles and responsibilities.

Most people have long viewed the library as an unchanging organization. For them, it has been the same place for the past hundred-plus years—an authoritative repository of information resources. However, digital era patrons have different expectations. They are not necessarily interested in the authority exercised by the library in building good collections. Increasingly, we hear from faculty that today's students are interested in digital resources only. Convenience, and the ability to retrieve information on one's own rather than relying on help from librarians, are exceedingly important attributes of digital information according to students. Faculty members spend considerable effort in trying to persuade their students to go beyond the computer screen to find materials of value for thinking through important issues in their studies. But, we have learned from paying close attention to use patterns in a variety of institutions that for younger users especially, and increasingly for all users, the importance of an authoritative physical institution is decreasing. Librarians know the great value of curated print, but new generations of information seekers place higher value on convenience and speed than on carefully assembled and authoritative print collections. If libraries are expected to change from purely physical places to hybrids with both print and electronic resources, and eventually, we assume, to collections largely digital, they must assess their ability to make the change and become abstract, virtual entities.

But amid the rapid changes, there is one constant—the need for access to high-quality research materials. Faculty members need librarians' support in finding new ways to make connections between the user and the materials that will facilitate intelligent inquiry and the creation of new knowledge. How will librarians provide this traditional service in the new environment? Can library services be restructured to present high-quality, trusted information in digital form to meet the needs of users for truly useful material as well as for immediate, convenient access?

That is the context within which we must consider particular needs for research. Reflection on these broad questions suggests to me the need for three lines of research in particular. Success in the new environment will require learning much more than we now know about the use of digital resources, their preservation, and the training needed for operating the library of the future. More precisely, the essential research questions may be stated as follows:

1. How are digital resource users best served: What resources will they want? How will they want to use them? And, what services will most enhance use?
2. What elements are required for a coherent preservation strategy covering resources both digital and traditional?
3. What kinds of education will "librarians" of the future need?

RESEARCH QUESTION ONE: HOW ARE DIGITAL RESOURCE USERS BEST SERVED?

A. *Why is it important?*

Academic libraries have routinely conducted surveys of their users to determine how many people come through the front door, how many gain access to electronic resources from their dorm rooms or from home, and how many believe that they receive adequate and timely answers to their questions. Unfortunately, there have been few studies that ask broader and, I would argue, more meaningful questions, such as the following: How do users identify the information resources they need? What sources continue to provide information needed by the user? To what extent do users feel confident that resources they have identified for their particular purposes are best? Are users equipped to assess the utility and quality of the resources they use? To what extent do they rely on library-validated information?

Popular media and librarians alike report that students turn first to the Web for their information needs. What they find there may well be provided by the local academic library. But, do the students understand that? Their belief that they can find what they need through their personal computers adds to the difficulties librarians have in justifying their collections budgets to their administrators. During this transitional period in which libraries are responding to users' needs by supplying both print and electronic resources, it is critically important to understand the changes in information seeking behavior and to think carefully about the implications of this change for library services and collections.

B. *Previous research*

We are beginning to recognize the importance of understanding the needs and information seeking behavior of users of digital as well as of traditional material. In a recent study of twenty-four large institutions that

Denise Troll Covey undertook as a Digital Library Federation (DLF) Distinguished Fellow, she found that users want libraries to offer a seamless presentation of collections and services regardless of where, by whom, or in what format they are managed. She found also that users want technologies that enable them to bring these materials together into synthetic wholes for particular purposes. Users need to identify appropriate digital materials, combine new resources with their own digital files, and make use of these combined formats in research papers, classroom work, and multimedia presentations (Troll Covey, 2002).

To learn more about use, users, and the usability of digital library collections and services, Troll Covey worked with DLF members to identify an agenda for research, development, and information sharing. They identified the following specific lines of research and development needed under three broad categories:

1. Research methodologies and their application in the digital library context.

- Identify, evaluate, and determine the potential shared application of quantitative and qualitative research methods appropriate for evaluating the nature, extent, quality, and effectiveness of the use and usability of digital collections and services.
- Encourage commercial vendors and local developers to apply whatever is learned from use and usability studies in the design and development of digital library collections, services, and applications.
- Encourage application of whatever is learned from use and usability studies in the development of user support services and in professional development activities (e.g., for public service librarians).

2. User support in a 24/7 digital library.

- Identify communities that use physical as well as digital libraries.
- Conduct an environmental scan of current practice, and then identify, evaluate, and determine methods appropriate for delivering public service functions and user support in a 24/7 digital library service environment.
- Contribute to the development of performance measures, best practices, and knowledge management appropriate to 24/7 user support services.

3. The library as space.

- Study the use of the library as both a physical and virtual place.
- Identify social interactions in the physical library that are not currently possible in the digital library, determine which social interactions are essential to the mission and values of a library, and investigate ways to support these interactions in the digital library environment (Greenstein & Troll, 2000).

As the DLF committee observed, these three research areas are interrelated:

The research methodologies developed to evaluate use and usability of digital collections and services (area 1) will inform strategies for supplying user support in the 24/7 digital library (area 2) and decisions about the use of library space (area 3). Similarly, investigations into the use of library space (area 3)—for example, the study of social interactions—will inform the development of 24/7 support services (area 2) where such interactions may also be encouraged, albeit in an online environment. (Greenstein & Troll, 2000; Troll, 2001)

Libraries are challenged to design measures of user behavior that help them make good decisions about what materials should be added to collections that support users' research and inquiry needs. Unlike old measurements that had more to do with the size of collections and number of transactions, new measures must yield information about where and how users find the resources they need, measures that have nothing to do with physical collections in a particular institution. The Association of Research Libraries, in its E-Metrics and LibQUAL+ projects, is developing tools that its members' libraries can use to assess their programs and services as an alternative to the traditional quantitative methods.¹

In 2001, the Council on Library and Information Resources and the Digital Library Federation commissioned Outsell, Inc., a commercial research firm, to conduct a survey of changing patterns of library uses in universities and colleges. Outsell was charged to collect data on how both students and faculty in all types of academic institutions use internal and external information resources. To provide a large enough sample for statistical significance, Outsell conducted interviews with 3,234 randomly selected students and faculty members. The results, published in November 2002 (Friedlander, 2002), help us answer questions about how users identify information they need, where they look for that information, to what extent they rely on information resources provided by libraries, and to what extent they seek information elsewhere.

The data from Outsell indicate that comfort with digital resources among students and faculty is almost as great as with print, but that library use is changing rather than diminishing. Questions now arise about how much responsibility any one institution has for producing, preserving, and managing digital resources that can reach every computerized community.

C. Suggestions for additional research

Beyond the studies by Troll Covey and Outsell, continuing research into the use will be needed because the proliferation of Internet-based information is fundamentally altering the expectations, behaviors, and preferences of library users generally. Such studies will help us define the library of the future by illuminating what collections and services users want and expect from libraries within the larger constellation of networked information and service providers.

In producing its report for the DLF, Outsell collected massive quantities of raw data through interviews; significantly, the respondents were not chosen from known library users. To gain insights into the real value of the Outsell-collected data, other researchers should be invited to pose actual problems to which the raw data can be applied. In addition, other types of libraries—community college and public libraries, in particular—should be encouraged to undertake similar types of surveys of their users. CLIR has deposited the Outsell data with the Inter-University Consortium for Political and Social Research (ICPSR) so that all researchers will have access to them.

RESEARCH QUESTION TWO: WHAT IS NEEDED FOR A COHERENT PRESERVATION STRATEGY IN THE DIGITAL AGE?

A. *Why is it important?*

To develop a coherent strategy for the preservation of library materials in an era when new kinds of materials are being created electronically, librarians need research along several lines. We need continued research to improve the preservation of traditional materials. Also, we need new research into the preservation of digital resources, both those that contain reformatted traditional materials and those created digitally. I do not treat these lines of inquiry as individual research questions because digital and traditional preservation must be looked at together if we are to have effective and affordable preservation programs in the future. In connection with both, we need research into the status of programs that provide preservation in college and university libraries, and how best to encourage and develop these programs.

Let us look first at the national preservation situation. The 1980s and 1990s witnessed a nationwide movement to preserve endangered library and archival print material. This activity was spurred by concerns about the vulnerability of paper-based materials from the past 150 years and by the ready availability of resources for preservation from government and private foundations. In 1989, the National Endowment for the Humanities (NEH) launched its nationally coordinated programs to preserve the intellectual content of U.S. newspapers and brittle books through preservation microfilming. Organizations such as the Association of Research Libraries (ARL), the American Library Association (ALA), the Commission on Preservation and Access, the Council on Library Resources, the Library of Congress, and the Research Libraries Group (RLG) exerted national preservation leadership. They articulated a vision and created an advocacy campaign to promote preservation awareness, which led, among other things, to the gathering of annual preservation statistics and the increased use by publishers of acid-free paper. By the early 1990s, most research libraries had established full-fledged preservation programs.

By the end of the 1990s, however, there were growing concerns that these programs were themselves at risk. ARL annual preservation statistics showed that as of 1999 preservation expenditures had remained flat for the previous seven years, and that the number of staff members assigned to preservation had reached a ten-year low (Reed-Scott, 1999). Yet more recent ARL surveys on preservation suggest a more positive picture, indicating that staffing levels have risen and that funding has grown or stabilized. (ARL, 2000; Young, Kyriellidou, & Blixrud, 2002). There are uncertainties in many libraries about the relationship of preservation to digital resource developments. While library directors continue to identify traditional preservation as a key concern, new demands, particularly in the digital domain, often compete with preservation for resources, and receive them from internal reallocations. Outside funds available for preservation have diminished as government and private foundations experienced declines in appropriations or changed their program priorities. For example, the multiyear effort through which the NEH hoped to finance the microfilming of 3 million brittle books has failed to keep pace with projections, in large measure because of a sharp cut from which the NEH budget has struggled to recover. Many preservation programs have been initiated with outside funds, and many remain to one or another degree dependent on soft money. Preservation education programs and regional preservation centers also remain dependent on outside resources.

Within the library profession, uncertainties are underscored by the lack of a clearly articulated vision for preservation in the digital age, a decline in effective national leadership for preservation by professional organizations, and a dwindling pool of qualified candidates for top administrative posts. We greatly need to know how this state of uncertainty and flux is affecting the ability of individual libraries to continue their indispensable preservation functions.

Preservation of books has been an important concern of librarians for decades, but the preservation of digital resources raises important and urgent issues. Books and manuscripts may be discovered decades after their publication and are still readable, even if the paper is fragile. Digital information, however, cannot be read in even a few years if the creator did not have the foresight to include information about the hardware and software used to create the content. For the first time, the decision to preserve must be made at the point of creation. This requirement creates new problems for librarians, and requires new research.

B. Previous research and suggestions for additional research

Research has been conducted in a number of preservation-related areas. It is useful to break the larger question of what is needed for a coherent preservation strategy into a few subthemes, and describe the work that has been done and needs to be done in each area.

Preservation Research Subquestion 1: What is the State of Libraries' Preservation Programs? With support from the Institute of Museum and Library Services (IMLS), four organizations—the Council on Library and Information Resources (CLIR), the Association of Research Libraries (ARL), the University Libraries Group (ULG), and the Oberlin Group of libraries—joined forces to conduct an examination of the state of preservation programs in American libraries. Using both quantitative and qualitative evaluation techniques, the authors of the study have made what they term “a first attempt” to “establish benchmark data for subsequent longitudinal comparisons,” through which researchers will be able to provide greater insight in the future (Kenney & Stam, 2002). Here are some of the issues that the study set out to investigate:

Library trends: Preservation programs need to be considered in the context of recent trends affecting American libraries. ARL member libraries report a 12.5 percent drop in circulation since 1995 and a significant decline in purchased volumes (26 percent for monographs and 6 percent for serials) since 1986. Members of the Oberlin Group, however, report consistent rises in both acquisition and physical circulation.² What accounts for these differences? And, how do such figures correlate with core preservation activities such as binding, preshelf processing, and book repair? To what extent are preservation and access activities intertwined?

Digital development: Libraries of all types report significant growth in digital acquisitions and conversion, but few have developed adequate digital preservation strategies, according to Margaret Hedstrom and Sheon Montgomery in their report, *Digital Preservation Needs and Requirements in RLG Member Institutions*. What is the role of preservation programs in shaping institutional policies for digital preservation? Has there been a shift in preservation resources to meet these needs? How are analog and digital preservation activities related to one another?

Aging assumptions: In 1991, ALA issued a Preservation Policy, and that same year, ARL published preservation program benchmarks for selected core activities (Merrill-Oldham, Roosa, & Morrow, 1991). Are these policies still valid, given the changing circumstances of ownership and access? Similarly, does the brittle books strategy developed in the 1980s remain the best approach? Are we making sufficient progress? Employing an ample range of technologies? Is the brittle books program still viewed as an important preservation imperative?

National leadership: What are the pros and cons of developing a national preservation plan for the digital age? What is needed to revitalize preservation leadership by national professional organizations?

Education and recruitment: Why are institutions finding it difficult to attract top professionals to preservation positions? What is the state of preservation education in library and information studies programs? How can

the profession help develop preservation leadership skills and the next generation of preservation administrators?

Collaboration: Consortial preservation efforts have been heavily dependent on outside funding. To what extent have these efforts enabled libraries to reduce their own preservation expenditures and increase program effectiveness? To what degree are institutional funds devoted to cooperative preservation activities (e.g., shared offsite storage facilities)? Are cooperative efforts more characteristic of certain libraries than of others? Are there any business models for cooperative preservation programs that will promote greater self-sufficiency?

Economics: To what extent are preservation programs at financial risk? What strategies for financial sustainability have succeeded for preservation programs in college and research libraries? And, how can they be used elsewhere?

The IMLS-funded State of Preservation study helps us understand how academic librarians are viewing their preservation roles and responsibilities. As a next step, CLIR has begun an in-depth survey of endangered materials, focusing particularly on the audio and visual collections that have been held in libraries but not included in preservation treatment plans or programs.

Preservation Research Subquestion 2: How Can We Best Preserve Digital Materials? Research efforts so far have focused on the technical aspects of digital preservation. The National Science Foundation has funded a series of workshops to address research needs. The Internet Archive has hosted several meetings at which individuals from the library, technology, and scholarly communities worked on research requirements for preserving massive Web sites. The Andrew W. Mellon Foundation has funded seven pilot projects in which research libraries and publishers have attempted to work together on requirements for establishing archives of electronic journals. All these endeavors have been important in advancing research on the technical details of digital preservation. But, they also showed that the organizational, legal, and economic issues could be even thornier than the technical issues. These nontechnological issues must be more carefully analyzed in the future.

Although many aspects of digital preservation have received attention since the mid-1990s, most of the presentations and papers on the subject have ended with little more than general comments about the complexity and expense of the tasks, and ambiguity about responsibilities and roles. In December 2000, the Library of Congress received a congressional addition of \$100 million to its budget to finance the development of a national strategy for preserving digital information. This news was welcomed in a library world badly in need of such leadership. Following the recommendations of a National Advisory Board established for the project, the Library of Congress commissioned papers on the challenges (technical, organizational, and financial) of preserving digital content in six formats: large

Web sites, film and video, recorded sound, digital television, electronic books, and electronic journals. These papers provided the context for a series of meetings that brought together librarians, archivists, scholars, technologists, content creators, producers, and distributors to discuss digital preservation priorities and strategies. The discussions informed the development of a national strategy that was accepted by the Congress in 2003.

From the Library of Congress project, research questions are emerging such as the following:

- What kind of technical infrastructure will be needed to support a network of repositories for the preservation of digital information?
- How will materials to be preserved be selected?
- What are the legal barriers to preserving digital information?
- How do requirements differ for preserving information in different formats?

Numerous individual projects are yielding interesting results, but there remains much more to learn about these questions.

High-level architectural principles have been established, and they appear to be promising. However, considerable work is needed to translate the principles into an established system if there is to be an operational repository of preserved digital information. The job to be done is highly technical, and it is urgently needed.

Additional work is needed to identify the types of born digital materials that will be selected for long-term preservation. The Library of Congress has a long and rich legacy of collecting primary source materials in all formats. That concept of universal collections must be translated to a distributed, digital environment.

Preservation Research Subquestion 3: How Best to Improve the Preservation of Traditional Materials? We are unlikely to digitize every book, journal, manuscript, artwork, film, photograph, videotape, and sound recording in the general and special collections of the nation's research libraries. Not only would this be prohibitively expensive but also demand for many items is sufficiently low to make expenditure on digitization far less than necessary. At the same time, many items that we have digitized have been "rediscovered" by scholars who want to see the originals in addition to having digital copies. Finally, we want to keep many things as originally created—rare books, signed manuscripts, original images—because of the historic, artistic, and financial value of the objects themselves. The preservation of traditional materials must therefore continue even in the digital era, or one might say *especially* in the digital era because no medium is more susceptible to media decay and loss through obsolescence than the tapes and disks containing magnetic bytes and bits.

Preservation of original "artifacts," however, continues to raise problems. Books printed on wood-pulp paper through a process widely used

since the 1840s continue to “brittle”; that is, chemicals from the process interact with heat and humidity to make the paper destructively acidic. The funding initiative begun in 1989 by the National Endowment for the Humanities to microfilm three million deteriorating books in research libraries continues but remains far short of its initial goal. In the meantime, original estimates of the rate of acidic paper deterioration have been questioned, and experiments have begun with such alternatives to microfilming as mass deacidification.

Similar needs confront us for the preservation of audiovisual materials. Anyone who has left family photos on a piano close enough to a window to receive the sun’s full glare knows how quickly their images and colors fade. Old photos made with nitrate film are even fire hazards. And old recording media, such as wax cylinders, acetate platters, and flimsy tape, easily break. Moreover, even if the library has perfectly preserved study collections of films, videos, and audiotapes of historic events, artistic performances, natural phenomena, exotic cultures, oral history interviews, and whatever else scholars at one point or another have brought in from field trips and studios, many will be inaccessible unless the library has also kept all the original recording equipment in working condition or has transferred the material to preservation film and tape that can be played with today’s technology. Studies sponsored by the Library of Congress, the Council on Library and Information Resources (CLIR), and others have documented the risks facing huge quantities of analog, audiovisual material.

Money is needed to meet these needs, but so is research. In November 2001, CLIR issued a major publication on preservation, *The Evidence in Hand: Report of the Task Force on the Artifact in Library Collections* (Nichols & Smith, 2001). CLIR had convened a task force, composed of scholars, librarians, archivists, and academic administrators, to consider questions about preserving original (that is, unformatted) library materials in the digital-information age. The report analyzed issues in a way designed to help research repositories answer these questions:

- What qualities of an original are useful or necessary to retain in their original form? Under what circumstances are original materials required for research?
- When is it sufficient and appropriate to capture intellectual content through reformatting and not necessarily retain the original?
- Which preservation options provide the most appropriate and cost-effective means of preserving the original?
- From both custodial and scholarly perspectives, what are the advantages and disadvantages of these various preservation options?

The report also laid out a set of recommendations for future research that included the following:

- Gather data on the state of artifacts in nonacademic libraries and repositories.
- Research and develop curricular needs for the use of original sources.
- Increase media longevity studies and extend them to all new media, including digital. (Nichols & Smith, 2001)

Some light has been shed on the state of artifacts in nonacademic libraries and repositories by the IMLS-funded study on the status of library preservation programs. The user studies described earlier have shed light on the need for use of original sources. It remains here to emphasize the third item posited by the task force—the need for media longevity studies. In particular, research is imperative to assess anew the rate at which acidic books become brittle and to determine the proportion of endangered books that actually have become useless so that we can be more certain of how much time we have to save others. In addition, we need research to tell us at what rate and in what volume materials printed on potentially acidic paper continue to be produced by publishers. And, we need further, rigorous study of the effects of experimental deacidification techniques—and of storage improvements—on the life expectancy of print materials. Equally important is continued research on improving the longevity of film and audio resources, materials that will be increasingly important for documenting late twentieth and twenty-first-century history.

Finally, because it would be pointlessly expensive to microfilm, let alone digitize, every printed *copy* of every book found to be disintegrating, we need research to get a better idea of how much duplication there is in the holdings of research libraries, and a better idea of how much use of multiple copies is made. We need to study the potential pros and cons of extended collaborative arrangements through which libraries, jointly financing or dividing up responsibilities for services, or even sharing ownership of physical and digital resources, could store, reformat, and meet patrons' needs for library materials more cost-effectively.³

RESEARCH QUESTION THREE: WHAT EDUCATION WILL “LIBRARIANS” OF THE FUTURE NEED?

A. *Why is it important?*

In 1923, the Carnegie Corporation published a landmark report written by economist Charles C. Williamson. Entitled *Training for Library Service*, the study became the principal guide for the development of professional education in the next four decades. The earlier in-house training programs in libraries largely disappeared as universities embraced this new field of academic study and created schools of library science.

Since the publication of Williamson's report, professional library education has remained in the hands of universities. Yet, in the last two decades,

the state of library education has changed substantially. Many universities, especially those privately funded, have closed their schools of library and information science. Others have incorporated their library science curricula into other, related departments.

Even more important than declining numbers of library schools, those that remain have abandoned their common professional focus. All the schools have changed their names to incorporate the word *information*, recognizing that the profession of librarianship no longer focuses exclusively on libraries and their functions but instead now involves managing information wherever it is collected, transmitted, and used. Graduates of today's schools find employment in the insurance industry, the film industry, the software development business, and other businesses created or transformed by the revolution in information technology.

Seeing this diversification in the professional prospects of their graduates, and challenged by the growth of information science in other schools of the university, library schools have desperately been seeking to redefine their roles and their curricula. The changing idea of information science in the universities has weakened the position of library schools. Many that closed simply failed to accommodate the new interests and meet the new standards of their colleagues in engineering, business, economics, and other disciplines. The remaining library schools are recruiting faculty from all of these departments. A dean of the School of Information at Michigan came to the position after being chair of a computer science department; and before him, the dean had been recruited from Michigan's School of Engineering. A dean of what had been the library school at Berkeley came from economics. Renamed the School of Information Management and Systems, the Berkeley school has given up its American Library Association accreditation because it no longer regards the training of librarians as relevant to its mission.

At the same time that schools of library and information are developing curricula to prepare graduates for a great variety of information related careers, libraries are working to integrate print-based and digital collections and services. The academic curricula must be flexible enough to support many different career tracks, and libraries are but one such track. The particular skills needed in public, academic, or corporate libraries are probably best taught on the job. Many of the large public and research libraries are beginning to understand the need to become teaching libraries if their professionals are to be wholly effective.

Libraries of all types are finding it increasingly difficult to recruit the talent they need. This is happening at a time when the libraries are expanding their role in managing the information resources that constitute the foundation for inquiry, scholarship, and teaching. The Association of Research Libraries reported for 2002 the highest level of director turnover in a couple of decades.

In early 2002, the Institute of Museum and Library Services received a special appropriation of \$10 million to focus on the recruitment and training of a new generation of librarians. Although it is premature to describe the influence of this new program, it is encouraging that a federal agency has been charged with addressing the problem.

Also, the Association of Research Libraries and the American Library Association have launched programs aimed at increasing diversity among library and information science students as well as among practitioners. These organizations understand that user needs are most effectively met when the cultures of users are also represented among the information professionals who meet the needs.

The Council on Library and Information Resources has combined forces with EDUCAUSE and Emory University to create a short-term leadership training program aimed at bringing librarians, information technologists, and teaching faculty together to consider the collaboration required in managing today's mixture of traditional and electronic information resources. The work of transforming education and training for librarians of the future must go hand-in-hand with developing new leadership models for managing information-providing organizations that must necessarily emerge in academic institutions.

B. Needed research

Clearly, the time has come to analyze more systematically the requirements for librarianship in the future. There is really no previous useful research to build on, but we greatly need research focused on the following kinds of questions.

- What kinds of professionals, with what kinds of skills, will different types of libraries need?
- Are today's schools of library and information science equipped to train the kinds of professionals that libraries will need?
- If not, where will appropriately skilled professionals best be trained?
- What is the relationship of teaching libraries to the graduate programs in information and library studies?
- What should practitioners learn in their on-the-job education?
- What is the expected rate of retirement for those now working in different types of libraries?
- Will the output of schools of library and information science be sufficient for filling vacancies?
- How can leadership positions most effectively be filled in the future?

CONCLUSION

The three lines of research I have proposed—research into the needs and behaviors of library resource users, into options for preserving such resources, and into requirements for redefining professional librarianship

and training for it—may seem unrelated at first glance. But, as digital technology increasingly influences the functions and services of libraries, these three areas of inquiry take on new and connected meaning.

The greatest research needs are to understand how roles and responsibilities change in the digital environment. The nature of library work and the function of libraries will change dramatically. In the digital world, libraries and librarians do not—cannot—work in isolation. The nature of digital information is such that both its creators and publishers along with technologists must join librarians in organizing its preservation. When librarians provide access to publishers' electronic products, they typically do not own those products or the intellectual property rights in them. Preservation for long-term access, a traditional responsibility of research libraries, must now be achieved through collaboration among heretofore unlikely partners.

User studies become increasingly important as libraries move from housing materials to providing electronic access to them, becoming gateways to material instead of owners. To succeed in this new business, libraries must understand how users look for and find the information they need. And if access provision becomes the primary role, libraries must determine how they can add value to the information retrieval process.

The confluence of these issues will force us to think in new ways about the requirements for those who will serve in information roles. Research will also be needed to inform approaches to recruiting, educating, and providing ongoing training to those who will be responsible for the library of the future.

NOTES

1. See Rush Miller and Sherrie Schmidt, "E-Metrics: Measures for Electronic Resources," a keynote paper delivered at the 4th Northumbria International Conference on Performance Measurement in Libraries and Information Services, at <http://www.arl.org/stats/newmeas/emetrics/miller-schmidt.pdf>.
2. For information on the Oberlin Group, see <http://dewey.willamette.edu/publications/movtyp/spring99/english.html>. The statistics collected by the group from its members are not generally available to others.
3. These points are elucidated by Deanna B. Marcum and Anne Kenney in "The Preservation of Our Brittle Books Must Also Preserve Access," *The Chronicle Review*, March 8, 2002, p. B-20.

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