World Libraries on the Information Superhighway: Internet-based Library Services

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ABSTRACT

THE INTERNET IS NO LONGER a technology with which libraries experiment, dabble, or observe from afar. Rather, it is an integral part of library service that can take many forms—an extension of library collections and resources through licensed and/or digitized content, a gateway service through public access workstations, or a means through which customers can interact with the library through such services as digital reference. The advent of the Internet requires a reconceptualization of the information creation, dissemination, and consumption processes—and the role of libraries in these processes. Moreover, there is a need to examine our ability to engage in the assessment of network-based information services and resources as we move away from input/output evaluation approaches to those grounded in service quality and outcomes frameworks. Information professionals, and those relying on information professionals, face a number of challenges in the networked information resources and services environment. Meeting these challenges requires libraries to consider a variety of issues and strategies, several of which are presented in this article.

INTRODUCTION

The networked environment is complex and has multiple dimensions. This article focuses on selected issues that libraries face regarding service and resource delivery, management, organization, professional development, and assessment in the networked environment. It is an overview article and thus cannot address the full complexity of the impact of network-

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based services and resources on the library as an institution and librarianship as a profession.

For the purposes of this article, the author defines the networked environment as the myriad of public, private, organizational, and other networks, systems, and applications used to provide users with access to electronic services and resources. These services and resources could be as simple as an online document viewed via a Web page or as complex as an electronic commerce/e-government interaction through which a user can purchase products and/or attain services such as renewal of a driver's license. In libraries, network-based services and resources can take many forms, including:

- Searching library holdings;
- Placing a hold or recalling library material;
- Making an interlibrary loan request;
- Licensing online databases, e-journals, and e-books for customer access;
- Digitizing library collections for online access;
- Providing organized Web pages that lead customers to library/nonlibrary content; and
- Providing real-time and asynchronous digital reference services.

Depending on the nature of the services or resources that libraries wish to provide their customers, libraries will need to invest in technology infrastructures that range in ability and expense and staff and customer training, in addition to considering a number of management and organizational issues that best enable the library to take advantage of such services and resources. Moreover, libraries will need to engage in evaluation activities that truly reflect the complexity of the networked environment in general and library network-based services and resources in particular.

Connectivity Background Data

This article is not about the digital divide. It is important, though, to provide some background data regarding library, school, and societal Internet connectivity and involvement:

- 98.7 percent of U.S. public libraries have an Internet connection, and 95.3 percent provide public access to the Internet (Bertot & McClure, 2002, p. 5);
- 50 percent of U.S. public libraries have Internet connectivity speeds of T1 (1.5 mbps) or greater (Bertot & McClure, 2002, p. 7);
- 99 percent of U.S. public schools have Internet connectivity, with 87 percent of instructional rooms having access to the Internet (National Center for Education Statistics, 2002, p. 3);

- 85 percent of U.S. public schools have broadband access to the Internet (National Center for Education Statistics, 2002, p. 4);[1]
- 95 percent of academic libraries have Internet connectivity according to the most recently available national data from 1998 (National Center for Education Statistics, 2001, p. 9).
- 54 percent of the U.S. population uses the Internet, though disparities exist by age, ethnicity, income, and education (National Telecommunications and Information Administration, 2002); and
- Recent research suggests that there are between 85,000 and 144,000 public computing sites across the United States, through which individuals might have access to the Internet (Williams, 2003).

Together, these data point to a nation that is increasingly online in the home and through a number of publicly accessible outlets such as libraries.

There are multiple dimensions to library Internet connectivity, from which a number of issues for libraries emanate. On the one hand, libraries need to pause for a moment and reflect upon a major accomplishment. In 1994, just 21 percent of U.S. public libraries were connected to the Internet (McClure, Bertot, & Zweizig, 1994). In less than ten years, public libraries have attained near 100 percent connectivity. This deserves some perspective: there are approximately 9,074 public library systems in the U.S. that have a total of 16,298 service outlets (typically branches, but also bookmobiles). This is a major accomplishment—one about which the library community should be proud.

Some additional, and final, statistics provide perspective on the implications for connectivity and network-based services and resources—this time from the Association of Research Libraries (ARL, 2002a, 2002b):[2]

- Expenditures for electronic resources account for an average of 16.3 percent of ARL library materials budgets;
- Collectively, ARL libraries expend more than $132 million on electronic resources, with an additional $14.66 million spent on their behalf for electronic resources through consortia purchasing arrangements;
- Expenditures for electronic serials have increased by nearly 900 percent since the 1994–95 reporting year; and
- Reference transactions have declined substantially since 1997 (down from 158,294 in 1997 to 105,087 in 2001), and circulation (of print material) is on the decline as well, down from 508,633 in 1999 to 459,335 in 2001.

One final data point may be of interest. The author conducted interviews with several database vendors and aggregators that provide services to both academic and public libraries during June 2003. These interviews

sought to determine the extent to which academic and public libraries subscribe to licensed resources. In particular, the interviews asked the aggregate expenditures (for licensed resources) for the top twenty-five individual academic and public libraries (exclusive of consortia and statewide licensing agreements). The findings: public libraries spend as much, if not more, on licensed resources as do academic libraries.

To be sure, network-based services and resources are an integral—and substantial—portion of ARL libraries. Though there may be a number of factors that contribute to the decline in use of traditional library services, it is likely the case that user access to networked information resources and services—library and nonlibrary (e.g., Google)—are having an impact on print material circulation and reference services. While difficult to extrapolate to other library types, one would expect similar data and trends.

The networked environment provides the opportunity to develop new services and resources, and to provide access to those services on a global scale. For example, libraries can digitize special, rare, or unique collections; collaborate with museums, archives, and historical societies to create unique digital content; engage in collaborative digital reference services; create electronic libraries; and expand collections without the need for additional physical space—and make these services available to the world and not just those individuals who walk into the building(s) housing such collections.

By marrying the connectivity, collections, and expenditure data with the service potential aspects of the networked environment, some substantive issues emerge. Library networked information service and resource provision require 1. assessment techniques that evaluate specifically library networked resources and services rather than approaches that combine traditional and network-based services and resources into a single form of assessment; 2. significant capital investments in technology, networking infrastructure, and continual operational costs for licensing/purchasing network-based content, services, and resources; 3. continual learning strategies and programs for library staff and users; and 4. new library management structures that include collections development, reference services, resource sharing, and other library activities.

Assessing Library Network-Based Services and Resources

In 1999, Lakos (1999) used the phrase "culture of assessment" in his discussion of the need for libraries to develop and sustain coherent and pervasive evaluation strategies regarding library service and resource provision. Briefly, Lakos argued that libraries need to create an organizational culture in which assessment is a key component to understanding the meeting space of users and libraries. This type of culture is one in which library services are under an ongoing evaluation system so as to foster con-

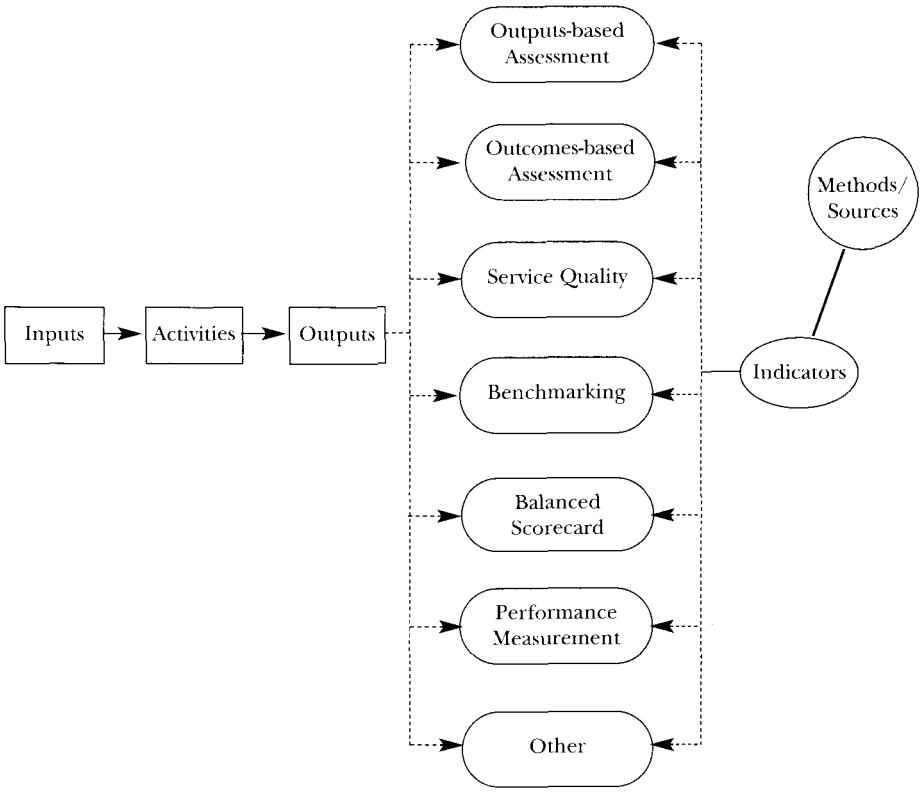
tinued improvement in meeting both library and customer needs. As will be discussed in ensuing sections of this article, such a culture requires different librarian attitudes and perceptions of library services and resources provision, different library management and working group structures, continual librarian training and education in a number of areas, and a different type of librarian than what library schools produced through their M.L.S. programs in the past.

The 1980s formalized the notion of input/output assessment techniques in librarianship (Van House et al., 1987; Van House, Weil, & McClure, 1990). This approach continues today in the networked environment as well (Bertot, McClure, & Davis, 2002; Shim et al., 2001; Bertot, McClure, & Ryan, 2000) and is in the process of incorporation of various national and international standards reviews (see, for example, the National Information Standards Organization's Z39.7 *Library Statistics* standards document at http://www.niso.org/emetrics). Indeed, entire library data collection systems center on this approach to library use, uses, and performance. For example, the Federal State Cooperative System (FSCS) managed by the National Center for Education Statistics (NCES) collects annual public library data focused on approximately fifty data elements; NCES also manages data collection activities for academic and school libraries through its library statistics program; ARL collects annual statistics from its members and so too does the Association of College Libraries (ACRL); and, as a final example, the Public Library Association collects annual statistics from a sample of public libraries through its Public Library Data Service (PLDS) program.

More recently, however, there is a push to move libraries towards service quality and outcomes assessment techniques (Hernon & Dugan, 2002; Cook & Heath, 2001). Service quality and outcomes assessment approaches differ substantially from input/output assessment but are nonetheless dependent on library inputs/outputs. Briefly (see Figure 1):

- Inputs are the resources that libraries invest (e.g., money, staff, workstations, online commercial databases);
- Activities are the library services/resources that the inputs actually generate (e.g., licensed resources availability, story hours, training sessions);
- Outputs are the service/resource results of library investments (e.g., number of users of the workstations, number of database content downloads, circulation of material);
- Outputs assessment involves the identification of the number of library activities that patrons use (e.g., number of database sessions, number of database items examined, number of training sessions conducted, etc.);
- Quality assessment involves determining the degree to which users find the library services/resources (outputs) to be satisfactory; and

Figure 1. Library Services and Assessment Frameworks.



- Outcomes assessment seeks to determine the impact of the library's services/resources (again, outputs) on the library service and resource users; or benefits, changes in skill/knowledge that library users derive from library services/resources.

Libraries that desire a comprehensive user-based assessment picture of library services/resources, therefore, need to use several evaluation strategies simultaneously—all of which are based on measures of outputs. Libraries often base their assessment strategies on trying to discover the reasons for service use/lack of use. Libraries need to know what investments (inputs) produce what services (outputs) in order to determine the perceived quality (quality assessment) and impacts (outcomes) of those services/resources. Depending on the assessed outcome and quality, library managers will want to modify their resource investment to attempt to achieve, or sustain, the desired service outcome(s). Finally, while this article focuses on issues in outcomes and service quality assessment, there

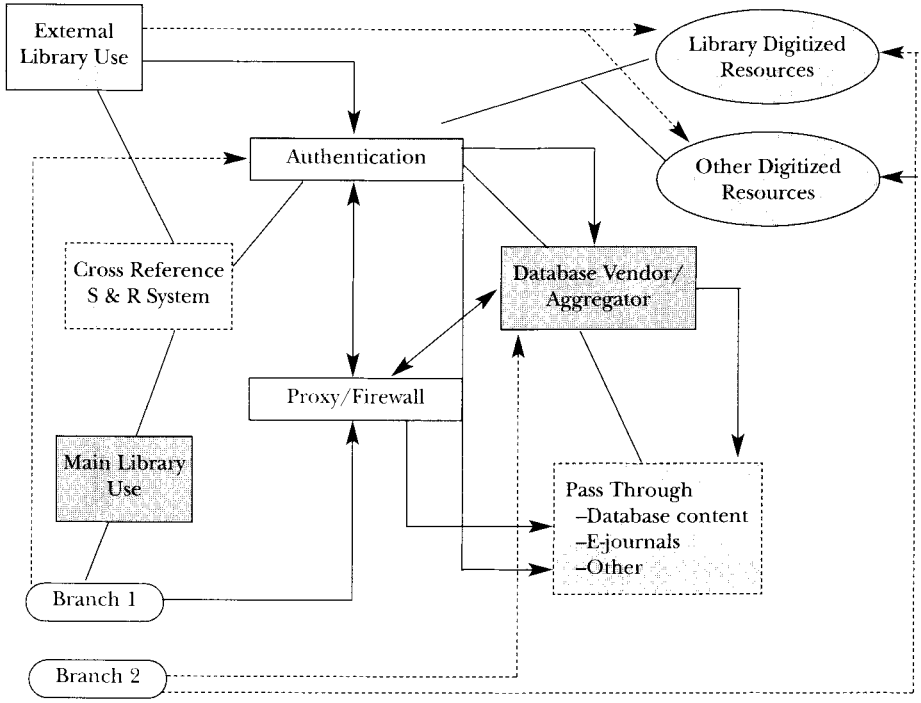
are other approaches to library services/resource evaluation that may be more appropriate (e.g., balanced scorecard) given the library's data needs and situational factors.

There are several issues associated with service quality and outcomes assessment in general and in the networked environment in particular. A more detailed discussion of these issues is available in Bertot & McClure (2003). This article, however, focuses on a high-level discussion of service quality and outcomes assessment in the networked environment. Figure 2 demonstrates the complexity of library network–based service and resource provision. At their core, service quality and outcomes assessments focus on user-based perceptions of a. the quality of library services/ resources, and b. the impacts of those services/resources on users. However, as Figure 2 shows, a vast majority of network-based services/resources that libraries provide are not under the control of the library. For example:

- Libraries are often not the content creators/managers for network-based services and resources;
  - OPACS and other internal operational software are most often purchased/leased from specific vendors and are proprietary;
  - Licensed content (e.g., databases, e-books, and the interfaces used to access vendor content) are the property of the vendor(s), and libraries typically lease that content through annual licensing agreements (though libraries can in fact purchase permanent access to e-book holdings and other resources);
  - A new, and likely to increase in use, vendor-based product is that of a cross-resource search and retrieval interface (think Google) that libraries can purchase for the purpose of enabling customers to search across vendor, Web, and library online resources through a single interface. This interface, which sits in-between the user and various other resources, is a proprietary vendor product not under the control of libraries; and
- Various technology infrastructures are not part of the library network/equipment. Customers can access "library content" from a number of locations (e.g., office, home, dorm room, other) with a wide range of computing technology and connectivity (including wireless connectivity and mobile devices). Moreover, external library connectivity has many parties involved from leased-line providers (e.g., academic computing, county information technology services, bell operating companies) to ISPs, phone lines, and wireless technologies.

To summarize, then, libraries do not control a vast majority of their network-based services and resources. Therefore, any service quality and outcomes assessment techniques will need to take that into account and ensure the account assessment of library services and resources.

Figure 2. Complexity Access to Network-Based Services and Resources.*



*An earlier version of this diagram first appeared in Bertot, McClure, & Davis (2001).

This is a particularly problematic issue with currently promoted service quality and outcomes assessment products. For example, ARL's LibQUAL+ initiative (Cook, Heath, & Thompson, 2002) and the outcomes assessment approach promoted by Hernon and Dugan (2002) use or recommend the use of survey instruments and other data collection techniques that mix online and print/traditional library services and assume library ownership of collections, services, and resources. These approaches can be quite useful at gauging library service quality/outcomes in the aggregate. Research indicates, however, that the print/traditional and electronic environments differ dramatically in important key areas such as user information-seeking behavior (Cool & Spink, 2002; Ke et al., 2002) and the ability of users to engage and extract content (Brophy, Fischer, & Clark, 2002). Lumping together traditional and networked services, therefore, leads to confounded variables, data, and results—and potentially erroneous conclusions regarding customer perceptions of outcomes and service quality.

There is a substantial need for service quality and outcomes assessment tools to probe deeper into the specifics of the services/resources they are assessing rather than continue to ask generalized questions. The general questions are helpful to provide libraries, at a glance, successful and less than successful areas of library services according to users. They do not, however, provide specific reasons for the success or lack of success of such services. Thus, libraries need to consider what the subsequent evaluation effort will be to enable in-depth probing into particular service/resource areas.

Moreover, it is likely the case that customers may actually provide feedback regarding a "library service" that is not actually provided by the library, such as online leased content. In most instances, libraries simply serve as gateways to content that resides with, and is owned by, external entities. This begs the question: Upon what, exactly, would libraries measure service quality and outcomes? For example, when a user provides feedback regarding the level of satisfaction with an online journal, is that user assessing the connectivity that leads to the journal? the interface that leads to the journal? the authentication system for access to the journal? the search interface for journal content? the journal content's format (e.g., HTML, PDF), etc.? Almost none of the above are actual services/resources provided by the library. Rather, they are particular to the various vendor systems to which the library subscribes. Asking users what they "think about a library service," therefore, is quite complex in the networked environment and points to a number of methodological problems that require resolution. Simply put, the outcomes and service quality evaluation tools of today are not adequate to engage in meaningful assessment activities for library network-based services and resources. There is much research required in this area.

Customers May Be Right, But Won't Always Get Their Way

Hernon (2002) criticizes non–user based measures of library services (e.g., input/output type measures) and strongly promotes a customer satisfaction approach to measuring the success of library services. Such a framework, adopted also by the LibQUAL+ approach, suggests that customer feedback will make its way into the resource allocation, decision-making processes, and planning activities of a library. There are two issues that emerge from this:

1. Some library services will not go away or be modified substantially regardless of user ratings. For example, the Federal Depository Library Program (FDLP) was created, among other reasons, to promote democracy and bring government closer to the people through more local dissemination and access points to government information. In the

creation of the FDLP, Congress did not specify a usage quota or user satisfaction level for such collections. This does not mean that FDLPs (or other public good–type collections such as archives and records agencies) could not benefit from user-based input. The context for such evaluation efforts, however, is important and can influence the interpretations of the results from such studies.

   a. Tangential to this issue is the notion that the Web would render the print-based FDLP program obsolete. In effect, some consider federal agency Web sites as a form of FDLP. However, since September 11th, increasing amounts of federal Web site content has been removed systematically because of national security interests. It may in fact be the case that the print-based FDLP collections, though perhaps less accessible and on a lower technology rung, are of increased significance in this era. As Patricia Diamond Fletcher discusses in this issue of *Library Trends*, FirstGov is a single point of access to online government information that continues to improve in its usability, searching, and retrieving capabilities. However, as good as FirstGov gets in terms of technology, its value decreases in direct proportion to the decrease in content to which it provides access.

2. Customer (end-user) input may have little specific impact on certain key network-based services and resources.[3] A number of key vendors have various online products and services—Elsevier has ScienceDirect, Ebsco has EbscoHost, Thompson/Gale has InfoTrac, etc. Each of these products has proprietary technology, enterprise systems, applications, interfaces, search capabilities, usage tracking capabilities, and more. The probability that a user satisfaction survey conducted on a campus library will affect the look, feel, and capabilities of each of these vendor products and services is likely remote.

While a customer-centered approach to library services in general and library network-based services in particular is desirable, it may not always yield the type of results one generally considers appropriate in a customer focus model.

Brief Discussion of Network Statistics

Much research has emerged since 1998 regarding library network statistics—essentially an input/output model for electronic library services and resources use and uses. This article does not review this work; however readers interested in such efforts should review Bertot, McClure, and Davis (2002), Shim et al. (2001), and Bertot, McClure, and Ryan (2000). For the latest in terms of network statistics data elements, definitions, and methodologies, readers are encouraged to review the NISO Z39.7 *Library Statistics* standard Web site at http://www.niso.org/emetrics.

What is of significance, however, is the notion of compliance. There are a number of forms that compliance can assume when considering network-based services and resources:

- Definitional. Groups, organizations, corporations, and individuals have expended a substantial amount of effort on the identification of network service/resource data elements and the definitions that accompany such elements. Researchers, vendor representatives, librarians, and others have worked collaboratively over the last several years through such entities as the International Standards Organization (ISO), NISO, the International Coalition of Library Consortia (ICOLC), and the Information Institute in the School of Information Studies at Florida State University to solicit library, vendor, and consortia compliance to key data elements regarding databases, online journals, and e-books.
- Reporting. Based on agreed-upon definitions, libraries and other entities (e.g., vendors) are asked to report the data regarding selected data elements in a uniform way through often centralized data reporting systems (discussed above). In general, the collection and reporting of data are executed through a decentralized process left in the hands of participating libraries with the understanding that all will adhere to the definitions as closely as possible. This approach provided various degrees of flexibility for libraries as no two libraries operate in exactly the same manner—particularly when it comes to electronic services.
- Methodological. Most library data collection and reporting efforts rely on accepted research methodologies such as focus groups, interviews, and surveys used with appropriate approaches such as sampling. Libraries are, however, left to create those surveys and/or focus group protocols to best fit the library environment in which the libraries reside—albeit with the accepted definition of elements as described above. The LibQUAL+ effort discussed before, however, requires libraries to use the same survey instrument and methodology across libraries. Thus, libraries that use the LibQUAL+ protocol also engage in methodological compliance.
- Technical. In order for libraries to offer and/or participate in the provision of various services/resources, they need to adopt a variety of technical standards such as the Z39.50 search and retrieval standard. Other standards exist or are under development—particularly in the area of metadata—that libraries will need to monitor so as to enable other services/resource provision based on those standards in the future.

To this multidimensional view of compliance, one now needs to add two more—*data* and *configuration*.

A new compliance effort—Project COUNTER (http://www.projectcounter.org/)—concentrates solely on the issue of vendor/

publisher online data compliance. Through Project COUNTER efforts, vendors and publishers have begun to adhere to a Code of Practice (http://www.projectcounter.org/code_practice.html) that will require participants to provide their usage data to a third party for data normalization efforts. The intent is to allow libraries to receive online resource usage data in a standardized format that allows comparability of data across vendors and publishers.

The COUNTER effort is a significant step forward regarding vendor/publisher online resource usage data. COUNTER largely adheres to the definitions as put forth in the ISO and NISO standards and concentrates its efforts on standardizing vendor/publisher data. The problem with COUNTER, however, is that it is quite conceivable that libraries will only be able to compare usage data *within* the library and not *across* libraries. Why? Just as no two libraries operate in the same way, no two libraries have configured their various systems and applications in the same way. While this permits a valuable degree of customization at the local institutional level that reflects a number of operational issues, it also impacts significantly what the vendors/publishers collect in terms of usage statistics (as discussed in the *Investments in Technology and Content* section of this article below). Thus while libraries may have faith in the quality of the data provided them by COUNTER-compliant vendors/publishers, comparing different library usage data (i.e., benchmarking) will likely remain the equivalent of comparing apples and oranges. Intra-library comparisons should not be a problem. If libraries want to engage in benchmarking and peer comparison activities, they will likely have to consider systems and application *configuration* compliance.

Investments in Technology and Content

The nature of the networked environment is one of rapid technological change that will necessitate *continual* investments in new technologies and upgrades to existing technology infrastructure. One-time capital investments for information technology in libraries are not a viable strategy. Libraries that wish to provide high-quality network-based services and resources to their service communities will need to develop a rational strategy and budget for the purchase, installation, maintenance, and replacement of information technology. Libraries are only beginning to recognize adequately the ongoing nature of information technology costs and to develop funding strategies to support those costs.

Beyond the need to engage in continual and regular technology investments and updates, libraries also need to consider three critical factors regarding technology and network-based services and resources:

1. The types and nature of network-based services and resources desired by libraries may require that various library technologies/systems adhere

to existing and/or emerging technical standards. For example, a library may need to comply with Z39.50 search and retrieval capabilities to provide a cross-resource search and retrieval capability (e.g., OPAC, Web, and vendor databases). This may require upgrading, the purchase of a module, or even the purchase of an entirely new OPAC so that such a system might be used by the library. This is particularly important if such a cross-resource search and retrieval system is to function in a consortia or statewide network.

2. To a large extent, library network-based resources and services are limited by the technology infrastructure of the library. For example, a library Web site requires minimally a Web server, a registered domain name, some content, and an incoming connection. If, however, libraries want to digitize and make available digitized collections via their Web sites, offer interactive services such as a "MyLibrary" feature, or conduct Web-based user surveys, libraries will need a host of additional software and equipment to engage in these activities (or at least contract with external entities for such services). It is imperative that libraries understand the relationship between their technology infrastructure and the service/resource limitations and/or capabilities that such infrastructure imposes upon the library.
3. The technology and networking infrastructures of a library determine what libraries can know about the use and uses of their network-based services and resources (Bertot, McClure, & Ryan, 2000; Shim et al., 2001). The ability of libraries to assess the use of their Web sites, as well as the ability of vendors to report the uses of database (or other) content is entirely dependent upon the library's technology installation and configuration. The use of firewalls, time-out features on workstations, and a number of other locally determined features significantly affect the nature and kinds of usage reports, and the meaning of those data, that libraries can receive and/or generate.

The above indicates the need for libraries to develop an information technology infrastructure that enables the types of network-based services and resources that they wish to provide their customers and maintain and upgrade that infrastructure regularly. Moreover, libraries need to review their technology infrastructure's capabilities continually in light of new service/resource, standards, and other developments over time. The ability for libraries to provide network-based services and resources is neither inexpensive nor a one-time proposition. It is also the case that, as technologies change, this will necessitate a change in assessment techniques that describe the use and uses of technology-based services and resources.

Content Costs and Issues

If ARL libraries are any indicator of what is happening in libraries in terms of electronic materials expenditures, then libraries are in the process

of dramatically altering their collections to the point of redefining collections development and acquisitions processes. It is not unusual for materials expenditures to change over time as new media are introduced. For example, "books/CDs on tape," video cassettes, or DVDs only became expense items for libraries as the technologies developed. The same holds true for online resources such as e-books, e-journals, and databases. Thus, there are at least three key issues regarding licensed network-based resources:

1. Libraries are increasing their licensed resources. This may occur for any number of reasons—space considerations, a way to increase collection size without significant difficulty, and/or a means through which to meet distributed customer content demand through services that are accessible from many locations. Whatever the reason, libraries are increasing the number of electronic resources to which they subscribe—and that is likely coming at the expense of other types of library material.
2. Libraries do not own many of their network-based resources. The traditional model of library collections was one of ownership—libraries bought materials that were housed in their facilities for the purpose of circulation and/or browsing by users. Until collection weeding occurred, these resources were part of a permanent collection that the library maintained. The network-based collection works quite differently, with libraries leasing content in most cases rather than owning material.[4] Thus, the expansion of electronic collections in libraries may come at the expense of collection permanency.
3. Leased collections require ongoing licensing fees. This is not a new economic model for libraries for serial-type publications that are subject to annual renewable fees.[5] However, this differs substantially as an economic model from other types of print materials, such as books, that are subject to one-time purchase fees (perhaps with periodic repurchases as material gets lost or is worn). An interesting research question that requires study is to what extent are library collections becoming leased (not owned)? Moreover, how does that evolve over time? According to the ARL data presented above, nearly 20 percent of library materials budgets is for electronic resources. It is not clear what percentage is for ongoing expenditures or what the trajectory of that expense item is—though the data point to an upward trend.

The above indicate the differing nature of materials costs and the implications for such cost considerations in the networked environment.

Library Professional and User Skills

A key question facing the library profession is "What is a librarian in the networked environment?" This seemingly simple question forces a

complex answer. While librarianship as a profession has never been monolithic in nature, the networked environment creates a situation that expands the functions of a librarian substantially. Take digital reference services as an example. Digital reference adds a series of technological, organizational, management, and knowledge layers to the reference function (Lankes et al, 2002). The library professional in the networked environment, therefore, is one who is a(n):

- *Information expert,* someone who has a fundamental understanding of information retrieval, knowledge management, information organization, information architecture and presentation, and information resource location and retrieval;
- *Communicator,* someone who has the ability to foster and exist within numerous partnerships and collaborative ventures. Librarians will also need to engage in effective communications through a variety of non–face-to-face computer mediated (CMC) forms of communication as projects may span institutions and time zones—e-mail is prevalent, but increasingly project teams use various online white board/meeting programs (e.g., Microsoft's NetMeeting), online chat, and other forms of communications technologies;
- *Instructor,* someone who can instruct users and other library staff through both formal and informal training sessions on a number of network-based services and resources (e.g., computer use, Web searching, online database use), as well as aspects of information literacy;
- *Manager,* someone who can manage varied and numerous projects, envision the possibilities of the networked environment, see the "big picture" of a project, and delegate responsibility to others;
- *Technologist,* someone who is technology savvy, is aware of new and emerging technologies, is aware of the various technology standards in existence or under development, can consider the service potential of emerging technologies, and understands a library's technology infrastructure and its implications for the ability of the library to provide various services and resources and collect use and usage data regarding those services;
- *Negotiator,* someone who is able to engage in informed contract negotiations with a number of content and resource providers such as database vendors/aggregators and systems providers. Particularly key is the ability to negotiate favorable terms for access to content (e.g., simultaneous use licenses, particular databases, desired journals/e-books) and use reporting elements and features (e.g., session counts, items accessed, searches, other);[6]
- *Strategist/Planner,* someone who thinks strategically, strives toward a vision, and can develop and implement strategic planning initiatives.

Librarians also need to engage in strategic planning activities that extend beyond the library to the larger communities that they serve, such as a university, city, county, etc.; and

- *Evaluator,* someone who is willing to benchmark and assess various initiatives—both qualitatively and quantitatively—so as to ensure project objective/goal attainment, anticipated outcomes, and service quality goals. Moreover, as evaluators, librarians will need to know the various assessment techniques available to them (e.g., network statistics/outputs, outcomes assessment, service quality), the ways in which to use these techniques so as to benefit the library's understanding of their services/resources, data analysis of the evaluation project collection activities, the interpretation of the results of such assessment approaches, and ways in which to feed the results of the evaluation projects into the library's provision of services and resources and planning activities.

While some of these qualities have long existed in the library profession, many are new and evolving. The library professional of the future is, increasingly, an information expert with a myriad of technology, management, communications, and assessment capabilities.

More significantly, perhaps, is that the education process for librarians is continual and ongoing—it is not the case that, upon graduation from a degree program, the librarian is complete in his/her education. With technology changes, new assessment tools, and various other issues, libraries need to build a continuing education process for librarians to work effectively in the evolving field of librarianship. A library degree is a necessary, but no longer sufficient, qualification for a library career. Given the skills required as outlined above, it may also be the case that "librarians" in the networked environment are more appropriately trained in disciplines (e.g., instructional design, information systems, business) other than librarianship through M.L.S. degree programs for certain library functions.

Customer Instruction

It is not possible to cover all topics in this article. It is important to mention, however, that library customers also require continual training and education regarding the networked environment in general and library network-based services and resources in particular. Indeed, libraries of all types participate in educational services that fall broadly under the header of "information literacy." Bertot and McClure (2002, p. 13) found that 42 percent of public libraries offer formal Internet/computer training courses on a variety of topics (this does not include the five- or ten-minute point-of-use sessions requested by users seeking help). Academic librarians are generally considered faculty, have teaching requirements, and often offer a wide range of "information literacy" courses that span tech-

nology and information content (Ratteray, 2002; Chiste, Glover, & Westwood, 2000).

Impact on Organizational Structure

New forms of library services require new library organizational structures (Liu, 2001). Libraries may find that function-based hierarchical structures no longer work well for library service in the networked environment. Increasingly, libraries need to consider, and in some cases are moving toward, a variety of work models, such as:

- Team-based/group activities that focus on a particular project (e.g., designing a Web site, digitizing a collection, providing a comprehensive electronic library-based collection);
- Cross-functional approaches to service development and provision that reflect the reach of network-based services. This may mean more and frequent collaboration across libraries and external library partners such as historical societies, academic units, archives, museums, and records management agencies; and
- Fluid, matrix-like structures that can quickly form to work on a project, may include a number of project subteams, and then disband upon project completion.

As such, library organizations need to consider organizational structures and management methods that better reflect their changing operating environment.

Concluding Comments

Libraries have moved beyond the use of the Internet as a novel experiment into the use and provision of network-based resources and services as a substantial—and increasing—aspect of library services. The evolution from dabbling to entrenchment has a number of library institutional, organizational, management, professional, and assessment implications that this article discussed selectively. The real work has begun, and libraries are working diligently to accommodate the new reality in innovative, strategic, and visionary ways.

This article suggests, however, that we have much to learn about library involvement with and use of network-based resources. So, too, do we have much to learn regarding customer perceptions of network-based service quality and outcomes. It is important for librarians and information professionals to focus on the capabilities enabled by the networked environment rather than the complications brought forth by the complexity of network-based information resources and services. The profession's and researcher's understanding of the networked environment will evolve through experimentation and study.

NOTES

1. "Broadband," in the National Center for Education Statistics survey of public schools, includes cable modem service, T1, Fractional T1/T3, and T3/DS3 service.
2. ARL has approximately 120 academic library members. Additional information on ARL is available at http://www.arl.org.
3. This article is not a critique of vendor systems, products, or services. Any mention of specific products/services is illustrative only.
4. Some e-book vendors do allow libraries to purchase the electronic book and add those titles to their permanent collections.
5. Even in the case of serials, however, the library owns the back issues that it purchased.
6. Readers should review the network statistics and their definitions found in the NISO Z39.7 *Library Statistics* standard found at http://www.niso.org/emetrics for additional information regarding the data elements that they may want vendors to report.

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