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Resource Sharing in a Changing Environment

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University of Illinois
Graduate School of Library and Information Science
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"RESOURCE SHARING IN A CHANGING ENVIRONMENT"

EDITED BY CHANDRA PRABHA & GAY N. DANNELLY

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Introduction

CHANDRA PRABHA AND GAY N. DANNELLY

Libraries have shared resources for many decades through both formal and informal agreements. These agreements have usually been predicated on the use of structured interlibrary loan protocols requiring regular and continuing intervention between the library and the library user. With the advent of electronic catalogs, the development of the Internet, and contractual access to resources provided by commercial vendors, the entire nature of library service, resource provision, and the independent library user are changing radically. Ideally this will decrease the intervention previously required. However, during the developmental phase of these new resources, more assistance may be required by users to navigate the technology and to find what they are actually seeking.

The articles in this issue present a number of the concerns facing libraries and users and provide a variety of insights into the challenges of information selection, acquisition, access, and archiving. The use of external services is increasing as libraries downsize and streamline their personnel resources. Issues of corporate takeovers and the growing concentration of information rights and services in fewer companies have vast implications for the long-term availability of information.

The diffuse and diverse nature of the elements of resource availability and the potential for resource sharing in the present environment complicate an already difficult process. However, the activities of the growing number of consortia are providing new models for ways to simplify and enhance such programs. The components of these programs are developing new alliances among libraries, information providers and
vendors, and the many funding mechanisms being used to support such new services.

The traditional role of collection management and the perceived imperative for resource sharing through formal policy agreements among institutions is being changed significantly by the advent of electronic resources and the capabilities for networking among institutions. Edward Shreeves considers the relevance of cooperative collection development in the digital age and questions the relevance of such a model based on the functions and assumptions of the print age. The elements of successful resource sharing presented by Shreeves encompass the effect of technology on the provision of bibliographic access, the establishment of new delivery mechanisms, and the necessity for leadership and vision that are required for such integrated programs. Cooperative collection development has been of marginal importance in cooperative programs of the past rather than a central prerequisite for effective resource sharing. Shreeves concludes that the digital world is fundamentally changing the role and place of the subject specialist in a way that makes the knowledge of the digital literature the most valuable resource rather than the knowledge of the "objects" of the past or the present.

Trisha Davis sets the legal and technical context in which selection of resources takes place at the local institution, thereby establishing the factors that must also be considered in the larger arena of shared resources. The traditional reputational effects of author, publisher, and producers; content; and format continue to be the central issues for selection of electronic materials. However the additional issues of technology (including access methods and archiving) and licensing are primary considerations in the reality of providing resources to users.

John Barnes's article identifies the traditional role of libraries and their need to maintain these functions despite the changes in technology. He postulates that technology does not change the fundamental role of the library in terms of collecting, accessing, and archiving information. Noting that fundamental change requires a critical mass, Barnes defines the primary steps in the evolution of electronic journal publishing as it moves from print formats to primary provision via electronic means.

Barnes considers that none of the recent or current mechanisms for provision of electronic journals effectively answers the needs of libraries over time, particularly the right to own the information permanently, a condition being rapidly removed from smaller libraries who do not have, and are likely never to have, adequate technological support.

William Potter sets the context for cooperation in the current environment by establishing the construct of resource sharing far beyond physical resources—i.e., by sharing virtual resources via technology. The further development of state and regional consortia is involving many
libraries in a variety of memberships. Such relationships establish the need to balance the various commitments in each group in order to enhance the resources available to the library’s users and the exploitation of the specialties within each membership.

Recognizing that such consortia have a variety of elements in common, Potter also notes that the role of “pride of place” is important to the membership as a whole and provides both incentives and recognition within and outside of the membership. He discusses five such consortia and addresses the permutations of the common elements as realized within each one. The elements include the nature of the participating libraries, the primary program of the project, the reasons for formation, funding sources, and the involvement and participation levels of the larger libraries in the group’s activities. Specific shared characteristics of all the consortia presented include central authority, the need for a “level playing field in available resources” for local users, expansion beyond public higher education libraries at an early stage of planning, and the macrovision of the electronic library for a broad base of users.

David Kohl’s “landmarks” of cooperation in this century include joining a consortium; integrating access to resources through both cataloging and circulation; providing for both physical delivery and virtual access; and finally, integrating collection development into the cooperative program. In evaluating the “communal academic library,” he takes OhioLINK as a test of the current realities of resource sharing.

Kohl notes that cooperative collection development is the last step in the formation of a library-shared resources program. His analysis of the realities of trying to establish the “shared collection” in terms of future collection decisions at the local level is a salutary presentation of the “real world” of interinstitutional resource sharing as a planned activity and its integration into collection development.

Resource-sharing programs presume adequate bibliographical apparatus to identify and locate materials which users seek. Clifford Lynch articulates in lucid style the strengths and weaknesses of union catalogs and distributed search, both of which make resource sharing possible. He observes that union catalogs will continue to play a prominent role because centralized implementations make consistent searching/indexing, consolidation of records and performance management possible. In the distributed search model using Z39.50, in the absence of standards for implementation, the differences in the indexing among constituent systems make searching uniformly across systems problematic; consolidation of records is another problem. Linking A&I databases to “content” in electronic format and serial holdings presents additional challenges. Lynch’s article serves as a reality check of what is possible technologically in the near future.
Jennifer Younger considers the role of cataloging in the electronic document/object era. She describes the current climate in which the cataloging of electronic resources is in flux as the MARC record format is reconsidered in light of the needs of multidimensional objects. Younger describes the consortia of library and information professionals that are considering the long-term requirements for adequate resource description and identification operating within the context of the traditional library catalog, while recognizing the changing nature of the resources identified. The lack of agreed-upon international standards in the cataloging of traditional materials is exacerbated by the complexities of electronic formats and access mechanisms. Younger’s discussion of the specific projects addressing the various aspects of “cataloging” of digital entities provides a needed context for the identification and access of digital materials, whether provided via international, local, or consortial means.

Tona Henderson and Bonnie MacEwan review the Pennsylvania State University experience with integration of electronic resources into the teaching process and the faculty acceptance of the change in delivery format. Noting the need for a “commonality of access” for students and faculty, they consider the relevance of the relationship between library collections and faculty needs for teaching and research. Describing the impact of the electronic format on the process of information presentation in the classroom, they consider copyright and variable ability of faculty in terms of computer literacy and electronic information processing.

Czeslaw Jan Grycz examines issues of resource sharing in the broader context of scholarly communication. His survey of emerging attitudes among authors, publishers, and librarians as each group responds to problems arising from shifting from paper to electronic media in an austere economic climate illustrates how what appears as solutions to a particular group may actually be counterproductive. The ability of the Internet to provide access to information about resources and to the actual resources themselves is changing the nature of scholarly communication. The ease of e-mail has fostered a closer bond among members of a discipline while eroding their identity with their parent institutions of employment. Issues of copyright, fair use, and piracy remain to be addressed; a viable business model for electronic publishing must be worked out. As we struggle with these issues, Grycz reminds us that, as a nation, we should be cognizant of the information needs of emerging free markets.

Bruce Kingma presents an analysis of document delivery versus resource sharing in the SUNY system and considers the potential versus real savings from shared access, as well as the delivery of scholarly articles and joint collection development. The SUNY experience demonstrates that document delivery is cost effective, while shared collection development yields small savings.
As inadequate funding for current journal costs forces libraries to cut subscriptions, library consortia are considered by many to be cost-saving mechanisms. Kingma notes that the economic situation again brings the basic decision of access versus ownership into the mainstream of library approaches to the provision of information.

Kingma provides an economic model of the fixed and marginal costs of subscriptions and interlibrary lending, developing a break-even cost of ownership versus access. While delivery of titles can be provided at a lower cost within a consortium, in cases of minimal consortial use, document delivery is more immediately cost effective.

Randall Marcinko, an early developer of document delivery services for libraries and individuals, provides an analysis of the document delivery process and the services that must be provided for an effective and economically viable undertaking. Marcinko touches on the important issues of intellectual property rights and corporate takeovers resulting in further concentration of document delivery rights. The detailed description of the elements of the document delivery process provide an important context for libraries as they determine the feasibility of relying on such services for the bulk of their ILL needs. The implementation of electronic document delivery changes the nature of the process in terms of the need for library intervention and again provides a new model of library service.

Marcinko's analysis of the reality in which document delivery, a strategic element of information services, operates in the current technological, economic, and copyright environments provides an unusual opportunity for the reader to consider the process itself. In addition, the implications for library collections over a long period of time and the nature of reliance on external commercial services needs to be considered in relation to the nature of archiving of information.

Furthering the discussion of commercial document suppliers, Chandra Prabha and Elizabeth Marsh present an analysis of current interlibrary requests via OCLC for a twelve-month period and evaluate the potential for the supplying of materials through document delivery. The data confirm that the majority of requests for periodical articles relates to articles which have been published in the last five years with 95 percent of the requests from the last twenty-five years.

Prabha and Marsh also report that nearly 50 percent of articles requested were from periodicals that began publication in the last twenty years. Can it be that this reflects the very tight library acquisition budgets of the last two decades when libraries were able to maintain long-held subscriptions only by declining to add new titles and by decreasing monograph expenditures? This article also raises interesting questions about the function of libraries in conjunction with the current role of document
suppliers, particularly in light of their ability to provide 92 percent of the articles requested.

Perhaps the most interesting issue raised in this article, however, is the reliance of document suppliers on the existence of research libraries’ collections. This article and that of Marcinko both make clear the explicit relationship between the suppliers and the traditional research library. The potential for increasing interdependence will be directly influenced by the development of electronic journals and the evolution of both the services and the nature of the collections which will have a considerable impact on the information industry.

Together these articles present strategic aspects of the current environment in resource sharing, with increasing interdependence between libraries and, perhaps more uneasily, dependence on external commercial resources for the provision of information. The legal issues of intellectual property rights and contract negotiations and their attendant limitations increasingly restrict the rights of those seeking information.

While the immediacy of information provision has certainly improved, the long-term health of the library and of the cultural record is being challenged as information rights concentrate in the hands of fewer producers, and access to information is ceded to commercial organizations. This is of critical importance since the economic viability of any commercial organization has to be the primary concern of that business. As libraries, and the academic community in particular, become ever more dependent on this process, the archiving of information becomes an even greater strategic issue that must be addressed by the academic community.

The increased availability of resources via the World Wide Web is fascinating, but the authority provided via the publishing process is becoming less prevalent. The need to educate users to the nature of the information they are using is becoming more and more important. This is an exciting time for libraries and their constituents, and it is also a time for the library community to concentrate its efforts not only on the short-term response to immediate needs but also on archival electronic information for long-term societal needs.
Is There a Future for Cooperative Collection Development in the Digital Age?

EDWARD SHREEVES

ABSTRACT

OF THE THREE MAJOR COMPONENTS of resource sharing, cooperative collection development, in contrast to bibliographic access and interlibrary lending, has thus far experienced less extensive transformation as a result of new technologies. There is widespread agreement about the factors that should lead to success in cooperative collection building projects, but there is also a general sense that such projects have not lived up to their promise. The changes being experienced during the present transition to a largely digital environment offer new opportunities for cooperative collection development efforts but also call into question the value of investing in models based on a predominantly print environment. Collection development librarians may find that, in the future, their expertise may be the most important resource they have to share rather than the collections they are building.

The phrase "access over ownership" and its variants had achieved, by the early 1990s, an almost mantra-like status among librarians from all types of libraries. Its widespread currency, however, reflects more than just the rhetorical effectiveness of an oversimplified concept. Increasing pressures on the budgets of all libraries, especially research libraries, together with improved means of communication and delivery, have forced librarians to make a virtue of necessity and pay increasing attention to resource sharing as an important element in the package of services offered to users.
Most would define the "resources" of resource sharing to be the information resources typically collected by libraries and made available under certain conditions to users not traditionally a part of the owning library’s clientele. Later discussion will suggest that the concept of the resources to be shared in the new electronic environment needs to be broadened to include human and computing resources, among others. In traditional terms, however, resource sharing focused largely on three functions or tasks: (1) bibliographic access—that is, knowledge of what is available for sharing from other sites through such means as union catalogs or bibliographic utilities; (2) a system for making requests and providing delivery of information, chiefly through the interlibrary loan (ILL) process, often bolstered by agreements among members of a consortium to provide expedited service to members; and (3) cooperative collection development, which sought to ensure that libraries built complementary collections of resources on which to draw. The only essential component of resource sharing is the second, a protocol for making requests and acceptable methods of delivery. Convenience and political considerations have caused most resource sharing to occur within the confines of a consortium or federation of libraries, though a consortial relationship is not absolutely necessary to cooperation at its most basic level.

Developments over the past twenty years have revolutionized libraries’ ability to provide bibliographic access, even if these developments did not arise primarily to serve the needs of resource sharing. Innovations introduced over the past five or ten years are fundamentally altering the nature of interlibrary loan operations. Only in the third area, cooperative building of collections, has major change been slow to come. Yet, as many have pointed out, offering access as a stand-in for ownership works only when another library has chosen ownership over access and is willing to share the wealth (Branin, 1991, p. 82). The following paragraphs will touch briefly on some of the familiar changes in the ways bibliographic access is provided along with the changes being experienced on the delivery side of resource sharing. However, for its primary focus, this discussion will be about cooperation in the realm of collection management and development and the role of cooperative action in bringing about change in the processes of scholarly communication.

A number of significant advances based on machine-readable cataloging produced the incidental effect of dramatically improving access to bibliographic information for resource sharing. The rise in the 1970s of bibliographic utilities like OCLC and RLIN and their universal use by larger libraries provided de facto union catalogs for purposes of identifying, at the title level, materials held elsewhere. In the 1980s, many libraries began to implement integrated library systems locally, including online public access catalogs (OPACs) and acquisitions and serials subsystems.
In some ways, this development represented a step backward for resource sharing, since the OPAC allowed libraries to make records for certain materials available to local users without requiring them to be made available to other libraries through national utilities. The explosion in the use of computer networks in the mid- to late-1980s compensated somewhat for this regression by enabling the persistent to search the catalogs of other libraries. The steady progress of retrospective conversion in the 1980s and 1990s also enhanced resource sharing efforts as more and more locations for older materials became findable by online searching. Finally, the increased acceptance and implementation of standards such as Z39.50 began to make it easier to search the catalogs of other libraries for all kinds of records.

Technology has also had its effect on the provision of documents via interlibrary loan. Taking advantage of every advance from the photocopier machine to the latest scanning devices, interlibrary loan departments have tried to keep up with sharply increasing demands. The 1993/94 ARL Statistics (Association of Research Libraries, 1995, pp. 8-9) shows an increase in borrowing by ARL libraries of 99 percent and an increase in lending of 50 percent in the years between 1986 and 1994. Most of those writing about resource sharing and cooperative collection development have recognized the absolute centrality of effective delivery to the success of cooperative efforts (Mosher & Pankake, 1983, p. 426; Branin, 1991, pp. 90-91). For remote access to substitute for local ownership, a library must minimize the time between identification of a needed resource and its provision. While few expect the time lag for remote resources to approach that offered by locally held materials (when those materials are on the shelf), there is general agreement that the average time of delivery must be reduced from its current average. Projects such as the North American Interlibrary Loan and Document Delivery Project, sponsored by the Association of Research Libraries, are seeking ways to streamline and improve the quality and speed of interlibrary lending (http://ARL.CNI.ORG/ACCESS/NAILDD/status.html). Recent studies have also highlighted the real costs of interlibrary loan transactions and led to renewed efforts to improve efficiency and effectiveness (Roche, 1993). Wider use of faster methods of delivery have cut the time spent by "returnables" in transit, while such systems as ARIEL have helped improve the quality of transmitted images as well as allowing for delivery of scanned images to the user's desktop. All of these steps, both actual and prospective, have led to incremental improvement in the delivery component of resource sharing, but it is fair to say these improvements have not yet convinced most users that access to remote information sources is the near-equivalent to local resources. The growing utilization of commercial document suppliers has also enlarged the range of delivery options available. At the same time, they have heightened awareness of the value
which users attach to rapid delivery and put added pressure on ILL units to match their speed.

One of the most interesting new directions is the move to allow patrons to initiate direct and unmediated requests for materials from other libraries. Enabled by the technologies of the Internet, by standards like Z39.50 and Z39.63, and by more and more user-friendly interfaces, patron-initiated ILL could potentially increase the usage of distant resources substantially. It also raises a host of policy issues for libraries and consortia hoping to implement this service. For example, should all classes of users be allowed access to direct borrowing? Should a loan in this environment be governed by circulation policies or by interlibrary loan protocols? If governed by circulation policies, whose, the borrowing or lending library's? Should borrowing of locally held material be allowed? Should there be limits on borrowing by individual patrons to discourage abuse? Is the loan made to the borrowing library, as in the ILL model, or to the patron, as in a local circulation transaction? If to the patron, who assumes responsibility for ensuring return? Patron-initiated ILL promises to put pressure on consortial commitments to view members' resources as a seamless whole, the consortium as "one library." The ultimate vision of resource sharing posits a completely digital environment in which the user identifies the electronic resource he or she wants through a comprehensive system of metadata and then simply connects to it without knowing or caring where it resides.

Resource sharing among research libraries, and between research libraries and libraries with less extensive collections, has long occurred—and will continue to occur—no matter what takes place in the realm of cooperative collection development. There is little evidence to date that cooperative efforts aimed at acquisitions have had more than a modest effect on other aspects of resource sharing. There is, however, widespread belief that cooperation in building collections can significantly improve the quality of library service by broadening and deepening the range of materials collectively available. Libraries—so the argument goes—can increase that portion of the information universe maintained within the national (or state or regional) collection through a planned and conscious division of labor in building collections. Thereby, users will have access to a collectively richer whole than if that collection had been developed purely in response to local imperatives. In the paragraphs that follow, some of the fundamental assumptions related to cooperative collection development and resource sharing will be examined, and suggestions will be offered about the future directions that cooperation relating to information resources might take. Uncertainty about the characteristics of the scholarly information universe makes such speculation more than a little risky. Nevertheless some vaguely outlined shapes seem to be emerging from the mist. The stakes for the constituencies that research
libraries serve (and therefore for libraries themselves) are high enough that librarians and scholars must examine the implications of future scenarios carefully and marshall their efforts to meet the most important and realistic goals.

The purpose of cooperation among libraries has been summarized as providing "better, faster, easier access to more" (Allen, 1994, p. 9). Cooperative collection development has to do almost entirely with the "more" of this definition. The improvements sketched above relating to bibliographic access and delivery are chiefly concerned with "better, faster, easier." A fairly standard model for cooperative collection development in the print environment divides the information universe into "core" and "peripheral" materials. A research library has a responsibility to maintain on-site a "core" collection that serves immediate needs, especially those of its undergraduates. At the same time it will develop collections of "peripheral" material in selected areas that respond to local priorities but also serve consortial needs. This collection, in turn, is backed up by the collections of consortial partners built through distributed responsibility for peripheral materials in complementary fields. Defining what "core" and "peripheral" really mean has always been one of the stumbling blocks to successful cooperative projects. In general, materials on the periphery were considered to be research materials (of the sort that might form the bulk of an RLG level 4—or perhaps level 3—collection) unlikely to be in heavy demand by any member of the consortium. Described from another perspective, the body of material to be shared would come from that 80 percent of a research collection which received 20 percent of the use (Branin, 1991, pp. 85-86).

Cooperative collection development has so far been a marginally important component of resource sharing, not a mandatory prerequisite. In the 1960s and 1970s, collection budgets at many research libraries were strong enough to build deep collections in many subject areas. While no one could supply locally everything called for by those conducting research on campus, the different emphases in universities around the country, supported by relatively generous resources, resulted in naturally diverse collections. Overlap was considerable, to be sure, but many libraries were able to acquire substantial amounts of unique or rarely held material as well. This situation corresponded roughly to the model described by Mosher and Pankake (1983) as the status quo approach to cooperative collection development: "This approach presumes that the total collecting activity of ARL and other major research libraries achieves, on a national scale, reasonable depth in every area of interest to research in the United States, both in the present and in the future. It is the total of the collections of research libraries which approaches comprehensiveness" (p. 424). The means for discovering what was held elsewhere were primitive by present standards, but, through the happenstance of differ-
ing programmatic focus and selectors with deep pockets, the range of resources acquired and held was collectively broad. Today, there is growing evidence that the range of resources is becoming narrower, and collections are becoming more homogeneous. The indications for this are most clear-cut in the journal literature of the sciences, medicine, and technology, and in material published outside the United States in the humanities and social sciences (Chrzastowski & Schmidt, 1993, 1996; Perrault, 1994; Reed-Scott, 1996).

Yet, despite growing evidence that the national collection being amassed today is weaker than it was, and despite advances in many aspects of resource sharing, cooperative efforts in building collections have still been limited in their impact. Why is this the case? Have cooperative collection development efforts failed to achieve more because they have so far commanded only a limited amount of time and energy? Or have they been constrained by the competitive culture of the academic world, by the still unacceptable slowness of delivery, or by copyright restrictions? It could be argued that, whatever the cause, this is an endurable state of affairs, not because the rich tapestry of strong collections renders the attempt unnecessary, but because the time and energy such efforts require of collection development and other library staff are more urgently needed elsewhere, in particular, to invent and build the national digital library. This question will be discussed later, but first it may be useful to review some of the standard beliefs about cooperative collection development.

In a review of the literature related to cooperative collection development, two noteworthy themes emerge. First, there is remarkably widespread agreement about many of the factors which should lead to success. Second, there is a grudging admission that "only modest successes can be identified" (Branin, 1991, p. 87) among the many cooperative collection development efforts that have been underway over the past half century. These somewhat contradictory ideas raise some questions. How reliable are the success factors identified, if successes to date have been only modest? Are they so rarely found together in sufficient strength and quantity that most efforts are doomed to failure? Or is there a missing critical factor—yet to be clearly identified—which would serve as a catalyst to enable the rest to result in substantive achievement? Perhaps verdicts of limited success underestimate the long-range effects of cooperative collection development work in the late twentieth century. Would the research collections which now serve the nation collectively have been much less diverse than they actually are had it not been for the dozens of "modestly successful" efforts around the country? Finally, how will librarians and scholars know if they achieve success? How is success in cooperative building of collections to be measured?
Many authors have described the factors which influence the success of cooperative collection development undertakings, and there is no reason to discuss them at length here. It will be useful, however, to review some of them briefly. Some of the more frequently mentioned success factors include common goals among members of the cooperative group, recognition of local priorities, leadership, physical and bibliographic access, effective delivery, and effective communication among participants.

Clearly partners in a cooperative collection development enterprise must feel a shared sense that cooperation will provide benefits to each of them, and that there is a compelling reason to put resources into such an effort. The most compelling motive is financial. In a world with enough money to buy materials, enough catalogers to describe and classify what was bought, and enough shelves to house what was cataloged, local ownership would still provide the best access, at least when print on paper is the medium at issue. Fiscal realities have never allowed many libraries to operate in anything approaching this setting, and the recent well-documented pressures on library budgets have made such a model almost unimaginable. The fiscal imperative for cooperation leads immediately toward one of the fundamental conflicts that cooperation entails. Campus and sometimes library administrators in research universities expect that coordinated acquisitions and resource sharing can magically do away with the need to find hundreds of thousands of new dollars every year to feed the inflationary appetites of the materials budget. On the other hand, collection officers and bibliographers are convinced that no less money is needed but claim that it can be spent differently to create more diverse collections and thereby better meet the needs of researchers. This argument can lead to the cynical view that collection administrators and bibliographers are seeking to maintain the information resources budget at all costs because it remains the primary source of whatever power they possess.

Resource sharing arrangements in general, and cooperative collection development activities in particular, cannot succeed unless they recognize the overriding importance of local needs. "Programs must be responsive and minimally threatening to local priorities and programs" (Mosher & Pankake, 1983, p. 425). Commitments which call for putting consortial demands above local priorities are unlikely to remain viable for long. Some models for cooperation have sought to make a virtue of this strong bias for local needs by attempting to base cooperative programs on local strengths (Branin, 1991, pp. 98-101). With this approach, an institution accepts responsibility to collect for the consortium in areas which also meet local needs and reflect local strengths. At the same time, a commitment by one library to a particular area does not obligate consortial partners to give up supporting that area itself. As stated by Mosher and Pankake (1983): "No institution should be obliged to give
up anything it wants to keep” (p. 425). Recognition of the importance of the local imperative, then, is a key element of any successful cooperative program. If this recognition of the primacy of local needs is taken to its logical conclusion, the question must be asked whether cooperative programs that rely on an institution meeting local needs in order to meet consortial goals really make a significant difference to what it collects? Or will such an institution acquire more or less the same titles it would have acquired anyway?

Another factor often cited as a key to successful cooperation is leadership and vision on the part of both campus and library leadership and among faculty and librarians at the operational level. The leadership for many cooperative initiatives has come from above—from collection development officers, from library directors, from provosts or other campus leaders, even from legislators. While vision and leadership are vital, the top-down approach can lead to difficulties, because the change in behavior that successful cooperation demands must take place at the level of the librarian making title-by-title decisions. If the selector has no belief in the value of cooperation and sees no payoff for that change in behavior—or perhaps sees risk (e.g., a reduced budget)—his or her enthusiasm for cooperation is not likely to be high. The involvement of bibliographers and selectors, not simply in implementing decisions made by others, but in planning and defining the contours of cooperative projects, is therefore seen by several observers as critical (Mosher & Pankake, 1983, p. 426; Dominguez & Swindler, 1993, p. 488). An often overlooked function of leadership here is the role of university and library leaders in selling the concept of resource sharing and shared collection building on campus, especially to faculty and other researchers. To accept reliance on other libraries’ resources demands cultural changes among faculty, who must give up cherished notions about the self-sufficient collection, browsing, and immediate access. Leadership is required not only to persuade library staff of the merits, or necessity, of cooperation, but also to ensure that the message is delivered to the rest of the academic audience.

As discussed earlier, bibliographic and physical access to collections is one of the most obviously important aspects of successful resource sharing and cooperative collection development. If users cannot discover what consortial partners own, and cannot get it into their hands within an acceptable amount of time, divisions of labor in collection building are self-defeating. Although physical proximity has receded as a pivotal factor in resource sharing arrangements, it can still influence the degree of success experienced. A significant part of interlibrary lending traffic still consists of “returnables,” which are more quickly transported by courier among libraries within reasonable geographic proximity. Proximity also allows for easier movement of people to collections, often a more
convenient way to share resources. Nevertheless, technology has brought about a measurable reduction in the importance of distance as part of the equation for successful cooperation. The advent and widespread use of computer networks has also reduced, though not eliminated, the importance of another major barrier to cooperation in the past—the difficulty of communication among selectors and collection officers in different institutions, and the labor-intensive maintenance of the tools of cooperation. Electronic mail, standards for linking library catalogs and databases, and other elements of the digital revolution have radically improved the ability of selectors to communicate and inform their decision-making with knowledge of the decisions made by counterparts elsewhere. Yet the electronic community, enabled by e-mail and the Internet, does not replace the human-scale community permitted by face-to-face communication. Particularly when a group of selectors does not know one another from work in national, regional, or state settings, such face-to-face meetings offer the best chance of leading to productive working relationships.

Besides access to electronic mail and support for software that makes group communication by e-mail easier, cooperative collection development efforts can benefit from a number of additional tools and support mechanisms which can improve their chances of success. Many of these tools are emerging from the growing maturity of library automation and widespread access to networks. Certainly, ready access to the catalogs of consortial partners—especially when those catalogs include acquisitions as well as fully cataloged records—supplies one of the missing ingredients in older cooperative activities: information about partners' decisions at the title level. Even so, the infrastructure to support cooperation among selectors still has gaps. For example, it remains difficult to identify quickly and conveniently the serial commitments of consortial partners. With serial commitments demanding such a significant portion of the budget, the relative difficulty of obtaining such information can present serious obstacles to cooperation, especially in heavily serial-dependent fields. Though the effect on collaborative decision-making for future acquisitions is limited, the unevenness of retrospective conversion efforts, and the absence from many catalogs of certain categories of materials (government publications, maps, etc.), can also limit the effectiveness of cooperation.

It may be useful to examine some of the reasons offered for the limited success of cooperative collection development efforts to date. Branin (1991, p. 89) suggests that the priority given to local collections has pushed consortial efforts into second place. He also mentions the unwillingness of libraries to give up autonomy, the difficulty of administering consortial programs outside of a relatively limited geographical range, and the lack of sufficient authority in many regional and national programs
Atkinson (1996), besides citing the local imperative, also mentions "the failure to factor into cooperative collection planning such post-acquisitions functions as processing and storage" (p. 29). He further notes that libraries have not taken into account the fact that most of the information they wish to share is owned by others who do not want to see it shared in ways that reduce their potential revenues.

It has even been suggested that success in cooperative collection development is not really the objective, and that there is a degree of hypocrisy in the nominal support it receives (Atkinson, 1996, p. 30). Everyone, from the president or provost of the university to the individual bibliographer, pays lip service to its importance and value, but no one expects or wants cooperative activity to have much more than a minimal effect. What is important is the appearance of effort. Atkinson (1993) cites this argument as "cynical and mostly wrong" but containing "some elements of truth" (p. 29). As he summarizes the argument, it suggests that librarians do not want cooperation to succeed because it would result in loss of budget. The faculty do not want such efforts to succeed because the current system creates artificial markets for specialized publications in which they can publish and build their reputations. The university, dependent on the faculty for its own competitive reputation, connives in the charade.

One possible way to test the truth of this assertion would be to examine the extent to which rewards for selectors, collection administrators, and university librarians are based on their contributions to cooperative efforts. Of course, measuring the performance of collection management librarians is difficult in the purely local environment and even more challenging in a consortial setting. If libraries are serious about the importance of successful cooperation, however, it is essential that library administrators find ways to measure success in this arena and make sure that valuable contributions really count when awarding salary increases and promotions.

Many of those writing about cooperative collection development have focused on the need for consortial commitments to match local priorities. Relatively little has been said, however, about the importance of coordinating consortial commitments to purchase with commitments to provide acquisitions, cataloging, preservation, and reference services. There is an unspoken assumption, perhaps, that if commitments result from local priorities, the effects on these related services will be minimal. But there is little evidence that acquisitions, cataloging, and reference staff have been integrally involved in the development of cooperative collection building projects, especially at the planning stages.

While it is commonplace to assert that cooperative efforts have failed to live up to their promise, there is little or no data to support this assertion and no widespread agreement about the right measures for success.
and failure. This lack of objective measurement reflects the larger difficulties that collection development has measuring its effectiveness in either quantitative or qualitative terms. The campus administrator interested in slowing the inexorable growth of the acquisitions budget might wish to apply a rather crude measure—reduction in expenditures—to measure success. By that token, of course, cooperative collection building projects have failed completely. Librarians may counter that the growth rate of expenditures has slowed because of cooperative efforts, an assertion difficult to prove at best. For the bibliographer or collection development officer whose announced goal is to use the same amount of money differently, to broaden the consortial collection, measures of overlap and uniqueness need to be used more systematically to measure success. Dominguez and Swindler (1993, p. 470) apply this measure to the long-standing cooperative arrangement among the Research Triangle University Libraries. They report that 76 percent of the titles in their shared online catalog were found on only one campus. In this instance, it seems intuitively probable that the cooperative programs among these universities—often cited as one of the most effective in the country—have increased this percentage. Even so, it is impossible to know what the percentage of overlap might have been without such programs. Because of its inherent difficulty, there has understandably been little effort to measure the extent of changed behavior caused by cooperative arrangements—particularly the cumulative results of decisions not to buy certain materials.

The future of cooperative collection development is inextricably linked to the future of collection development itself. Cooperative collection development exists solely to further the library's goal of meeting local information needs—the classic and traditional function of collection development. Until recently, the entire edifice of resource sharing and cooperative collection development has been based on the assumption that information is contained in physical objects which are relatively difficult to move through space and time. Even electronic technologies which make this process more efficient—fax and digital transmission of images—are slowed by the need to fetch and handle these physical objects. The innate grounding of collection development in the physical object, its focus on the distinction between what Atkinson (1993) called the collection and the anti-collection, renders its function in the coming digital world questionable at best. Should the research libraries of the United States put substantial human resources into adapting and emulating the model provided by the Triangle Universities in order to address collaboratively the problems of collecting mostly print resources in the late twentieth and early twenty-first century? The answer to this question depends on what librarians collectively believe about the pace of the transition from print to electronic and on the probable shape of that digital world.
Many have noted that we are in the midst of a transition from a world of scholarly communication dominated by print—the journal and the monograph—to one in which digital networked information packages will be the primary vehicle for communication among researchers. A fundamental question facing those who have done traditional collection development is where to put their limited, much fragmented, energies and resources over the course of this transition. Recently, Dan Hazen (1995) called into question the value of the traditional collection development policy in the electronic information age. The same skepticism should perhaps be applied to the widely assumed value of cooperative collection development. If librarians were facing the same fiscal pressures now commanding their attention, watching as collections became more and more homogenous, but in an unnetworked, nondigital environment (a scenario difficult to imagine, at best), it would clearly be worth the effort to find ways to overcome the obstacles in the way of successful cooperative collection development. The massive challenges now facing the academic world in the face of the digital revolution demand that the utmost attention goes to ensure that the development of the new environment favors the advancement of research, teaching, and learning. If this effort succeeds, it is likely that the goals of cooperative collection development will be achieved almost as an unintended byproduct. If librarians and scholars fail in this endeavor, then success in cooperative collection building may be largely irrelevant.

The electronic future may take any of several forms. It is possible to make intelligent guesses about potential scenarios for such a future, but assurance is inherently out of reach. In what is likely the rosiest scenario for the academic community, scholars, scholarly societies, and institutions would assert responsibility for "publishing," organizing, managing, preserving, and disseminating the research reports and related information which they, and other researchers with similar aims and values, produce. Such a scenario could be characterized by practices regarding intellectual property which allow great latitude in the use of information. A less attractive alternative scenario would see major academic publishers maintaining control of the distribution of scholarly information and restricting its flow through licenses that are designed to ensure a revenue stream—whether to make a profit or to subsidize the economic vitality of a scholarly society. In this scenario, the publisher would maintain strict control of intellectual property and would further control the use of information through licensing with rights more restrictive than those permitted through copyright. At the same time, copyright law in the electronic environment might change in ways that degrade the group of rights known as "fair use." Obviously variations and combinations of these two scenarios are both possible and likely, and other quite different futures are possible.
Even in the current transitional and hybrid system, the changes already underway are transforming cooperation among collection development librarians. Most electronic information available commercially in the present environment relies on licensing for use by libraries. The emergence of consortial approaches to licensing such information has led to some of the most dramatic financial successes of resource sharing. Unlike traditional cooperative collection development, which seeks to rationalize and distribute responsibility for acquiring little-used marginal publications, shared approaches to licensing tend to focus on high-use high-demand databases which all or most members of a consortium wish to make available. Even when this is research-intensive information, the ability to provide immediate access from anywhere makes it far more shareable than the peripheral material that was the traditional object of cooperative collection development.

While the details of individual licenses are often privileged, the experience of consortia, such as the Committee on Institutional Cooperation (CIC—the academic consortium of the "Big Ten" institutions and the University of Chicago and University of Illinois-Chicago) and the University of California system, show that considerable savings can result when libraries form partnerships to negotiate access to expensive electronic products. Besides the savings in data costs, such joint licensing will usually save money in terms of staff support for managing the information and computer resources required to store the data and run search software. The experience of negotiating licenses within a consortial setting also raises awareness among librarians of the importance of paying careful attention to the terms and conditions of licenses. The combined buying power of the consortium has a better chance than do individual libraries of persuading data providers to alter unacceptable terms in addition to lowering their prices. Besides sharing the cost of access to mostly bibliographic databases, there is also potential for distributing labor and sharing expertise in the management of full-text electronic resources, as is currently being attempted within the CIC with electronic journals and electronic texts in the humanities. Here, it is not primarily the cost of the resource itself that is motivating cooperation but the reduced overhead of managing them collectively. Experiences within the CIC also point to the absolute necessity of taking into account "post-processing" activities in making decisions about such resources. In a sense, the decision to acquire or not to acquire (or, to license or not to license) is the most straightforward of all. The more difficult issues relate to providing an acceptable interface to the resource, ensuring that it is kept up to date (traditionally, the task of serials acquisitions), and preserving it. Resolving these issues mandates the involvement of staff from many functional areas of the library system.
There are unmistakable signs that the changes now occurring and those yet to come will continue to transform the basic terms of reference of cooperative collection development. The classical model was based in part on the understanding that a large segment of any research collection was seldom used, and that a limited number of copies of this lesser-used material would suffice for a region or the nation. Collection development librarians were the ones best positioned to identify and select appropriate titles to stock this shared collection of lesser-used research materials. Their qualifications were based on subject knowledge, understanding of the publishing world in that subject, knowledge of academic programs both generally and locally, and familiarity with ways of acquiring sometimes obscure and difficult-to-get material. Selection for some kind of local ownership will probably continue to play a role in the provision of electronic resources for some time to come. Gradually, however, the function of selection will likely pass more and more into the hands of users, who will exploit the tools provided by libraries and others to identify and retrieve material through the network. Collection management administrators will likely become managers of electronic rights, ensuring that the avenues are open for the users of his or her institution to get to the information they need. One feature of the new environment which has a basic effect on cooperation is the lessened, if not eliminated, importance of the concepts of location and copy. If access is permitted to an electronic product (by licensing, adequate bandwidth, good interfaces), it does not matter whether the user is on the same campus or half a continent away, nor does it necessarily matter if there is one copy or hundreds. The notion that fewer—or single—copies of lesser used material are enough for a consortium, while multiple copies are needed for materials in local demand—a fundamental distinction in cooperative collection development—is irrelevant.

How fast the changes in scholarly communication will take place is one of the unknowns. At present, most research libraries still spend approximately 90 percent or more of their acquisitions budgets on print, microform, and similar formats. Despite being the center of attention, and despite their high unit cost, electronic resources have not begun to consume even a quarter of the information resources budget of a typical research library. The production of scholarly information in print form does not seem to have diminished. Predictions have differed about how quickly the shift to a predominantly digital environment will occur—some believing it will be gradual and prolonged, others that it will be abrupt and is imminent (Odlyzko, 1995; *The TULIP Final Report*, 1996). It seems likely that the shift will occur at different rates in different fields. What, if anything, does this mean for cooperative collection development? It is at least partly a matter of resources and priorities. If the transition to a digital system of scholarly communication is near, the most urgent task
for librarians—especially collection management librarians—is to ensure that the system-to-be meets the needs of the academy. One of the truisms of cooperative collection development is that it is difficult and time consuming. So far, it has at best fallen short of its promise. Are the energies and efforts now being put into cooperative collection development projects better spent shaping the electronic future in ways that serve the goals of research, scholarship, and teaching? Or will the pressures on print research collections continue to be so severe that librarians must pay continuing or increased attention to collaborative collection building over the course of the transition? Note that this rhetorical question does not imply that other aspects of libraries' resource sharing efforts focused on print—particularly improvements in delivery and bibliographic access—should be slowed. The payoff for making interlibrary lending and borrowing work better will be immediate and can take advantage of the existing shared collection. The benefits of cooperative collection development may take years to be felt, if they achieve meaningful results at all (Mosher & Pankake, 1983, p. 425).

The suggestion that cooperative collection development projects may not be worth doing because the print environment will not survive long enough for the labor to make a difference certainly rests on assumptions that ought to be questioned. It is reminiscent of the claim sometimes made by campus planners that new library buildings will never again be necessary because of the shift to digital resources. Nevertheless, there is enough potential validity in this argument that it should command the attention of those deciding priorities for librarians' attention over the next decade. If it does not categorically demand reducing the level of priority for cooperative collection development as it is traditionally understood, it does suggest that librarians should give careful attention to the focus of cooperative efforts. Those fields in which the transition to digital formats is likely to take longer, or in which print is expected to retain its hold indefinitely, may well be the best candidates for cooperative activities based on traditional models. It may also be time once again to look more closely at more radical and sweeping approaches to cooperation. The time for handcrafted approaches like those based on the RLG Conspectus may be over.

The object of attention of cooperative collection development in the past has chiefly been the information unit—or the subset of information units that comprised a narrowly defined field. Selector involvement was important, because a selector who knew the field that was the object of cooperation was now expected to select for a broader audience—the consortium or even the nation. The availability of subject expertise was assumed to be an indispensable prerequisite of most traditional projects. In the emerging digital world, selection for local ownership is likely to recede in importance as the central work of collection development
librarians, who by and large comprise the largest group of subject experts in research libraries. What may in part replace selection as their core activity are various kinds of mediation demanding the same kinds of subject knowledge, along with knowledge of the emerging electronic universe. Subject specialists who once functioned primarily as selectors are in a good position both to guide users through the chaotic world of electronic information that is likely to persist for some time, and to play a role in organizing that world and helping to provide markers of quality and appropriateness. Several authors have recently discussed librarians' potential roles in this arena (Hazen, 1995, pp. 30-31; Atkinson, 1993, pp. 103-05). If it seems self-evident that the subject specialist/selector can make a significant contribution to this effort, it seems equally self-evident that this is a task in which cooperation is essential, particularly among the research libraries which employ a significant percentage of the subject experts working in American libraries.

If making sense of the emerging digital information environment is one task for selectors in which cooperation can play a role, another is what might be termed transitional cooperative collection management. Cooperative collection development has tended to focus primarily on transforming the way decisions were made about new additions to the collection. There have of course been a number of cooperative storage and preservation projects, and the Center for Research Libraries was created as a means of managing little used materials collectively. The task of managing large print collections, less and less frequently used, characterized by considerable overlap and often in poor physical condition, is likely to become an increasing financial burden for research libraries. Addressing this problem could follow two parallel tracks, both of them benefiting from collaboration and the sharing of resources. First, libraries could work together to make collective decisions about which titles to store, distributing responsibility for retention and allowing for the emptying of potentially miles of shelf space. Such a program, if feasible at all, would require active selector involvement and also has complex and serious implications for reference service, not to mention technical services and preservation operations. Second, libraries could collectively approach projects to digitize selected portions of the record of the past. Once again the advantages of collaborating—in selecting what to digitize, in dividing the labor, in sharing expertise—are obvious. In particular, the need to be selective, to identify priorities in approaching the massive amount of material available to digitize, also calls upon the skills of subject specialists working together in collaboration.

Resource sharing in the past has been based on a scarcity of fiscal resources, which resulted in reductions in the range and depth of information resources individual libraries could make available. Two CIC institutions have recently begun sharing the services of a South Asian bibli-
ographer through a joint appointment. In the research library of the late twentieth century, the scarcest resource may well turn out to be human expertise, particularly in subject disciplines and technology. The dearth of area studies specialists is already being felt in certain fields. The sharing of subject specialists and the pooling of their expertise may become the most important resource to be shared in coming years.

The changes being experienced in the course of the transition to a largely digital environment offer new opportunities for cooperative action in making information resources available to clients. At the same time, the nature, urgency, and speed of these changes call into question the value of continuing to invest in models of cooperation based on a predominantly print environment. The reasons for finding effective ways to develop coordinated collections were never stronger. On the other hand, the uneven track record for traditional cooperative projects, in conjunction with the rapid expansion of networked electronic information, argues for careful selection of areas of focus, for consideration of radically different approaches, and for a healthy skepticism about the level of effort earmarked for such activities. These conflicting impulses can induce real ambivalence about the future potential of cooperative collection development, at least in its traditional forms, in resource sharing. Certainly, the focus on collective action to help build, exploit, and manage the digital environment could bring measurable and meaningful results. Beyond that, collection development librarians may find that knowledge of the digital world in their subject specialty, rather than their collections, may be the most important resource they have to share.

REFERENCES


The Evolution of Selection Activities for Electronic Resources

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Abstract
As the principles of collection development have evolved over the last two decades, most selection activities for electronic resources have developed from criteria established for print materials. For nonprint formats, selection criteria follow a generally standard model, varying only slightly as additional criteria are needed to assure equipment compatibility and storage security. Selection of electronic resources, such as CD-ROMs, dial access databases, electronic journals, and World Wide Web (WWW) products, requires a more extensive set of criteria. This article outlines how the traditional selection activities must continue to evolve to meet the needs of the new electronic environment.

Introduction
At the center of the traditional selection model are three basic criteria: the reputation of the author and publisher, the scope and breadth of content, and the relevant details of special formats or features. Much has been written about each area, with particular guidelines focusing on various subject areas and particular nonbook formats. Gorman and Howes's (1989) review of the standard writings on selection criteria reduce several detailed sets of criteria to two broad categories: (1) content, and (2) presentation and form. Most contemporary writings on collection development continue this traditional content and format-based orientation with some additional mention of pricing structures. With the advent of electronic formats, however, these selection practices are no longer...
The actual criteria for selection and subsequent acquisition of electronic products move far beyond the traditional models. The complexity of access to electronic products has greatly increased the tasks related to selection activities. In making the appropriate decision, the selector must consider not only the content and format of the product or item, but the equipment needs, access methods, purchase or lease options, and varying cost structures. Sandore and Ryan (1994) remind us that evaluating the new technologies and resources is just as important as providing them. Such review requires a detailed understanding of the technology involved and how it will be applied to the use of the product. The selector must consult with the reference staff, technical specialists, network directors, and product engineers to assure that the product will, in fact, be accessible, that it will provide a user-friendly interface, and that it will integrate efficiently into the local environment.

The two primary factors influencing collection development activities for electronic products are technology options and licensing issues. As a primary function, libraries should select only those electronic products for which they have the applicable technology. Today’s literature is full of articles and advice on technological issues such as establishing access to CD-ROMs, setting up local area networks, and linking to networked services via the Internet and the World Wide Web (WWW). Yet for selection purposes, technology and access issues are unique to each library, requiring an in-depth knowledge of the local computing and networking environments. The selector must work closely with technical staff to understand this information, make the best selection decision, and in turn communicate these technical requirements to those handling the acquisition and automation functions.

The second major influence on selection activities is the handling of license agreements. The 1976 Copyright Law has not proven to be effective in protecting the rights of authors, database and software owners, or producers and distributors of electronic products. To protect their economic investments, many of these parties have moved to the use of license agreements, either passive licenses shrink-wrapped to the product or more extensive licenses requiring signatures by both parties. These license agreements explicitly deny many rights defined by the copyright laws and have introduced new issues of user identity, product capabilities, and restrictions on use into the selection decision. The selector must consult with appropriate acquisition specialists, purchasing agents, and/or legal counsel to assure that all user and technological needs can be met before the final selection decision is made.

To best understand the development of selection criteria for electronic products, an examination of each issue is helpful. The following analysis examines each category of selection criteria for electronic products, including CD-ROMs, networked databases, remote access databases,
and WWW sites. An evolutionary approach is taken to the traditional selection criteria to illustrate the changes brought on by the movement to electronic media. The newer issues relating to technological concerns and license agreement limitations are discussed in terms of users and access, deliberately avoiding the related pricing models. The resulting study provides a guideline for selection activities at all three levels.

**Traditional Selection Criteria**

A primary function of the collection development process is to define the library's criteria for selection. The most fundamental criteria are designed to evaluate the reputation of the author(s) and publisher, ascertain the level and depth of the content, and consider any special format or features that add value to the title. Many of the readily available print review sources address these issues in great detail. For electronic resources, these criteria quickly evolve into evaluation of other parties participating in the creation of the product, assurance that the correct content is available, and confirmation that the product performs as expected. Adding to the complexity, electronic product reviews are available from a wide variety of print and electronic sources.

**Reputation of Authors, Publishers, and Producers**

Traditional selection practices for print materials have relied on the reputations of authors, illustrators, editors, printers, and publishers as a key criteria for selection. In the nonprint and electronic publishing worlds, this group of creators expands to include graphic artists, photographers, software authors, screen designers, and home page developers. The concept of examining the reputation of the creators by considering their qualifications and previous works does not change but expands significantly in the nonprint and electronic realms.

In the nonprint market, the producer's and the distributor's reputations are equally important to the selection process. For traditional audio and video products, such as sound recordings and films, the producer and distributor are often the same as the publisher. It is rare that a product is produced or distributed in multiple versions by different firms. The technology involved has been standardized over the years, and products are seldom offered in formats beyond the consumer norms. Selectors can rely on standard criteria and many years' experience with these firms to quickly evaluate the content, level, and quality of their products.

When a work is transferred to an electronic medium, adjunct creators, such as the author of the search software and the database designer, take on new importance. In the 1980s, it was the print index author/publishers, in tandem with digital tape and CD-ROM producers, who first prompted the transition to electronic format. These partnerships have created new markets for print production databases by providing a method
to integrate them directly with automated library systems or via separate search engines. Selectors are often familiar with the content, level, and scope of print products but have little experience with evaluating online interfaces or the technology required to integrate them into the library catalog. At this point, the selection responsibility has to be expanded to include the library's technical experts.

Now that many traditional print products are moving to CD-ROM and WWW based formats, the advent of search engines and web browsers brings an entirely new perspective to the evaluation process. A single database may be available in several versions from multiple vendors running under various access methods or search engines. Many selectors have begun to rely on products from large producers/distributors, such as UMI, SilverPlatter, and EBSCO, not only for quality of content but also for the reliability of software, ease of access, and customer support. Selectors are familiar with these companies' previous products and how well they perform and integrate with the local technology. Thus new partnerships of author/publisher and producer/distributor have become meaningful and worth examination in the selection process.

CONTENT: SCOPE AND BREADTH

Content is the second criterion that comes to mind in traditional collection development. Broadus (1981) has provided in-depth advice on how to examine a title to determine its intended coverage, audience, special features, and relationship to the collection's actual needs. Selectors normally are familiar with questions concerning the need for in-depth coverage or a broad overview, an exhaustive analysis or a selective review, a historical perspective or a more contemporary observation, and the avoidance of errors and bias. These issues remain critical to selection of nonbook and electronic products as well.

When considering a print title, it is relatively simple to base a decision on an in-hand review of the book. For nonprint materials, a physical examination of the item is even more important. Typeface, illustrations, graphics, and even packaging dramatically affect the item's quality and usefulness. Often the product includes audio or video components which should be seen or heard before a final decision is made. Many selectors have learned to rely explicitly on thirty day trials, examination copies, and interlibrary loans for this purpose.

The review process for electronic products is similar in that the scope and breadth of the content must be considered in the traditional manner. However, a second major difference between the review of print and electronic products lies in the profusion of product choices available to the selector. When electronic products are created from databases used to produce their print counterparts, they may easily be sliced and diced
and repackaged into a variety of products. Many times, the content available in the electronic product is not the same as the print product. Producers both bundle and separate text, indexes, and graphics according to requirements of the medium and what they believe will sell best. Selectors must thoroughly examine all purchase options and determine the most appropriate version for their library's needs. Often these choices are not clear from the marketing information or even from sales representatives.

The many content options create selection dilemmas. The electronic environment expands access to content by adding features such as interactive indexing and the ability of the user to move through the database at will. For CD-ROM or WWW-based products, several print volumes or even multiple titles can be combined into a single electronic work. If the desired title is only produced as part of a much larger work, the selector must consider the content and value of the added material in relation to the library's needs and the product's cost. Many products come to market quickly but are missing the complete back files, or have partial indexing of the content, or lack certain graphics. If the desired title is poorly indexed or missing detailed illustrations, the selector may have to trade off content for ease of use and accessibility.

The method of review, however, is considerably more challenging. Like nonprint materials, the selector must either trust the marketing information and reputation of the author/publisher or do a hands-on examination. Many producers are pleased to send a trial disc or put up a web sample for review. However, when these are only sample files and not the actual product, the selector cannot test the actual search engine or extent of the database. If the reputation of the database or software producer is well known, a sample product normally is sufficient for a selection decision. If this is not the case, some distributors will ship the product, with invoice, on a thirty-day trial basis. This works well for the selector who has the knowledge and equipment to mount and test the product in that time frame. If the product needs to be mounted and tested through a complex network or remote access system, an extension of the thirty days can usually be negotiated. The important point is to be certain the product will function as expected before the selection decision is made.

Tenopir (1993) reminds us that it is important to remember that all of the various ways to access electronic information are part of the assorted distribution media. What is important is not whether something is online, on CD-ROM, on tape, or in print, but the content and ease of use. Content must be what users need or want, and it must be accurate, timely, and appropriate. Libraries cannot avoid the hardware, software, and access issues, but if we place too much importance on them, we may miss the content.
FORMAT AND SPECIAL FEATURES

The third set of criteria that selectors depend upon are the item’s format and any special features. For books and print items, something as simple as how the text is organized and presented greatly influences the selection decision. Binding options and large-print versions may be a deciding factor for certain types of libraries. The existence and quality of special content features such as bibliographies, indexes, tables, and appendixes can be extremely important to the selection decision. Finally, physical standards such as the quality of paper or illustrations play a significant role.

For nonprint products, these traditional criteria remain important, but format compatibility is key to the selection decision. Once the library has committed to a specific format of audiovisual equipment, computer network platform, or access software, the collection is built to those standards. Libraries have struggled for years with varying video, audio, and computer standards, only to have new options and formats arrive with each decade. Unless the desired item is available in a compatible version, it simply should not be selected. Selectors must possess a working knowledge and detailed understanding of the viable options for the type of material they are considering. Once basic compatibility is assured, the selector may then begin to consider special features and quality issues.

Often the item’s user friendliness in terms of loading, accessing, and operating the equipment is a deciding factor in selection. The product that cannot be loaded easily and quickly onto standard equipment will require significant assistance from library staff, and for this reason alone will not be selected. Special features such as operating manuals, user guides, templates, and even simple instructions on the package add to the products’ value. A seasoned audiovisual selector knows the importance of testing product use as a separate factor from content and reputation.

For electronic products, the examination must go a step further. Only a hands-on search will provide the selector with an understanding of how the product functions. A given title may have valuable content, good development of ideas, and quality writing, yet be very difficult to search or have a slow response time. The selector must examine command structures, screen displays, system responses, and help screens to assure reasonable functionality. As mentioned earlier, the reputation of the publisher or producer often assures the selector of quality features that guarantees a user-friendly product.

TECHNOLOGICAL CONCERNS

The selection of electronic resources follows the well-established criteria for selection of nonprint materials. Any selection decision must be based on the principle that the library has adequate equipment by which
to view, play, or provide access to the product. Given the many electronic formats, the criteria expand quickly to cover a continually changing array of products and access methods. The similarity to nonprint formats ceases when questions of archiving arise. Selectors may safely assume that, with proper care, microforms and audiovisual materials can be adequately preserved. The archiving of electronic resources raises concerns about the security of data files, search software and operating systems, remote access links, and storage costs. To address these technological questions, the selector must work in coordination with a variety of technical experts. Without their help, a decision based on traditional criteria may not succeed.

**ACCESS METHODS**

In traditional collection-development theory, access issues are limited to location or storage questions. The concept of providing or assuring access is never questioned. Hazen (1991) points out that these emerging electronic technologies are "forcing shifts in both the theory and the practice of library selection" (p. 294). With the prospect of large-scale access to remote resources, the library profession must alter some of the basic assumptions in its conceptual framework.

The naive selector might easily assume that the primary focus for testing access should be ease of use. Yet, given the wide array of products and access methods available in any given library, the selector may struggle just to gain access. The traditional review literature now covers CD-ROM products, online access to full-text databases, electronic journals, and WWW sites. Access to these products may be as simple as an option on the library's online public access catalog (OPAC) or via e-mail through a listserv on the Internet. For other products, though, the selector needs to understand concepts such as client-server technology, Z39.50 compliance, and graphical user interfaces (GUIs). Until these access methods are mastered, the selector cannot begin to evaluate the product's ease of use.

More experienced selectors often believe they have mastered the common electronic formats. But even basic products quickly become overwhelming to the user when they are acquired for network applications. The simple user-friendly CD-ROM that is a popular stand-alone title may perform erratically on the local area network. The selector must rely on advice and reliable testing from the technical staff to assure the product will sustain the desired number of network users without a significant drop in response time. In the networked environment, problems with search commands and printing options can quickly arise due to software updates. Manhoff et al. (1992) advise that questions of access procedures, screen presentation, and file format and storage are answered differently depending on what product is being considered. In discussing
options for electronic journals, Manhoff notes that subscribers often must use a very specific hardware/software/communications setup simply to assure successful retrieval. Selectors cannot make a valid content-based decision until these hurdles are conquered.

Selectors must ask questions about product support and data updates. Electronic products by their very nature are updated regularly. For remote databases, this may involve nothing more than a regularly scheduled alerting message from the provider. For CD-ROM or Internet based products, updating may require the addition of more discs or the retrieval of new files. Such decisions would involve the need for more storage space on the server, more slots in the CD-ROM tower, or even regular updates to the search software. While assuming that familiarity with electronic access has become a basic skill for many selectors, Metz (1991) also notes that selectors should not be expected to double as software and telecommunications experts. To investigate these issues and assure currency, selectors require ongoing support from the library's technical specialists.

Finally, evaluation of electronic products should focus on issues that assure a user-friendly interface. Excellent coverage, reputable content, and extensive back files are irrelevant if the product is complex and/or tedious to search. It is essential for the selector to evaluate such basic features as menu-driven versus command-driven functions, consistency in screen displays, online help, Boolean search capabilities, and response time. Preview copies or test discs are an excellent method of determining how users will respond to the product. The selector may even actively recruit key patrons to test the product in their presence so immediate feedback can be gathered. This type of hands-on review is an important part of the selection process for any type of electronic resource.

ARCHIVING

Libraries traditionally have considered archival storage to be a high priority. Selectors have included the archival value of a title as a prime criterion for inclusion. For electronic products, assuring access to, and storage of, files is a critical issue. Selectors must never assume that this responsibility is safe in the hands of the database producers. Publishers have not traditionally maintained paper stock, and they have quickly realized that they are not in the business of storing large sets of data and maintaining ready access to them. This enormous task is very complex and expensive for even standard resources. As Dannelly (1995) succinctly states: “There is little reason to expect that any publisher, commercial or academic, will retain electronic information much longer than they retain paper copies. Again, it is a question of economics” (p. 666).

Assuring archival access becomes an even more critical issue for particular types of products, such as electronic journals and full-text data-
bases. Libraries also have learned that both storing large files of data and maintaining access to them is a significant additional cost in terms of staff, time, and resources. Selectors often are hesitant to rely on electronic copies of titles for fear that archival access will not be maintained. According to Manhoff (1992), libraries have traditionally been the archivists of periodical materials regardless of format. Libraries have adapted to storage on paper, microform, and audiovisual formats within our collections. Until there is assured access to electronic products, libraries have little choice but to acquire or produce paper, fiche, or data file copies.

**Licensing Limitations**

Selectors cannot afford to ignore the implications of license agreements when making a purchase decision. As long as electronic resources are available for lease rights only, examining license agreements will be an integral part of the selection process. The selector has to determine if a license exists, what impact the license will have on the selection and acquisition process, and if the rights assigned by the license are adequate for the library's purposes. In particular, the selector must examine issues of user definition, use rights and restrictions, and contractual obligations and penalties. An acceptable license agreement is required before the selection decision is finalized.

**User Definition**

Until the last decade, the entire concept of who uses a title or a product was never an issue in selection. Only in extremely rare circumstances did the publisher even inquire as to which library was acquiring the book and exactly who would be using it. Any question of confidentiality or proprietary rights was handled simply by limiting the title's physical distribution.

Questions of user identity first appeared in the selection of film and video products. Educational pricing structures for films and videos have been established to allow schools and academic institutions to acquire or lease a title for specific purposes related to the curriculum. Libraries and media centers are required to sign rental contracts or license agreements stating that the film or video product will be shown only to students of the institution. In public libraries, the definition of the user also becomes relevant when a film or video is purchased for the general collection and circulates to library patrons. As long as the selector defines the target user group, most distributors are more than willing to lease or sell the title at the applicable rate.

In general, a selector may expect a signed license agreement as a requirement for the lease or purchase of any networked computer software, CD-ROM database, or access to a remote electronic product. The
license agreement will explicitly define the category of user allowed to access the product. Such definitions normally include registered patrons of a public library; the currently enrolled students, faculty, and staff of an educational institution; or the current employees of a specific office of a corporation. The number of users usually is defined in the license agreement by level of service acquired or by a separate price schedule.

For selection of computer software and electronic databases, the definition of user is not problematic as long as the product is protected reasonably from illegal copying and multiple use. Selectors considering single-user single-machine applications will rarely encounter any question of the user. The selector needs to define all potential categories of users who will access the product, secure a lease, or purchase options that will provide such access and modify the license agreement as needed to allow such access. If the software product is being considered for networked or multiple-use applications, the selector has a much larger set of issues to handle: the definition of the user and the number of users.

The selector should be alert to problems that arise when the terms of the license agreement fail to adequately define the library's users. Many license agreements provide a simplistic limited definition of the user and expressly prohibit all others from access. A public library may want to provide access to walk-in users who are not registered as patrons. An academic institution may have student-teachers, visiting lecturers, part-time students, alumni, consultants, and others who expect to use all library databases. A for-profit company may want to allow access to an online product by their employees in other parts of the region. These exceptions may not be covered in the standard contract. The selector cannot expect the product to be ordered until these variances are addressed. Access for these additional users must be negotiated as an integral part of the selection and acquisition process. The outcome will determine not only who may use the product but how much it will cost.

Beyond the definition of the user, license agreements sometimes also allow only a specific number of simultaneous users or limit access to users only at a specific location. These are even more frustrating factors for selectors to handle because the details of such restrictions often are not apparent without a detailed examination of the license agreement. In recent years, most products have been priced to allow libraries to purchase or lease access for a set number of simultaneous users. To make the right decision on number of simultaneous users, the selector must understand how access is controlled, consult with public services staff to estimate how many simultaneous users will be needed, and work with automation staff to assure access is indeed limited to that number.

Many times the information provided by sales representatives or marketing literature alludes to "free networking," when in reality the carefully worded user definition in the license agreement restricts access by
the location of the network. Some licenses define users not only by student or employee status but by their presence in a particular library branch, office site, or academic building. The selector again must understand and negotiate the license agreement to assure that all users, regardless of location, may use the product.

**USE CAPABILITIES AND RESTRICTIONS**

The concept of defining use is relatively new to collection development. Very rarely are libraries explicitly told how they, or one of their patrons, may use a traditional print product. Selectors in special collections or corporate libraries frequently are concerned with acquiring and controlling access to proprietary materials. Selectors of nonprint materials for schools and public libraries expect to limit use of entertainment films and videos. Yet in the electronic age, almost every license agreement includes statements which detail even the most fundamental user capabilities.

The selector must understand how the majority of patrons will use the product to assure such uses are allowed by the license agreement. Simple assumptions such as the ability to search a database or print out portions of text must be verified. Definitions of approved uses vary widely and often include vague terms such as "a limited number of copies may be made" or "an insignificant portion of the search results may be cited." The library selector should consult with public services staff to determine if these definitions are acceptable or if the license agreement needs to be edited.

A typical license agreement will define three major use rights: (1) to make searches of the text or database; (2) to make hard and/or electronic copies of the search results; and if applicable, (3) to make an archival copy of the software. Every license agreement will define these capabilities in different sections of the contract and in varying legal terms. The selector should read and reread the contract as many times as needed to assure that the rights are understood clearly.

By contract law, any rights not expressly granted in the license agreement are reserved to the product supplier. Many times use rights are stated in vague terms and are open to misinterpretation by selectors. Contract language often varies from the ambiguous to the explicit. For example, in the delineation of copying rights, the following statement is simple and clear: User may make a machine-readable copy of the software for archival purposes only. The following statement leaves considerable room for interpretation: User may make a reasonable number of copies of any search results that do not contain a significant amount of data. The selector has the responsibility to identify specifically the library's usage requirements and to assure the desired rights are granted in the license.
A large portion of text in license agreements is dedicated to prohibiting user rights and capabilities. The selector should carefully examine these sections to assure that their basic assumptions about product access or application are correct. Use restrictions may be hidden in complex definitions or stated simply as use restrictions. Few users are interested in decompiling or reverse engineering the software, yet selectors can expect to find this restriction in any contract applying to software installation. Typical restrictions also prohibit the right to copy the database, reproduce or redistribute the data to third parties, make derivative works, transfer the license, or sell the product.

The definitions provided in the license agreement are as important as the delineation of rights. By examining the definitions, the selector may discover additional use restrictions. A well-known database producer advertises their product as “fully networkable.” Yet by studying the definitions at the beginning of the network license, the selector will learn that the network use permitted in later sections is restricted to a local area network within a single building where the product must be located. In fact, any dial-in access is strictly prohibited, even within the designated building. More obvious restrictions are the definition of sites by geographical boundaries or limitation of remote access by certain methods of telecommunication.

**Contractual Obligations**

Many license agreements include specific actions for which the library is held responsible. The selector must understand the consequences of agreeing to these obligations. It may be easy to identify and agree with a requirement to return outdated CD-ROM discs, restrictions on the assignment of passwords, and the commitment to prevent access to unauthorized users. The selector may have concerns about the library’s ability to assure that conspicuous copyright notices appear on each printout. A license agreement granting the provider the right to audit use of the product at any time should be reviewed by administrative, public services, and technical staff before acceptance. It is the selector’s duty to identify these obligations and bring them to the attention of those involved in the use of the product. If the terms of the agreement are not acceptable or negotiable, the product should not be acquired.

**Conclusion**

Almost two decades ago, Cabeceiras (1978) predicted that, before the end of the century, local libraries would be interconnected via electronic information networks. He anticipated that patrons would have direct and immediate access to information stored on paper, videodisc, microform, or on regional, national, and international databases. Perhaps his most visionary assertion was that the selector’s tasks would in-
clude determining what data are to be included, what media format would be selected, and what would, or would not be, preserved. What he could not predict would be the added complexities imposed by license agreements. We are close to the end of the century and continue to struggle with these content, access, use, and archival issues on a daily basis.

Traditional selection policies and procedures could not keep pace with the changes in the technology. The wide diversity of materials—print, audiovisual, CD-ROM, electronic journals, networked databases, and multimedia products—continue to evolve rapidly. As Woodward (1994) asserts, most libraries have introduced electronic information sources in a piecemeal fashion, mostly in response to user demand. Selectors must increase their knowledge of automated systems and electronic communications, their expertise in accessing and testing electronic products, and their skill in understanding and negotiating license agreements.

REFERENCES


ADDITIONAL REFERENCE

One Giant Leap, One Small Step: 
Continuing the Migration to 
Electronic Journals

JOHN H. BARNES

ABSTRACT
A number of recent events, most notably the emergence of the World Wide Web, have triggered a dramatic increase in the availability of electronic journals. Today's electronic journals make use of the technologies of the present but are also based on the experiences of the past. This article discusses the steps that have been taken to reach the point where we are today in electronic publishing, including CD-ROM systems, local data loading, and pre-Web online, and outlines some remaining obstacles, including critical mass, aggregation, local collection development, integration, and archiving, that must be overcome before libraries can make the ultimate leap from paper to electronic collections.

INTRODUCTION
With apologies to Neil Armstrong for restructuring his famous lunar line, this article will discuss the forces that have led to the recent "giant leap" in electronic journal publishing, yet remind us that it is but "one small step" down the path of library's conversion to electronic collections.

For more than a decade now, much has been written about the coming transition from paper to electronic collections in the world's libraries. The technologies-of-the-time, be they computer-output microfilm, CD-ROM, or FTP, have been utilized in projects and products that seek to facilitate this transition. While a great deal has been learned from the projects and there have been some relatively successful commercial endeavors, it has only been within the last two years that the major building...
blocks appear to be in place to begin the transition in earnest. A number of significant recent events are dramatically impacting the direction of scholarly electronic publishing, namely:

- The emergence of the Web has greatly reduced the entry barriers to electronic publishing by providing a ubiquitous real-time distribution channel and eliminating the need to develop and distribute proprietary access systems.

- While most electronic publishing is still about “putting paper on the screen,” new dynamic data formats such as Hypertext Markup Language (HTML), Portable Document Format (PDF), Virtual Reality Modeling Language (VRML), and others are providing new cost-effective means to “liven” online journal information through color, graphics, document linking, video, and simulation.

- Web-based electronic publishing has gained acceptance among the end-user community with the introduction of numerous mainstream consumer publications, including such notables as *Time*, *U.S. News and World Report*, *The Wall Street Journal*, *Science*, and *Nature*. Nearly every major commercial publisher is offering, or will soon offer, online versions of their publications. Even the scientific, technical, and medical publishers, long the most conservative and cautious with regard to electronic publishing, are now actively converting and repackaging their information for online distribution.

- The results from the major academic experiments of the early 1990s, such as TULIP, CORE, and Red Sage, are being publicly shared, and there seems to be agreement in key areas such as the high cost of local electronic journal storage, the importance of integration with bibliographic reference systems, the need for interdocument linking, and the necessity of a permanent electronic archive.

All of these environmental factors combined indicate a notable change in the direction of publishing that will inevitably dramatically affect libraries. The result has been a pronounced acceleration on the part of both the scholarly publishing and library communities to address the difficult questions of beginning the transition to electronic collections. Yet with all the changes brought on by the Web and associated technical innovations, much remains the same in the library’s mission. We are moving down a path of continuously better solutions to the same problems of collecting, accessing, and archiving information. What are the issues that still need to be addressed in order to finally make the giant leap to electronic collections?

**ONE OF MANY LEAPS**

The discussion of the implication of electronic publishing on libraries, users, and traditional publishers is rich with topics for debate: from
the impact on the relationship between the academic community, which produces a great deal of the scholarly literature and the commercial publisher who distributes it (Tenopir, 1995), to the advantages of electronic journals over their print counterparts (Hickey, 1995, pp. 530-31)—namely customization, searchability, information linking, availability and timeliness—to the technological merits of one storage format, be it TIFF, HTML, SGML, or PDF, over another (Weibel, 1995; Kennedy, 1996; Kirstein & Montasser-Kohsari, 1996). These debates continue, although they are not the primary focus of this discussion. Instead, we will start with the assumption that the advantages of electronic journals are accepted and outweigh the disadvantages, and that traditional publishers will continue, into the foreseeable future, to be the source of most of the information content.

In discussing electronic journals, this article refers to second-generation electronic journals (Duranceau et al., 1996, p. 50), namely multimedia representations, usually of existing print publications, that are distributed online and include searching, browsing, and output capabilities. While first-generation electronic journals—i.e., simple ASCII-text files usually noncopyrighted and distributed by a listserv and electronic-only journals—are not the primary focus, many of the same issues apply for libraries.

The Waiting Game

As is always the case with a fundamental lifestyle change, be it personal or professional, there is the period of wait-and-see as the “changer” and “changee” each hopes the other will make the next move and signal the future direction. Whether it be the invention of the automobile and its impact on travel, the standardization of the VCR and the resulting changes to home entertainment, or the proliferation of the personal computer and the impact it has had on productivity and information dissemination, each major lifestyle change is preceded by a period of considerable uncertainty.

In the end, the fundamental change does not take place until there is enough critical mass moving in one direction creating the necessary momentum to pull the rest along. The Model T brought direction to the fledgling automobile industry, the VHS tape format established the standard necessary for VCRs to take off, and the “Wintel” personal computer provided the standardization that has led to tens of millions of home computer users.

The same market dynamic is true for electronic publishing and libraries. Primary publishers, secondary publishers, and information vendors (hereafter information providers) have, over the past decade, experimented with projects and products aimed at positioning themselves for the much proclaimed coming of the electronic collection but, for the
most part, have taken a wait-and-see attitude before completely retooling production processes. Libraries, while experimenters in many of the projects and products, have also, predominantly, taken a wait-and-see viewpoint before "retooling" their collections by making wholesale conversions away from paper. The primary reasons are the lack of standardization and the high-cost of wrong guesses for both information providers and libraries.

The recent "giant leap" that we've seen in electronic publishing has taken place primarily on the supply side of electronic journals—the information provider side—and has specifically addressed the issues of standardized distribution and information timeliness. The impetus of this giant leap is undoubtedly the emergence of the Web and reduction in entry costs and the complexity it is providing to the information provider. This, in turn, is providing the essential standardization and critical mass of electronic journals that the library is looking for to finally start the migration from paper.

LOOKING BACK—THE EARLY STEPS

While the Web has not solved the information provider's dilemma of how to get the source material to an electronic format, it has addressed many of the issues of distributing the information thereafter. Just a few years ago, the information provider seeking to distribute an electronic journal was faced with constructing a solution from start to finish. This included not only the redesigning of the journal production system, but also selecting data formats, creating access software, and implementing full distribution systems. For the primary publisher, it usually meant partnering with a vendor who could provide the technical expertise to convert the print journal to electronic, develop software to access it, and provide distribution to the library. The "giant leap" we are experiencing now was preceded by many smaller steps. Most early solutions were of one of three varieties: (1) CD-ROM, (2) local loading, and (3) "old" online.

CD-ROM Systems—The First Step

The late 1980s and early 1990s saw various journal publishing and document delivery solutions based upon CD-ROM technology. While the CD-ROM-based systems offered significant storage economies and a means to distribute electronic journals, accompanying production processes significantly affected information timeliness.

While in some instances raw journal data were available from the publisher in electronic format, more frequently this was not the case. The first step in the process was usually the conversion of the journal from paper to electronic, usually through scanning and creation of bit-mapped images. Added to this was the time for indexers to create descriptive bibliographic citations and abstracts and to link this information to the image of the article.
While much of this has now been outsourced to service bureaus who specialize in these conversion services and can handle high volumes, there still remains a notable delay in timeliness brought on by the physical distribution (i.e., packaging and mailing) of the CD-ROM.

In addition to the high cost and lengthy production process for CD-ROM, the information provider was also required to develop, support, and continually enhance proprietary software used to access the electronic journals. Each new journal or journal collection brought with it a new interface and different functionality for browsing, retrieving, and displaying documents. The significant development effort for the information provider, coupled with the lack of interface uniformity for libraries, placed more roadblocks in the path of migration from paper to electronic journals.

While several CD-ROM-based electronic journal products have experienced success, they have not provided the platform for the giant leap from paper. In the end, the lack of timeliness has meant that these were essentially electronic document delivery systems—a highly useful complement to paper but not a complete replacement for the paper subscription (Lancaster, 1995).

Nevertheless, CD-ROM electronic journal systems did provide an important first step. For the information provider, they uncovered the key production, distribution, and technological issues that must be overcome in providing electronic journals and enabled them to build the necessary infrastructure for future growth in this area. Those who made the leap with CD-ROM have the great benefit of the knowledge and experience and are better prepared than others who chose to stand on the sidelines.

For the libraries which integrated CD-ROM-based electronic journals into their reference services, they too gained from the experience. They have improved the storage and accessibility of their journal collection, have greatly reduced the time to deliver documents, and have introduced their users to the benefits of electronic journals. They are better prepared for the leap.

Local Loading—A Side Step

At the same time that many information providers were focused on CD-ROM solutions, some publishers experimented with the approach of providing raw electronic journal data directly to libraries for local loading. Elsevier's TULIP Project and the CORE Project at Cornell are examples of this type of approach (a full report on the TULIP Project can be found at: http://www.elsevier.nl/locate/TULIP).

The premise was that publishers would provide image and text data for their journals directly to the library. The library would be responsible for storing the journals and developing the software necessary to access
them. Under this model, each library could, therefore, control the presentation and integration of the journals into their local library systems. Additionally, it was envisioned that timeliness of the material would be improved since the aggregation and CD-ROM production/distribution processes were bypassed.

While this model simplified the process for the publisher, it did so at the expense of the library, which was then faced with the daunting task of loading, indexing, and making available this large store of data. The cost advantages brought on by one production and distribution process shared by many were lost as each institution was required to redundantly develop its own storage and access platform. Projects such as these have shown that a significant technical and logistical infrastructure is required to support such endeavors and "the number of academic libraries really ready to support digital collections is not large" (Hunter, 1996, p. 210).

Similar to CD-ROM-based solutions, these projects were significant and important in the learning process for libraries and information providers with regard to electronic journals. They pointed out the vast differences, both in effort and cost, with building an electronic versus a paper collection. They highlighted the advantages of aggregation and economies of scale that are necessary to keep costs down, and they revealed key issues such as who maintains the journal archive and how many journals represent a "critical mass."

"Old" Online—Steps in the Right Direction

"Old" online refers to the now seemingly ancient days of pre-Web electronic journal solutions. They relied on proprietary networks, dial-up services, and the early incarnations of the Internet as the access channel to the electronic journals. The early electronic-only journals were also born under this model—a result of the significant reduction in production and distribution costs for the online electronic journal versus CD-ROM or paper equivalents. OCLC's original Electronic Journals Online (EJO) service is an example of this type of service. EJO pioneered the online electronic journal in 1992 with the development of the Guidon interface and the introduction of The Online Journal of Current Clinical Trials with the American Association for the Advancement of Science.

Like their CD-ROM counterparts, these online electronic journal systems relied on proprietary interfaces, usually customized for the specific features of the journal. Unlike CD-ROM, they suffered less from issues of information timeliness because of the elimination of the physical production and distribution of a disk yet were plagued by other issues, such as a limited telecommunications infrastructure, proprietary client interfaces, and low content availability. They saw some success, more typically from the individual subscriber who was focused on a few
journals than the library researcher who wanted to search across a broad body of information. The information timeliness and journal presentation issues had been largely addressed, but there remained significant obstacles such as high startup and maintenance costs, proprietary client interfaces, and questions about archives which remained unresolved for information providers and libraries.

**TODAY’S ELECTRONIC JOURNAL—BIGGER STEPS**

As we have all witnessed, the level of electronic publishing activity has grown exponentially over the last few years. The primary driver of this accelerated activity, of course, is the emergence of the Web. From the thousands of individual online journals, newspapers, and “e-zines” to niche-targeted online professional “clubs” such as BioMedNet, MathSciNet, and ChemWeb, to publisher-specific web sites which provide access to most, if not all, of a given publisher’s content, Web-based publishing is taking many forms.

It appears that the Web is the standardizing element that has been needed to stimulate the migration to an electronic environment. Its ubiquitous nature and the uniform browser access software seems to have removed one of the final barriers, namely distribution and access, in the path of the information provider looking to make the leap to electronic journals. Until the distribution and access problems were resolved, primary publishers were not likely to invest significantly in retooling their journal production processes to produce electronic material. It was more cost effective to rely on the secondary publishers or service bureaus to make the conversion from paper—thereby continuing to propagate a document delivery solution over the true electronic journal solution.

From all appearances, the Web will certainly have a profound impact on how the average consumer accesses information. The explosion of information and seemingly insatiable appetites of consumers for it seem to be testimony to that. But are the needs of the consumer, the average home computer user, the same as those of the library patron? Is the Web really the missing piece in the puzzle for libraries looking to make the leap to electronic collections? Or is it just one of several pieces missing?

**APPROACHING THE LEAP**

The emergence of the Web has undoubtedly greatly increased the volume of information available online and has introduced millions to the value of electronic information. But for the researcher, this has largely come at the expense of relevance and cohesiveness. Getting 1,000+ hits on a Web search engine is not necessarily providing a valuable service to the user. Similarly with electronic journals, having to locate the various relevant journals on the Web and then repeat searches across each one to locate the desired information is also of limited value. The Web has driven
an information explosion by improving access to it, but it has also quickly reminded us of the role the library plays in enabling the researcher to find the right information and to assure its continued existence.

With electronic journals, as with other information formats, the library will continue in its role of defining the collection for its constituency and assuring that that information is available, relevant, and easily accessible. The Web itself does not make this happen, but it can play a part in the solution. So what does the library need before it makes the giant leap from paper to electronic collections? A review of the findings from the various electronic journal products and projects over the past decade points out five key nonpricing areas that must be addressed: (1) critical mass, (2) aggregation, (3) local collection development, (4) integration, and (5) archives.

**Critical Mass**

Obvious in its statement, significant migration from paper to electronics cannot occur until there is a sufficient critical mass of journal content to warrant the effort involved in implementing the transition (Hunter, 1996, p. 210). As was discussed earlier, this is the primary barrier to any fundamental change in or out of the library and has been a leading deterrent to adoption of electronic journals up to this point. While there have been products available with several hundred titles in a subject area, they have largely been for document delivery purposes rather than true journal publishing. Projects and products in the primary electronic publishing area have rarely accumulated more than fifty titles in any subject area. Far from the necessary critical mass.

As noted, the emergence of the Web and standardized data formats are addressing this issue. In just a few years we have seen thousands of journals, newspapers, and magazines become available on the Web, and the expectation is that within a few years nearly all major journal publishers will have their information available in electronic format. The issue of critical mass will soon disappear.

**Aggregation**

While critical mass is a stimulator for the migration to electronic journals, it does not necessarily address a fundamental need for the library and researcher, namely a consistent and efficient means to locate information. In paper journal collections, this comes from the fact that they are all of relatively the same format, are typically available in one location, and are pointed to by various bibliographic reference tools. The same must be true, virtually, if not physically, in the electronic collection.

The Web has enabled primary publishers to more easily enter the area of electronic journals, but with this comes countless interfaces, document formats, and access procedures. The library cannot construct a viable electronic collection if it must accommodate potentially hundreds
of different variations in the access methods for its journals. Similarly, TULIP and comparable projects showed us the inefficiencies and high cost structures in a model where each library loads electronic journals locally. They clearly demonstrated the need for a centralized archive and technology sharing model. True cost savings can be realized by creating one shared online electronic journal collection, with each library free to license its own mix of journals from the pool of titles available. While electronic journal licensing agreements are unlikely to grant resource-sharing rights comparable to those available with paper collections, there is still opportunity for resource sharing in the broader sense. The resource sharing is of the infrastructure and technical expertise necessary to archive and access the information. As Jim Neal (1996) states in his article “Academic Libraries: 2000 and Beyond,” “we need the virtuous library to share collections, technology, and expertise and to partner in the packaging and delivery of information” (p. 74). Aggregation of electronic journals into a common format with a consistent interface is key to making them efficiently usable by the researcher and cost-effective for the library.

Local Collection Development

As with paper journals, decisions on collection development should be made at the local library level and should be made on a title-by-title basis. The local library, be it academic, public, or corporate, is responsible for assembling a collection that matches the needs of its user community. This includes determining the individual journals to subscribe to as well as the choice between subscription and document delivery. The distribution of electronic journals on preproduced media such as CD-ROM made it unfeasible to provide this journal-level flexibility in the past. Online distribution makes it again feasible, and libraries should make it a requirement of any electronic journal service. Publishers will continue to offer content bundles, today probably still at the journal level, but increasingly this will move to the article or concept level. The new electronic journal services must facilitate all of these options and not force “pre-packaged” collections on the library.

Integration

One of the distinct benefits in moving to electronic collections, especially those available online, is the ability to directly link the tools for searching and locating information to the information itself. Just as full-text databases have flourished for their one-stop offering of locator and document, so too will the new electronic journal services flourish once they are linked to the bibliographic databases and local systems used to locate information in the library. One of the great challenges with CD-ROM-based electronic journal systems was to find a way to integrate them with the local library system to provide a single solution. Some were
successful but not without a significant commitment of local technical and support resources. The Web, and its inherent interlinking infrastructure, makes this more easily accomplished. Yet the great majority of Web-based electronic journals products thus far have been standalone services, largely “disconnected” from established bibliographic databases, such as Medline, INSPEC, or ERIC, and local library systems. The library does not experience the entire benefit of the electronic collection until all of these pieces are integrated into one service.

Archives

Often overlooked by those outside the library community in their rush to electronic information is the fundamental role the library plays in providing an archive for information. Most early electronic journal products have primarily focused on the benefits of access. While certainly important, they cannot come at the expense of archival rights. Just as the “I-buy-it-I-own-it” right is a given with paper collections, it must also be considered so with electronic collections. The library is looked on as the permanent record for information, with its resources available indefinitely (Neavill & Sherble, 1995); electronic information should not change this definition. Without a doubt there will be no leap to electronic journals if this basic right is not granted by the journal publishers.

While it is necessary to have the same archival rights with electronic journals as with paper, it is not necessary to replicate the electronic archive as has been done with paper and microfilm. Just as the publisher must reevaluate their licensing approach with regard to archival rights, the library must reevaluate the means by which it provides the permanent archive. The library must continue in its role of defining the collection for its constituency and assuring that that information is available and easily accessible (Duranceau et al., 1996), but the redundant physical storage of the collection is no longer necessary.

In evaluating this decision of where the electronic archive is housed, the library must make tradeoffs among permanency, trust, and cost. Neavill and Sherble (1995) provide a comprehensive analysis of the costs and efforts involved in establishing a local electronic archive for the individual library. They conclude that while “local archiving appears to be the most reliable way for libraries in today’s transitional environment to ensure that their users will have adequate and continuing access to files...no library should establish an electronic archive without careful evaluation of the implications for the library and the inherent problems involved” (p. 15). Duranceau et al. (1996), in their discussion of their experiences with electronic journals at MIT, state similarly:

we will, in effect, be moving away from a repository model in the direction of a gateway model, until and unless we can participate in some kind of national archiving project....We acknowledge that this
shift represents a major change in our thinking about our role as a research library; it forces us to meet patron needs more and more through remote access, rather than through onsite holdings. Given our financial and staff constraints, we see no other viable option over the short term. (p. 55)

At the other end of the archive control spectrum is the option of relying on the publisher of the journal to serve as the permanent electronic archive. Even putting aside the aggregation issues raised earlier, there remain key concerns with this approach. As Neavill and Sheble (1995) state: “[M]any publishers of electronic journals maintain archives of backfiles at network sites, but there is little assurance that these files will be available permanently. Publishers may discontinue individual titles or go out of business altogether” (p. 14). MacEwan and Geffner (1996) came to similar conclusions in their discussion of the electronic journals collection of the Committee on Institutional Cooperation and stated: “Currently, it is unclear whether publishers will preserve and provide continuing access to electronic materials they produce. This is a critical problem for research libraries” (p. 7).

There also exists the issue of technical expertise. The publisher’s traditional expertise lies in the area of managing the process of creating and distributing printed information. The technical infrastructure necessary to support worldwide access to an electronic archive is quite different. Many publishers, most notably the smaller professional organizations and scholarly societies, will not have the ability to create and support such a service, yet there will still exist the need for the electronic archive. Publisher as archivist, while cost-effective, may jeopardize the ability of a library to assure its patrons of perpetual access to its information.

A third option, and the one likely holding the most promise, is a cooperative effort within the library community to create a centralized archive of electronic journals. As was discussed earlier under the section on “Aggregation,” an inherent benefit of online electronic information is that there can be one copy shared by many. This may or may not reduce the cost of licensing the journal (that, in itself, is a rich topic for debate), but it certainly significantly reduces the cost associated with providing access to it. As has been done successfully in areas such as cataloging, the library community should seek to cooperate in the establishment of a shared archive for electronic journals (Neavill & Sheble, 1995). By sharing the cost of data storage, access, and format migration, libraries will be able to make the move to electronic journals thereby adding value and reducing cost. This has both short-term and long-term consequences as Neal (1996) notes when he states that “the use of dedicated or shared collection storage facilities and the expansion of digital network delivery directly to faculty and students also minimizes the need for new building
In addition to direct cost saving, this centralized archive could assure authenticity, consistency, and permanency for each journal and would provide a single source that could be migrated as new data formats and delivery mechanisms evolve. The resolution of this issue alone will have the most significant impact on when the library makes the giant leap to electronic collections.

CONCLUSION

The explosion in information services spawned by the emergence of the Web has created an exciting time for libraries and the entire information community. This is no more evident than in the area of electronic journal publishing. Not only will most journals be available electronically in the coming years, but they will be available in ways much more dynamic than today’s "print on the screen" model. Whether it be imbedded software applets, video snippets, chemical modeling, or mechanical simulations, the journal of the near future will be a rich information experience. Yet for all the technological possibilities, the basic needs of the researcher and the role the library plays in meeting these needs remains strikingly consistent. For the giant leap to take place, rather than more small steps, requires that these needs be recognized and that publishers and information vendors address them in the products they offer.

REFERENCES


Recent Trends in Statewide Academic Library Consortia

WILLIAM GRAY POTTER

ABSTRACT
Historically, academic libraries formed consortia for the primary purpose of sharing printed materials. Recently, academic libraries are forming consortia to provide common access to electronic resources across the Internet, and they are forming these consortia on a statewide basis. This article describes five of these newer statewide efforts: GALILEO in Georgia, the Louisiana Library Network, OhioLink, TexShare in Texas, and VIVA in Virginia. In describing these consortia, particular attention will be paid to participating libraries, core programs, the reason for formation, funding, the involvement of the larger academic libraries in the state, and governance. Similarities and differences are discussed and emerging patterns in statewide academic library consortia delineated.

INTRODUCTION

Academic libraries have long formed consortia for the purpose of sharing existing physical resources—principally books and journals held by member libraries. This is done in recognition of the fact that a group of libraries has a combined set of resources that is greater than the resources of any single member. Indeed, studies have indicated that, contrary to what might be assumed, there is great diversity among collections, and even the smallest library contributes something unique (Potter, 1986). Recent figures from academic libraries in Ohio found that, of 5.7 million different titles held by thirty-one libraries, 58 percent were held just once. On average, 23 percent of each library’s collection was
unique to that library (Byerly, 1996). Alliances to share resources, then, make considerable sense because all the participating libraries benefit from access to titles they do not hold in their own collections.

To expedite the sharing of resources, academic library consortia have promoted the formation of union catalogs and expedited interlibrary loan. The OCLC Online Union Catalog lends itself to supporting interlibrary loan and provides the means for a consortium to facilitate requests among its members. Consortia that link circulation systems, such as LCS in Illinois and OhioLINK, permit users to determine the circulation status of a book at another library and initiate an online request. Courier services have been established to move materials from one library to another and high speed telefacsimile has become common to move copies of documents either across phone lines or across the Internet.

While the chief reason for academic libraries to form consortia has been to share existing physical resources, a new trend is becoming evident or at least more pronounced. Libraries are forming alliances for the purpose of identifying and addressing common needs arising from developments in information technology, especially the growing importance of the Internet and the World Wide Web. Specifically, it is becoming increasingly possible to offer a variety of electronic resources across the Internet. These resources include abstracting and indexing databases, the full-text of journals, the full-text of reference works, large collections of literary text, and extensive sets of digitized images. The best possible access to these resources requires high-speed workstations with access to a capacious network. Libraries are forming consortia to provide these resources on a suitable network with capable workstations. Moreover, the prevalent pattern appears to be that academic libraries are forming these consortia on a statewide basis.

**Concentric Consortia**

Academic libraries have many overlapping consortial arrangements. The University of Georgia, for example, has alliances through the University Center in Georgia, a consortium of academic institutions in the Atlanta metropolitan area. It also has alliances through the University System of Georgia, the Georgia Online Database (GOLD), and Georgia Library Learning Online (GALILEO). Beyond the state, the University of Georgia holds membership in several regional alliances, including the Association of Southeastern Research Libraries (ASERL), the Southeastern Library Network (SOLINET), and the Southern University Research Alliance (SURA). On a national level, it is active in OCLC, the Association of Research Libraries (ARL), the Center for Research Libraries (CRL), the U.S. Agricultural Information Network (USAIN), and numerous other amalgamations of libraries. At first glance, this is a seeming hodgepodge, but each group serves a different purpose and each is
important. Most large academic libraries can plot a similar set of consortial arrangements. These arrangements are like concentric rings—city, metropolitan area, state, region, national, and international. For each library, any one level may be more important than the others depending upon the mission and nature of the institutions.

VALUE OF STATEWIDE CONSORTIA

For most academic libraries, statewide cooperation offers distinct advantages and incentives. The state provides a predetermined political and geographical grouping of libraries. There are often common governing agencies for publicly supported institutions of higher education, perhaps a board of regents or a coordinating board for higher education. State government also exercises control over the publicly supported colleges and universities and, of course, provides much of the funding. The extent of direct interest that the governor or legislature takes in the operations of the libraries varies by state, but this interest is always a factor. The fact that a group of libraries shares a common funding source, be it directly through elected officials or through a board of regents or oversight agency, is an important reason to build statewide cooperative systems. There is great appeal in efforts to pool resources and in cooperating to control costs.

Beyond government, institutions in a state often share common social and cultural bodies, including foundations or economic development boards that have an interest in seeing the libraries of a state cooperate and prosper. Pride of place is also a factor in statewide cooperation. People want to promote their state and look favorably upon efforts that will demonstrably improve library services.

Other types of consortia, such as national groups of similar libraries, do not offer all of these factors. They may offer others, such as a way for research libraries to cooperate, that are also very important but, in the United States, state-based cooperation makes sense for public institutions. Further, while not all of these factors apply to private institutions, they are still part of the state and can also realize benefits.

CURRENT STATUS OF STATEWIDE CONSORTIA

Statewide cooperation among academic libraries is not new. Virtually every state has some level of formal resource sharing among its academic libraries with Illinois, Minnesota, Wisconsin, Ohio, California, and Missouri being among the most advanced in their efforts over the past two decades. Of course, it should be pointed out that OCLC grew out of a statewide library consortium.

As pointed out above, however, most of these efforts focused on the physical sharing of printed materials through union catalogs, expedited
interlibrary loan, and shared or linked circulation systems. Recently, new statewide efforts have been undertaken, often with the expressed purpose of providing an electronic or virtual library, a core of electronic resources, as the focus. Many of the more established systems are also working to offer electronic resources, grafting them onto existing programs. The newer consortia also address the need for sharing physical resources. However, these newer consortia are focused more on electronic resources. They recognize that electronic resources will be increasingly important and that there are benefits in banding together to offer them, using the leverage of a group and the advantages of a common funding source. This is not to say that the more established systems are not interested in offering electronic resources, only that they were not founded for this purpose.

**Purpose of this Article**

This article will describe five of these newer statewide efforts. In alphabetical order, these are GALILEO in Georgia, the Louisiana Library Network, OhioLINK, TexShare in Texas, and VIVA in Virginia. In describing them, particular attention will be paid to:

- participating libraries;
- core programs;
- reason for formation;
- funding;
- involvement of the larger academic libraries in the state; and
- governance.

The similarities and differences of these five consortia will then be discussed and emerging patterns in statewide academic library consortia will be delineated.

**GALILEO**

*Background*

GALILEO is an acronym for Georgia Library Learning Online. The program originated and is operated by the University System of Georgia, which encompasses the thirty-four publicly supported colleges and universities in the state (Potter et al., 1996). The services offered by GALILEO include the expansion of the systemwide data network called PeachNet, the completion of retrospective conversion and automation, a courier service for delivery of books, high speed telefacsimile equipment, and an attempt to facilitate walk-in borrowing at all libraries. The core of GALILEO, however, was built around the idea of an electronic library starting with an abstracting and indexing database linked to the full text of the journals most needed by undergraduate students.
Participating Libraries

GALILEO originated with the thirty-four institutions in the University System of Georgia. These include four doctoral institutions, two regional universities, thirteen comprehensive colleges or universities, and fifteen two-year colleges. Funding was provided early in 1996 to add the headquarters libraries of the fifty-six regional public libraries. A grant was secured to add ten private academic libraries in the Atlanta area beginning in July 1996 and twenty-one other private academic libraries in the state also elected to join. In addition, funding was provided by the state to add the libraries of the thirty-two vocational-technical institutes in the state. Funding is being sought to add more public libraries and to add school libraries in the future.

Core Programs

The central activity of GALILEO is to offer a set of databases, including full text of core undergraduate journals, and to provide these databases from a common site on the World Wide Web. Using SiteSearch software from OCLC, several databases are maintained on platforms at the University of Georgia and Georgia State University, including many databases from UMI and Current Contents. In addition, access is provided to other services, including databases on OCLC FirstSearch, the online version of the Encyclopedia Britannica, reference databases maintained by Gale Research, databases maintained by Cambridge Scientific Abstracts, and the full text of journals published by Academic Press. An important service of GALILEO is to ensure that participating libraries have access to the Internet and the World Wide Web through PeachNet.

While GALILEO does provide some assistance in the sharing of collections through the facilitation of interlibrary lending, its signature function is the provision of an electronic library of databases and full-text resources.

Reason for Formation

GALILEO was formed because the leadership of the University System of Georgia was interested in cooperative projects that benefited all students and faculty and in projects that might be extended to the rest of the state. The library directors and one of the vice chancellors had been considering ways to improve cooperation using advanced technology and were able to respond to the University System with a proposal that emphasized the need to offer a common set of resources to all students in the system. This proposal was well received and recommended for funding.

Funding

Initial funding for GALILEO was provided by the state with about $10 million in start-up funds coming from the state lottery and ongoing funds of about $2 million per year being appropriated from both the
lottery and general revenues. The private academic libraries are supported to a large extent by a grant from a private foundation. The public libraries and the vocational-technical institutions are covered by direct funding from the state.

Involvement of Large Libraries

The University of Georgia, Georgia Tech, and Georgia State University, the largest libraries in the University System, were actively involved in the formation and operation of GALILEO. If participation of the largest libraries is critical to the success of a statewide cooperative project, GALILEO enjoyed this participation.

Governance

Initial governance of GALILEO was provided by a steering committee consisting of four presidents, four library directors, and a vice chancellor. Working groups were also formed—made up of librarians and technical staff from many campuses—to address particular issues. Governance later passed to a new steering committee consisting of library directors from the University System, representatives from a users council, and a liaison from the Vice Chancellor for Information and Instructional Technology. An advisory committee, consisting of presidents or chief academic officers, library directors, vice chancellors, and outside consultants, functions as a GALILEO oversight board and provides strategic direction. The University System operates GALILEO on a contract basis to the other libraries in the state. All participating libraries are represented on a users council.

LOUISIANA LIBRARY NETWORK

Background

The Louisiana Library Network builds upon the success of LOUIS (Louisiana Online University Information System) (Boe, 1996). LOUIS is a centralized library system operating out of Louisiana State University (LSU) that supports the online catalog and processing functions for eighteen academic libraries in the state using NOTIS. Federal funds were sought and secured to use the LOUIS computer platform to provide electronic resources, including the full text of journals, to academic, public, and school libraries throughout the state. The resulting project was termed the Louisiana Library Network.

Participating Libraries

Libraries involved in the Louisiana Library Network include the seventeen academic libraries in LOUIS plus a public library in each of the state’s sixty-four parishes and eighteen school libraries throughout the state. The public libraries were connected in the fall of 1994 and the school libraries were connected in the spring and summer of 1995.
Core Programs

Federal funds covered the cost of workstations and Internet connections in the public and school libraries as well as subscriptions for the databases, including full-text articles. The academic institutions also provide the public libraries with e-mail services. The basic programs, then, are Internet access, World Wide Web browser software, e-mail, access to the online catalogs of the academic libraries in LOUIS, and access to databases, including the full-text of journal articles. Available databases include several from UMI (Periodical Abstracts, ABI/Inform, and Newspaper Abstracts), some indexes from H.W. Wilson, and several from Pierian Press (A Matter of Fact and Directory of National Help Hotlines). Additional services are planned.

Reason for Formation

The motivating factor in the formation of the Louisiana Library Network was to provide enhanced library services to the citizens of the state. Sharing of existing collections was not the primary factor. Instead, the emphasis was on access to new electronic resources, including databases mounted on the LOUIS platform, and services offered through the Internet and the World Wide Web.

Funding

Initial funding for the Louisiana Library Network came from a federal grant. In 1994, a tariff was enacted to support network connections in educational institutions. This tariff reduced the costs of continuing the project after the term of the federal grant. Many of the ongoing costs of the network have been funded by the state legislature with some support by the Board of Regents. The costs of the network connections are borne by each library.

Involvement of Large Libraries

Louisiana State University, the largest library and the flagship university in the state, took the lead in establishing the Louisiana Library Network. As the host of LOUIS, LSU initiated the federal grant proposal that created the network. Leadership was provided by the Provost at LSU as well as staff of the library and the computer center. Technical support and direction was provided by LSU. Again, involvement of the largest library in the state appears to have played a crucial role.

Governance

LOUIS and the Louisiana Library Network are administered by a director and staff at LSU. This office operates the server, manages the database, maintains the communications network, and provides staff training. Oversight is provided by the Louisiana Library Network Commission, which also makes budget requests and other recommendations to the Board of Regents. The commission includes several academic library directors, the state librarian, and staff from the Board of Regents.
OhioLINK

Background

OhioLINK consisted originally of all state-supported universities plus two private universities and the Ohio State Library. Using a common vendor, each library operates its own integrated library system that in turn connects to a centralized system where an online union catalog is maintained. This arrangement permits users to identify and request materials held in the other libraries using current circulation information. A courier service is used to deliver materials from one library to another. In addition, OhioLINK maintains an assortment of databases. As with GALILEO, some are maintained on a central server while others are accessed through Internet gateway connections.

The school libraries and the public libraries have also formed networks in Ohio. INFOhio connects the school libraries and consists of over twenty sites where an integrated library system is installed. The Ohio Public Library Information Network (OPLIN) connects public libraries to the Internet.

Participating Libraries

OhioLINK began as a network for publicly supported universities and colleges but is expanding to include private academic libraries on a cost recovery basis. The state library was also included from the beginning. Altogether, OhioLINK includes fifteen state-assisted universities, seventeen separate two-year colleges, two standalone medical schools, and the State Library of Ohio. Two private institutions, Ohio Northern and Oberlin, have joined OhioLINK and nine others are planning to join. The school libraries and public libraries developing their own networks and connection to OhioLINK is viewed as a critical component. These are three separate projects, and the extent that databases and other resources will be shared has yet to be determined. While this may present a set of difficult issues, library networking in Ohio is extremely advanced.

Core Programs

Initially, the core program of OhioLINK was the sharing of print-based materials. It does this by linking the individual local automated library systems at the member libraries to a shared central system where a master union catalog is maintained. Users can determine whether a library holds a given book and if the book is checked out and can then issue an online request for the book if desired. A courier service is used to move materials among the member libraries.

OhioLINK has evolved to also provide electronic resources, including the full text of many journals and reference works, and today is a leader in the number and variety of databases available. These include databases from UMI, Wilson, Pierian Press, and OCLC. Many of these databases are mounted on a shared central computer, using software from
Innovative Interfaces and Ovid, while others are available through Internet gateway connections.

**Reason for Formation**

OhioLINK has its roots in an effort to control building costs by providing regional storage facilities and then expediting interlibrary borrowing using ready access to each library's catalog. From that standpoint, it began as an effort to promote the sharing of existing resources. However, its function has evolved to provide electronic resources, and it could be argued that its larger purpose now is to leverage the weight of its consortium for the purpose of providing as many electronic resources as possible at the lowest negotiable price.

**Funding**

OhioLINK funding has been allocated by the state legislature to the Ohio Board of Regents. In addition to ongoing costs, over $20 million in capital appropriations have been made since 1989 to support the installation of equipment and databases.

**Involvement of Large Libraries**

Ohio is fortunate to have five members of the Association of Research Libraries: Ohio State University, Kent State University, University of Cincinnati, Case Western Reserve University, and Ohio University. These libraries have historically demonstrated a remarkable spirit of cooperation, dating back to before the formation of OCLC. This spirit of cooperation continued with OhioLINK.

**Governance**

OhioLINK is administered by an executive director and staff in Columbus. Oversight is provided by a Governing Board consisting of twelve chief academic officers for the participating institutions. A Library Advisory Council comprised of the eighteen library directors of the original institutions plus three representatives from the community colleges and a law library representative also provides direction. In addition, there are four working groups and a technical advisory council.

**TexShare**

**Background**

TexShare is a joint effort of the publicly supported universities in Texas to provide a common set of electronic resources and to expedite the physical sharing of resources. The Texas Council of State University Librarians had been seeking funding for improved cooperation for a number of years. In 1993, they were successful in obtaining funds to support the planning and implementation of TexShare through the Texas Higher Education Coordinating Board. The first elements of TexShare became operational in 1994.
Participating Libraries

All fifty-two academic libraries at the publicly supported universities and health science centers in Texas participate in TexShare. These libraries are all represented on the Texas Council of State University Librarians, a long-standing body that worked for many years to secure funding for increased library cooperation using advanced technology. While TexShare is currently limited to state university libraries, it is hoped that many of its services can be expanded to all types of libraries in the state in the future. Also, there are similar projects underway for public and school libraries, and areas of overlap and possible cooperation are being explored (Martin, 1996). A committee of the state House of Representatives has been investigating how best to coordinate networking and resource sharing for all libraries in Texas (Martin, 1996).

Core Programs

The first program was the TexShare Gopher, introduced in June 1994, followed shortly thereafter by the TexShare Web. These two services are the primary information sources for TexShare, and many TexShare libraries use them as their principal means of access to Internet resources. The University of Texas at Austin serves as the host site for TexShare Web. TexShare also provides access to a variety of electronic resources, featuring both citations and full text of articles, using databases from UMI that are mounted at the University of Texas in Austin using the Ovid search engine. Other electronic resources are also available (Rooks, 1996). Further, TexShare supports the sharing of physical materials among the fifty-two participating libraries.

Reason for Formation

The Texas Council of State University Librarians lobbied for many years to acquire funding for a project like TexShare. The council promoted the need to provide a level playing field, to ensure that students and faculty at all the universities had access to the same types of materials available at the largest libraries. Initial funding was provided in 1993. Emphasis has shifted from sharing physical resources to sharing electronic resources. Increasingly, people have come to see "that its greatest potential lies in making electronic resources available collectively to all the institutions" (Rooks, 1996, p. 295). This is a large cooperative, and together these libraries have considerable purchasing power and the potential to achieve significant economies of scale by working together.

Funding

The funding agency for TexShare is the Texas Higher Education Coordinating Board. Funding was first provided by the state legislature in 1993, and the first programs were introduced in the fall of 1994. This funding supported the establishment of the TexShare Gopher and Web
hosts, access to the online catalog of each library, access to selected electronic index databases, access to commercial electronic document delivery services, and access to information available on the Internet. For the 1996/97 biennium, funding was requested to continue these services and to expand TexShare to include a greater variety of electronic resources.

Involvement of Large Libraries

As stated above, TexShare was initiated by the Texas Council of State University Librarians, a council representing all the public university libraries in Texas. With legislative funding through the Texas Higher Education Coordinating Board, the first two years of the project were managed jointly by the University of Houston and Texas A&M University libraries. The University of Texas at Austin, in cooperation with the University of Texas System Office of Telecommunications Services, managed the electronic information resources for TexShare libraries. These three provided leadership while recognizing that they are partners with the other libraries. To quote from the final report of the planning project: “At the level of an overall vision for service, it is the fulfillment of a dream that the student in Beaumont or Brownsville has access to the same level of information as the student in Austin or College Station. TexShare will turn this dream into reality” (Developing TexShare, 1995). This statement demonstrates a broad based dedication to promoting the education of students at all institutions.

Governance

A TexShare management team coordinates the project with the assistance of an advisory board that meets quarterly. Working groups have been formed to address specific issues, such as the selection of commercial databases, electronic document delivery, a standard library card, and an interlibrary loan protocol. The Texas Higher Education Coordinating Board oversees TexShare and is the recognized funding agency. As stated above, during the first two years of the project, management was provided by the University of Houston Libraries and Texas A&M University Libraries while the University of Texas at Austin managed the electronic resources. These services were provided by these three institutions under contract to the Texas Higher Education Coordinating Board. In the future, different organizations may receive the contract to offer TexShare services.

VIVA

Background

VIVA, the Virtual Library of Virginia, provides a set of electronic resources and expedited interlibrary loan to the thirty-nine state-assisted
colleges and universities in the Commonwealth of Virginia. The libraries of these institutions have a history of cooperation. Recognizing that the State Council of Higher Education in Virginia (SCHEV) would be receptive to proposals for enhanced cooperation, the library directors, in 1993, initiated a budget request for funds to use advanced technology to begin to build a "virtual library." Funding was approved by the General Assembly for the 1994-96 biennium (Hurt, 1994).

To the user, VIVA is a site on the Internet that provides access to a variety of databases, including full text, as well as expediting the physical sharing of resources. Some resources are mounted on servers in the state, such as literary texts offered through servers at the University of Virginia. Most electronic resources, however, are available through gateways to commercial servers.

**Participating Libraries**

The initial VIVA project included the libraries at the thirty-nine publicly assisted colleges and universities on fifty-one campuses. These libraries include the six doctoral institutions, nine four-year comprehensive colleges and universities, and twenty-four community and two-year branch colleges. To the extent possible, the twenty-seven private institutions in Virginia also participate in VIVA by obtaining discounts on electronic resources and other group purchases, by participating in the expedited interlibrary lending, and helping to plan and shape the project. The Virginia State Library has been included in the planning of VIVA from the beginning, and the hope is eventually to extend VIVA services to all citizens.

**Core Programs**

From the beginning, VIVA had two major components: to develop and share electronic resources and to expedite the physical sharing of traditional resources. The electronic resources that were made available include OCLC FirstSearch, citations and full text for journals provided by Information Access Corporation, online reference works like the *Encyclopedia Britannica*, and literary texts. Through central funding and central negotiations, VIVA recognized considerable savings from what would have been spent individually. All of these electronic resources are unified under a common site on the Internet supporting a variety of Web browsers. The physical sharing of resources has been improved through the universal use of ARIEL software and redesigned interlibrary loan protocols (Perry, 1995).

Beyond these two core components, VIVA is considering how it might influence teaching-learning models and also expand into cooperative digitization projects for the scanning, storage, and display of materials from the libraries' rare book and archival collections.
Reason for Formation

The library directors of the publicly assisted colleges and universities constitute the Library Advisory Committee of the State Council of Higher Education, Virginia. When the SCHEV signaled an openness to cooperative projects that would exploit available technology, the Library Advisory Committee was quickly able to develop and propose VIVA based upon several demonstration projects. Interested in how higher education might be restructured, SCHEV was looking for projects that tried new approaches. VIVA proposed to demonstrate how a consortium might better share existing resources and jointly acquire new resources at great savings. With the aid of SCHEV, the VIVA proposal was presented to, and approved by, the legislature.

Funding

Funding for the 1994-96 biennium totaled about $5.2 million. The SCHEV recommended a significant increase in funding for library materials with the understanding that a portion of this increase would be invested in VIVA. This funding was used to acquire databases, to equip resource centers to support the databases, to provide staff at the six doctoral institutions to expedite interlibrary loan requests, and to support other operations. For the 1996-98 biennium, the state moved to direct funding of VIVA and provided $4.9 million for its operations.

Involvement of Large Libraries

The publicly assisted colleges and universities in Virginia have a history of cooperation that serves as a foundation for VIVA. The six doctoral institutions have always supported cooperative efforts and VIVA was no exception. Many of the resources available on VIVA, such as literary texts, were developed by the University of Virginia. George Mason University provides administrative support and houses the VIVA project coordinator. All six doctoral institutions are committed to rapid response for interlibrary lending. Again, the involvement of the largest libraries is evident in a successful project and, again, the involvement is one of a partnering nature.

Governance

VIVA has attempted to avoid a large central staff to manage the project, employing only a half-time project coordinator. Instead, VIVA relies upon a number of committees, headed by a steering committee made up of library directors. There are also several working committees: the collections committee, the interlibrary loan enhancements committee, the special collections committee, the technical issues committee, and the user services committee. In addition, two staff members from the State Council on Higher Education serve as liaisons to VIVA. It should be stressed that higher education in Virginia is highly decentralized. The State Coun-
council on Higher Education is charged to recommend policy to the General Assembly. It does not function as a Board of Regents with budget and policy control.

SUMMARY

Beyond these five states, many others could be mentioned as taking new and innovative approaches to statewide cooperation. In the interest of space, however, these five are illustrative of the present situation with statewide academic library cooperation.

Basic Functions of the Consortia

There are three basic functions provided by these consortia. The first is the sharing of physical resources. To this end, union catalogs have been assembled, local systems linked together, interlibrary loan protocols established, courier services provided, and so on. The second function is to provide connections to the Internet and the World Wide Web, including the provision of workstations in some cases. The third function, and the one that is becoming increasingly important, is to provide access to electronic resources, either by mounting them on a local server or providing access to resources on other platforms. Even those consortia that started out with the initial objective of sharing physical resources, such as OhioLINK, are finding that the collective licensing of electronic resources is becoming increasingly important.

Formation and Evolution

All five of the projects discussed above began as consortia of the publicly supported academic libraries in the state. This can be attributed to the fact that these libraries share a common central authority—a central administrative office, such as the Chancellor in Georgia, a central board of regents as in Ohio, or a coordinating agency as in Virginia. This central authority encourages and promotes cooperation as a way to maximize the investment in existing resources and collections and to leverage future investment. Perhaps more important, this central authority provides a single funding authority. Further, the directors of these libraries in each state have a long history of association and cooperation, usually meeting regularly. In Georgia and in Texas, for example, the library directors had been discussing how to use information technology to better advantage for a number of years before funding became available.

The central authority in each case has been in place for years, and the library directors have long sought funds for programs to advance the cooperative use of advanced technology. These two factors did not come together to provide funding until recently, however. What is the factor that precipitated the financial support? In the case of Ohio, initial funding came from a determination to curtail requests for new library buildings. With the other four, funding came about more recently and, it can
be argued, that the main factor was momentum generated by the publicity and reputation of the Internet and the emerging World Wide Web. At a time when newspapers and popular magazines are filled with stories about the "information superhighway," it is not difficult to promote the idea that all schools and all libraries should be connected. Coupling this need for connectivity with the content that an electronic library can provide makes a powerful argument for funding a cooperative project.

The other argument that supports each consortium is the need for a "level playing field." This is an important factor in all of these consortia, the need to ensure a certain level of access to all users. Some may disparagingly call this the lowest common denominator. A more enlightened view recognizes that users at all libraries have a common set of needs. Some may be more sophisticated than others, but there is a core set of resources that all users need—e.g., core undergraduate journals, ready reference works, a corpus of standard literary works, etc. Moreover, it is chauvinistic to assume that only the larger libraries have sophisticated users. A student at a community college may have potential that could be unlocked by using a set of databases and texts that might otherwise only be available at a research library. Similarly, faculty at four-year schools may prosper if offered resources otherwise available only to faculty at comprehensive universities.

Each of the five consortia is at some stage of extending its services beyond the publicly supported academic libraries in the state. GALILEO now includes private academic libraries, vocational-technical institutes, and public libraries. The Louisiana Library Network includes public and school libraries. OhioLINK has added private academic libraries and is considering linkages to statewide networks for public and school libraries. VIVA includes private academic libraries and has a goal of expanding to other libraries in the state. TexShare is currently limited to the state supported university libraries but is included as a component in a comprehensive plan to network all libraries in Texas (Martin, 1996).

Again, it should be remembered that each of these consortia provide both content and connectivity. They provide a set of electronic resources that are valuable and needed, usually by assembling these resources on a common Web site. Equally important, they also provide connections and workstations that can access the Internet, the World Wide Web, and all the services that are available there. In the past, terminals were installed for library projects that were dedicated to that project. Now, these workstations might be set up to go first to the project's Web site, but users are free, even encouraged, to go beyond and search out other services and sources on the Internet. In Georgia, the workstations installed in the public libraries are more likely to be used for retrieving resources on the Internet than in using the specific services included in GALILEO.
It is also interesting to note that the services offered by these consortia are increasingly placeless and virtual. In the case of VIVA, the presence is primarily a Web site that unites a set of electronic resources on a variety of servers that are jointly licensed by the consortia. A few of these services are mounted on platforms in the state, but most of them are maintained on servers owned and operated by a publisher or other agency such as OCLC.

Vision of an Electronic Library

In all five states discussed above, there is an emerging vision of an electronic library for all citizens of the state. This is a powerful vision that has broad appeal to state government and local communities. It is also a vision that offers increasing economies of scale. If a consortium of state-supported academic libraries can leverage favorable prices from vendors, consider the leverage possible with a consortium that includes every citizen in the state.

The idea of all citizens having access to a common set of resources in an electronic library is appealing to many. It is a natural extension of the history of openness and freely available information that has characterized library development in this country for the past century. However, it is also dangerously easy to oversell this vision. The truth is that at present there are not enough electronic resources available to provide a truly satisfactory electronic library. Also, what is available can be expensive. While consortia can leverage better prices than libraries working individually, it will always be cheaper to do nothing.

The services offered by these consortia have, to date, been largely additions to existing and continuing services. They have rarely replaced print resources and thus have not resulted in cost savings. They have, however, provided resources to an audience that did not have them before, especially in smaller libraries and in distance education settings. They have also provided an increased level of service and convenience to audiences that already have large library collections available to them. In the consortia discussed above, the emphasis has appropriately been placed on the extension of services, on leverage in acquiring new services, and on the possibility of future cost containment. It would be unwise to promote these consortia as a way to reduce overall expenditures.

The funding of these consortia varies in amount and nature. OhioLINK is funded as a continuing item, the Louisiana Library Network started out with federal funding, GALILEO was funded initially from the Georgia lottery, TexShare received an ad hoc state appropriation, and VIVA was funded from an increase in the budget for library materials for the member libraries. Comparison of funding is difficult because different consortia pay for different things. For example, much of the start-up costs for GALILEO covered increasing the capacity of PeachNet,
the statewide telecommunications network. In other states, adequate network capacity was already in place. However, the common element in all five situations was that a case for the benefits of increased cooperation was made to a central authority, and this case was presented by a united group of libraries. Speaking with one voice appears to be a key in securing funding.

Role of Larger Libraries

A critical factor in speaking with one voice is the involvement of large libraries in the consortia, especially those that are members of the Association of Research Libraries. The presence of these libraries was important in each of these five consortia. Unfortunately, whether the purpose is to share resources or meet common needs, larger libraries sometimes do not see the benefits of cooperation. They have the largest collections and thus believe that they offer the most and have the least to gain from sharing resources. Further, they sometimes do not see that they have common needs with a two-year college or public library. Thus, in some cases, the larger libraries may stand off or limit involvement. In these five cases, the larger libraries were true partners in the development and continuation of the consortia.

Conclusions

Statewide consortia such as MINITEX in Minnesota, WILS in Wisconsin, and the LCS network in Illinois were established to share physical resources, to provide library materials to members. Over time, these established consortia have added services and begun to offer electronic resources as well. Newer consortia, such as GALILEO and VIVA, were established primarily to support electronic libraries—i.e., to offer new services that every consortium member needed but that not everyone could afford. The emphasis in these consortia is on sharing a set of electronic services more than on sharing of collections. In practice, no consortium is all one way or the other, but there is a shift of emphasis in the fundamental reason for the creation of the consortia.

In the creation of electronic libraries, a principal value of statewide consortia comes in license negotiations. The consortia bring considerable leverage because of the number of libraries involved, the number of users represented, and the fact that funding is available. Experience appears to indicate that there are benefits in inclusive licensing that brings together libraries of all sizes and types. While some may think that the inclusion of smaller libraries would reduce the set of databases to a lowest common denominator, limiting availability to very basic resources, it appears that the alliance of large and small libraries tends to raise the level of the databases offered. This may be because the inclusion of large libraries tends to increase the demand for research-oriented files, and
the smaller academic libraries benefit by gaining access to resources they would not otherwise have.

Database publishers of research-oriented files may not be responsive to adjusting their pricing to accommodate smaller libraries. However, the need for a level playing field, for offering a common set of databases to all members, should motivate those concerned to negotiate inclusive licenses. Further, it can be argued that smaller libraries will account for less use of research-oriented files because their enrollments are smaller and they do not have many graduate students or research faculty. Indeed, the success of these consortia to date suggests that publishers are open to licenses and pricing that are inclusive.

Beyond academe, considerable value may be realized by offering university level resources through public libraries and even school libraries. Of course, the use will not be as great as at a university, but this is an argument for reduced pricing, not for the exclusion of some class of users.

Perhaps the most interesting point that can be made about these five projects is that they are very diverse. For example, while they attempt to provide a similar set of services, they all go about it differently in terms of hardware and software used. This reflects a hidden value of statewide cooperation, an advantage that this country has over many others. Given funding, each state chose to achieve similar goals in somewhat different ways. The ability for different states to try different approaches is healthy. This situation also allows other states to benefit from their experience. In other countries, the approach to consortia would be much more centralized on a national basis.

As a federation of states, this country is blessed, or perhaps cursed, with at least fifty different entities looking for the best way to do something. This can be a disadvantage when a single national purpose is needed. However, it can be a real advantage in situations where experimentation is beneficial. In the case of offering electronic libraries, experimentation is valuable, even vital. Diverse attempts by different statewide library consortia to provide electronic libraries should be viewed as a healthy development, even as a situation that promotes the evolution of library services through a form of natural selection. The approach that is the most successful is likely to be the one that will be emulated or that will be extended to other states. Statewide cooperation has traditionally been and continues to be a valuable asset for libraries in the United States.

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REFERENCES


Resource Sharing in a Changing Ohio Environment

DAVID F. KOHL

ABSTRACT
Starting from the assumption that significantly expanded resource sharing will be a dominant feature of all twenty-first century libraries, this article identifies five milestones or landmarks which can be used to identify key tasks and chart progress. Joining a consortium, integrating intellectual access, providing for both physical and electronic delivery of materials, and integrating the collection development process are steps illustrated with primary reference to the OhioLINK (OL) experience. This article focuses on clearly identifying major issues in resource sharing and illustrating possible solutions with actual examples. The intent, however, is to educate and facilitate ongoing discussion rather than propose final answers.

INTRODUCTION
The saga of the Oregon Trail, also known as the European settlement of the Far West, has been evoked by writers and filmmakers alike through the use of landmarks. For the settlers themselves as well as later storytellers, the landmarks of the Oregon Trail provided both guidance in navigating an unfamiliar territory and benchmarks by which to measure progress. Arriving at Independence Rock to sign your name, sighting Chimney Rock rising above the endless plains, or being welcomed at Fort Laramie gave reassuring evidence to the settlers that they were still on track as well as providing a gauge by which to measure how far they had come—and how far they had yet to go.
As we find ourselves as librarians launched on a similar trek into the new digital information world of the twenty-first century—a strange and at times overwhelmingly demanding territory in which we nevertheless know we must learn to live and make our home—it may prove useful for us also to identify landmarks—landmarks which will serve both to guide us and to calculate progress. In Ohio, as we develop that twenty-first century communal academic library, a mosaic of integrated collections known as OhioLINK, we have begun to identify a series of landmarks along the trail which may prove useful to others. It may be important at this point to emphasize that we are not suggesting particular routes, only the more general guides and reference points which landmarks represent.

**LANDMARK 1: JOINING A CONSORTIUM**

By now it must be clear to all but the most Quixotically inclined that adequately supporting the academic research and teaching mission of a college or university primarily through the resources of a single institution no longer makes sense as an ideal, much less as a practical possibility. Diminished funding resources, increased research and instructional demands, and the accelerating infrastructure demands of mechanically mediated materials, require a resource base and staff support far beyond the means of any one individual institution.

The key here seems to be broad-based cooperation itself rather than any particular type of constellation. In Ohio, the consortium consists (for all practical purposes) of all the libraries in post-secondary educational institutions—i.e., universities, colleges, two-year schools, and associated medical and law libraries. However, the CIC (Committee on Institutional Co-operation) consortium consists only of libraries in the "Big Ten" schools plus the University of Chicago. Georgia’s GALILEO project includes the University of Georgia, Georgia State, and the state’s technical and private academic libraries. ILLCSO (Illinois Library Computer Systems Organization) includes forty-five academic and public libraries which share a union catalog and participate in a resource-sharing system called ILLINET Online. TexShare in Texas includes fifty-two libraries in public universities and health science centers and provides online access to member catalogs, expedites interlibrary lending, and provides a mechanism for cooperative purchasing. The VIVA (Virtual Library of Virginia) project includes libraries in thirty-nine Virginia public colleges and universities on fifty-one campuses plus some participation from twenty-seven Virginia private colleges and universities and focuses on coordinated statewide acquisition of electronic information resources and ILL enhancements. LOUIS (Louisiana Online University Information System) includes seventeen public academic libraries sharing online catalogs and electronic databases within the larger environment of the LLN (Louisiana Library
Network). This consortium includes an additional sixty-six public libraries and eighteen K-12 libraries. In addition to these established groups, there are a number of consortia in the process of forming or redefining their mission in Washington State, Minnesota, Missouri, Iowa, and elsewhere.

It is probably worth noting that there are other differences among these consortia as well. The technical means of cooperation varies from OhioLINK's common software and hardware to ILCSO's common LCS software to CIC's Z39.50-based interaction. Governance patterns reflect widespread differences, and even the financial "glue" which supports these consortia varies. Ohio's OhioLINK is state funded, CIC is membership funded, LOUIS/LLN began with federal, and is shifting to state, funding, and so on.

**LANDMARK 2: INTEGRATING THE SYSTEM—CATALOGS AND CIRCULATION**

Libraries have long cooperated with one another, but the clear direction of today's cooperative arrangements is a far cry from the traditional ILL agreements or cooperative arrangements allowing patrons reciprocal use and borrowing privileges between libraries. The underlying nature of those earlier arrangements clearly presupposed independent, largely self-contained, institutions cooperating at the fringes on a limited number of issues. The nature of today's cooperation is a much more highly integrated operation where key central functions of the cooperating libraries are linked. The result is a blurring of the independent self-contained nature of the individual libraries, as individual institutions are transformed into distinctive elements of a superlibrary information mosaic.

Sharing catalog information—either through a single union catalog or by providing electronic access via dialup, Gopher, or Web server—with a cluster of individual libraries seems to be the universal and traditional first step after an appropriate consortial group is established or joined. In fact, such arrangements are so common that it almost appears to be the law of nature; the first thing the members of a library consortium do is share catalog information.

By itself, however, shared information about collections does not represent the watershed step between cooperation and integration. An integrated catalog is not just the sum of all the catalogs in the consortium but a new creation. An integrated catalog, for example, would not contain multiple bibliographic records for the same item, rather only the best or most complete bibliographic record for an individual bibliographic item is used, with holdings instead of bibliographic records indicating the item's location in various consortial libraries. OhioLINK libraries, for example, continue to have their local catalogs, but bibliographic and holdings information is passed on to a central integrated catalog as described above. Not only does an integrated catalog facilitate some technical processes
such as system searching for items but—as in the case of OhioLINK—
provides a platform for efficiently adding supplementary bibliographic
information for individual books such as table of contents, index, and
book review information. Additionally and more subtly, it begins to
change the audience for the catalogers from a predominantly local one
to the broader concerns of a consortial audience. Most importantly, how-
ever, the consortium needs to provide a platform or environment which
allows central circulation.

One of the best examples of a consortium-wide circulation system is
OhioLINK's patron-initiated circulation which illustrates the kind of core
integration referred to above. Any OhioLINK patron can search any
OhioLINK catalog from the local library, their office, or their home; check
out any of the circulating material they have found anywhere in the sys-
tem; and have it delivered to their local library for pickup at their conve-
nience. It is not called ILL because the transaction is no longer a library-
to-library transaction in any significant sense but simply a patron request-
ing a known item from a known location within a single system. It is, in
essence, no different than an undergraduate requesting an item from the
closed stacks from a library similar to that of the University of Illinois—
except that the number of volumes available is significantly bigger, and
the process may be more convenient (e.g., it does not require the library
to be open). Such transformation of a key local function (circulation)
into a systemwide function illustrates particularly well why integration is
a much better word to use than cooperation in describing this new rela-
tionship among consortial libraries.

Here too the paths to this landmark can vary. OhioLINK has achieved
systemwide circulation by using common software and hardware so that
the individual libraries are easily linked to each other. CIC, on the other
hand, which has a multitude of hardware and software platforms, is ap-
proaching a common circulation function via Z39.50.

**Landmark 3: Delivery System—Physical**

In terms of our journey, this landmark appears almost simultaneously
with the systemwide circulation system. Like the idea of one hand clapping,
bibliographic and inventory control systems make no sense without
a full-text document. In most of our libraries, the vast majority of the
information available is housed in books or bound journal volumes. If
the virtual library of a consortium is to be a reality, it is necessary that
these materials must be capable of being delivered quickly, reliably, and
cheaply to wherever they are needed. While libraries have always shipped
physical items back and forth for ILL, the difference which the virtual
library represents is the scale and importance of moving materials. Mov-
ing materials no longer represents a fringe activity involving a fraction of
a percent of total local circulations. At the University of Cincinnati, for
example, we now ship or receive over 5,000 OhioLINK volumes a month with the numbers still dramatically increasing. It seems likely that within a year, when all OhioLINK libraries are actively using patron-initiated circulation, these OhioLINK transactions will account for over 10 percent of Cincinnati's total circulation activity. Systemwide for OhioLINK, patron-initiated circulation deliveries are now in excess of 11,000 a week and between 1994 and 1995 (admittedly a growth period) increased at a rate of 319 percent.

Implementation of such a system, however, is far from being a simple process. The faculty and students will only accept the virtual collection of the superlibrary concept if physical materials really can be delivered quickly, conveniently, and reliably. Since these are all relative terms, it is important to know what they mean in practice. OhioLINK experience can be particularly instructive. We have been delivering materials among OhioLINK libraries on a statewide basis for almost two years. Contracting with a private delivery company (Pony Express—also recently selected by CIC to deliver materials among their libraries), deliveries are made to every OhioLINK library on a daily basis, five days a week. Any OhioLINK patron may request any available item from any OhioLINK library and have it delivered to his or her home library for pickup. This patron-initiated circulation only requires the patron, once they have found a desired item in the database, to enter their name, ID, and home institution. A call slip is generated in the circulation department of the holding library, a student retrieves the volume and provisionally checks it out to the requesting patron and then puts it in a Pony Express mail bag, which is sent to the patron's home institution. When the patron picks up the item, the provisional checkout is changed to a regular chargeout.

All OhioLINK libraries have covenanted to process OL requests within twenty-four hours, so with the twenty-four hour commitment from Pony Express, materials theoretically take forty-eight hours to arrive after being requested. In the real world, of course, there are always complications—e.g., staffing problems at circulation desks, physically remote branch libraries, books missing from the shelves but not noted in the record, etc. Nevertheless, repeated studies (unpublished OhioLINK internal studies) have shown that almost half (41-44 percent) of the requested materials are delivered within forty-eight hours while almost three-quarters (71-75 percent) are delivered within three days. Approximately 12 percent of the materials cannot be delivered for various reasons, primary among them: items missing from the shelves which the record lists as available. System enhancements already underway allowing local libraries to easily pass on such requests to other holding libraries are expected to reduce the no-fill rate to less than 5 percent. After some early system and organizational problems, the system has become reliable enough so that it is no longer necessary to notify patrons that their
materials have arrived; they are simply told to expect the materials to be there three to four days after they place their request. If they wish, skeptical patrons may also monitor the progress of their request by calling up the “View your record” function of the system, which allows them to confirm that their request has indeed shown up at the holding library and that the library has shipped it.

This system of consortial circulation has been a resounding success; faculty and students are universally excited and pleased. It would be hard for them to be otherwise since forty-four academic libraries in Ohio are now able to offer their patrons a library of 20 million volumes. The key, however, is not just the vastly larger collection potentially available to them but the three delivery factors mentioned above—speed, reliability, and convenience—making it a practical reality as well. A request delay of no more than three to four days, a probability of 95 percent or greater that the item will indeed show up, and the ability to enter a request for delivery immediately from the search screen that displays the desired item, seem to be the principal requirements for gaining widespread faculty and student acceptance of a virtual—i.e., physically dispersed—collection.

For the libraries themselves, there are two additional considerations—delivery cost and staffing. One of the advantages of a truly mass delivery system (in contrast, for example, to traditional ILL) is extremely low unit costs. The most recent internal study of OhioLINK delivery costs (excluding library staff costs) shows a per item round-trip expense of under 50 cents. Library staffing is a more complex issue. Clearly OL circulation continues to have an advantage over traditional ILL because the automated nature of the system allows most of the work to be done by the patrons themselves supplemented only by student workers—generally the cheapest staff available to academic libraries. But while the unit costs are extraordinarily low, the sheer volume of requests does add up. Almost all OL libraries have had to add staff to their circulation units or, in the case of the University of Cincinnati, create a separate circulation unit to deal with OL lending/borrowing. It is primarily a matter of perspective. In an absolute sense it does add significant costs to the library; in terms of unit costs, OL borrowing is clearly extraordinarily cheap and is the only way each of the OL libraries could afford to effectively add from 16.5 to 19.8 million volumes to each of their collections.

The OhioLINK wagon train has not completely passed this landmark, however. There appears to be one incomplete but important feature for this area—electronic browsing. One of the problems which faculty have with a virtual library is the inability to browse the collection. Discussions with faculty, however, suggest that it is not prowling about in dimly lit stacks to find dust covered books that is the attraction in browsing. Rather, pulling a book off the shelf to check the table of contents, flip through the index, and generally size up the book tends to be the attraction. In
other words, it is the inadequacy of the bibliographic information in the catalog that often makes browsing necessary. The solution to this situation is to enrich the catalog record by adding the book's table of contents and index information. In addition, the electronic catalog also allows librarians to add links to book reviews, Web sites, and other related information. Ultimately, enriching the record to allow significant electronic browsing will not only solve the problem of browsing the dispersed collections of the electronic library but may well ultimately make physical browsing the less desirable alternative.

**LANDMARK 4: DELIVERY SYSTEM—ELECTRONIC**

The best way for consortia to deliver full-text journal articles is electronically. Legal uncertainty and an aggressive stance by publishers makes it presently difficult for consortia to deliver electronic copies of articles within the traditional ILL fair use context. While technologies which result in direct print copies being produced at the requesting library—i.e., fax—are tolerated by publishers as long as CONTU guidelines are observed, delivery of electronic information which remains in electronic form at the delivery site is unacceptable. The publishers fear that electronic information per se is too easily retransmitted or even generally broadcast to the whole library community. This state of affairs will probably continue until either legislative, CONFU (Conference on Fair Use), or perhaps judicial resolution is achieved. In the meantime, there appear to be two different principal strategies which allow libraries to bypass the legal risk of fair use in the dissemination of electronic data.

The first is the use of aggregators. Analogous to the use of journal vendors such as Faxon, EBSCO, and others, aggregators make deals with individual journal publishers to provide electronic versions of their journals to customers. The library then only has to make a package deal rather than negotiate with each individual publisher. While a number of companies, including OCLC, are seeking to become aggregators, unusual historical circumstances have made UMI the first company to function in this regard. Contracts established with publishers years ago to allow microfilm distribution were quickly used by UMI to deliver electronic full-text articles for selected journals in their Periodicals Abstracts and ABI/Inform databases through a series of products culminating in ProQuest Direct. OhioLINK was an early beta tester of this program in its libraries. Originally UMI delivered the full text through a series of local CD jukeboxes with 800 or more CD-ROMs per jukebox. OhioLINK was then able to provide networked access to the jukeboxes from a central site and is now working with UMI to provide enhanced—non-CD—access from their corporate home in Ann Arbor, Michigan. This last step is important since, for high volume mass delivery, the jukebox technology does not work well; it is too slow and is mechanically complicated.
The volume of requests to OhioLINK is indeed great. Delivering full-text articles to every publicly supported academic library in the state of Ohio for over 600 journal titles is not only a very popular service but a very big business. In Fall 1995, with only thirteen of the OhioLINK libraries hooked into the service, up to 20,000 articles a week were being delivered. At the University of Cincinnati, where the UMI program was well established, up to 1,000 articles a day were being delivered. In 1995-96, articles were delivered only to libraries, but pilot projects are already underway to deliver the articles directly to office and home fax machines with the ultimate goal being the requesting and delivery of full-text articles at any time to any place. The cost is also modest with the page costs for content in the ten to twelve cents range, the equipment costs in the three to four cents range, and the paper and toner costs in the two to three cents range. Initially the electronic format has been image, but experiments have begun with ASCII formats which have advantages in terms of file size, display on low end terminals, and manipulability. In any case, as was true of patron-initiated circulation, full-text delivery also is an extraordinarily popular service. Even when print copies of the journals are available in the stacks, they are now seldom used if patrons can find them online.

The second solution to the problem of electronic delivery is negotiating a licensing agreement directly with a publisher for full-text delivery of all titles produced by that publisher. If aggregators represent a broad horizontal approach stretching across publishers, then single publisher agreements represent an in-depth vertical approach to titles and articles. In the past year, the most active publisher talking to a number of consortia has been Academic Press, but others, such as Elsevier and Springer, have recently joined the conversation in an increasingly serious way. The first large-scale single publisher contract signed took place in July 1996 between Academic Press (AP) and OhioLINK. There are a number of issues to consider in negotiating such contracts, and OhioLINK may once again be instructive.

Although publishing a journal in electronic format is theoretically cheaper than publishing it in print, publishers universally expect a premium for providing electronic access. Since for the present they must publish in both print and electronic format, there are little savings in providing electronic versions of their journals and many startup costs. It is also probably fair to say that electronic versions will get wider and heavier use than print versions. It is, therefore, difficult to argue that a small surcharge for electronic versions of established print journals is completely unjustified. How much that surcharge will be depends on negotiating skills. In the case of the OhioLINK-AP agreement, it was 10 percent over the combined cost of the present AP subscriptions for all OL institutions.
While the complete terms and conditions of the agreement are too extensive to detail here, the basic outline can be given. In return for an annual OhioLINK subscription of over $1 million a year, OL libraries may each maintain their current print subscriptions plus have access to all 175AP titles in electronic form. Should libraries wish to increase the number of their print titles from Academic Press, they may do so at heavily discounted subscription prices. Although it was not explicitly dealt with as such, it was important to many of the libraries that this agreement needed to have some kind of “fair use” quid pro quo built in. Whether seen in this light or merely as the result of bargaining and compromise, the OhioLINK-Academic Press agreement allows unlimited use of the electronic articles in OL library coursepacks, local online reserves, and classroom use. A very difficult area involved the use of electronic articles in interlibrary loan agreements between OL and non-OL libraries. Clearly the publisher did not want OL libraries to supply the world with easily duplicated electronic copies of Academic Press titles; the libraries on the other hand needed to maintain their networks of interlibrary loan agreements which often extended beyond the OhioLINK libraries. After the negotiation almost came to grief on this issue, a formula was finally worked out. Libraries could continue to share AP articles under CONTU guidelines as long as: (1) the library subscribed to a print copy of the journal, and (2) the library provided the requested copy in print and not electronic format. Not perfect for either party perhaps, but a solution which both sides could live with. The agreement covers multiple years, allows libraries to change their mix of print Academic Press subscriptions, and includes a cap on inflationary increases balanced by a guarantee that libraries would not reduce the overall revenue stream (plus electronic supplement) from OL libraries.

An important element included in the agreement is a provision for ongoing access to articles published during the time of the agreement in the case that the agreement ceases. If the agreement is terminated for whatever reason, those electronic articles which were made available during the time of the contract will continue to be made available to OL libraries by the company. For the present, long-term preservation will continue to be handled by archiving print copies.

During the contract period, the method of accessing the electronic journal articles will change. The first means of access will be through the Web. Patrons in OhioLINK libraries will connect to the AP Web site and look up the journal and then the desired article. Since the full-text files will be in PDF format, allowing both text and graphics, it will be necessary to use Adobe Acrobat reader to view the articles. The development path beyond this initial point remains undecided. If the bandwidth is sufficient, it may make most sense to continue to send OL patrons to the AP Web site. Otherwise, it may turn out to be desirable to have OhioLINK
load the files and provide them from the OL central server via Webpac. The key issue, however, will not be straightforward access but integration. The desirable endpoint is to allow the patron to conduct an OL search on a topic, title, or author and receive hits on AP full-text articles as well as on books and other materials in the collection. That will require linking present bibliographic indexes directly to the full-text articles—i.e., two different databases from two different publishers—and this is not a trivial task. Use of SICI (Serial Item and Contribution Identifiers) identifiers seems to be a promising avenue, but considerable work and experimentation will be required on all sides.

While the OhioLINK-AP agreement includes pros and cons for both parties, the overall agreement represents strongly positive solutions to critical problems for both sides. It allows a publisher to stem the tide of journal cancellations (and revenue decline) while allowing libraries to not only control inflationary increases and provide the advantages of electronic full-text access for library patrons, but also to significantly increase the number of journals available to their patrons as well. For example, only four OL libraries currently subscribe to more than half of the AP journal list. Hence the agreement represents the equivalent of hundreds of new subscriptions for OhioLINK libraries. Libraries are also advantaged by their ability to move ahead with providing AP articles in academic programs (coursepacks, reserves, etc.) as well as the elimination of any need to provide ILL copies between OL libraries for AP articles and the consequent reduction in demands on staff to handle such traffic and the considerable record keeping which attends such demands.

LANDMARK 5: INTEGRATED COLLECTION DEVELOPMENT

The final landmark for the present journey is integrated collection development—the most advanced form of coordinated collection development. Historically, coordinated collection development has had two key problems. In a pre-electronic world, there was always the underlying problem of who got physical possession of the jointly purchased item. Since a physical item could only be one place, there was always an awkwardness about the reality that whoever actually had the item had better access than others who might have jointly contributed to its purchase. Even where the focus was on not duplicating collections rather than joint purchase—e.g., California—the holding institution always had a major advantage in terms of access. This simple physical fact did much to undermine such agreements.

The second problem was the sharing mechanism itself. Although shared catalogs, especially electronic ones, have solved the problem of bibliographic identification and location, actually exchanging materials via interlibrary loan offices was both time consuming and expensive. The combined costs for an ILL transaction—i.e., costs to both the requesting
and lending library—have been determined to be over $30.00 per trans-
action. Turnaround time to request and receive an item even in the best
ILL systems has been typically measured in weeks or longer. And finally,
patrons are typically required to go through a cumbersome process of
filling out ILL forms which then had to be turned in to the library. While
all this is not a major problem for dealing with a relatively few items
peripheral to the collection, it is an inadequate basis for the high volume
and regularly needed materials of a highly dispersed virtual collection.

In such an environment, it is difficult to convince faculty, graduate
students, and often even librarians that any form of coordinated collection
development which may locate needed collections in other institutions
is actually a feasible solution. Even the huge financial pressures
generated by inflationary serials price increases has done remarkably little
to move institutions in this direction. What the OhioLINK experience
seems to clearly demonstrate is that coordinated collection development
must be the last, not the initial, step in the formation of a superlibrary
consortium. Until librarians can demonstrate to patrons that an actual
working system is in place that allows them to conveniently, speedily, and
reliably get the materials they need from other locations and institutions,
it is difficult to make any kind of truly serious case for not just coordi-
nated, but integrated collection development.

While it is still in the development stage for OhioLINK libraries, there
is a cautious but growing optimism that the widespread and enthusiastic
embrace of the patron-initiated circulation system will provide exactly
the foundation needed to gain general acceptance of integrated collec-
tion development. As OhioLINK libraries have begun work in the past
year to actually implement such a program, a number of points seem to
be emerging.

The first point is the limited value of the conspectus approach—at
least as it has traditionally been used. In terms of determining present
collection strength and depth, the conspectus is a wonderful tool. It is,
however, very time consuming and labor intensive to undertake. And for
a future commitment to developing a subject area at a given level and
depth, it is helpful mainly for the descriptive framework—i.e., a common
language identifying subject categories and collection levels—which it
provides. Past subject areas and collection levels of coverage are not nec-
essarily indicative of future intentions. Thus, although OhioLINK librar-
ies started down the road toward integrated collections by beginning con-
spectus studies, it soon became clear that such thoroughness would take
years and impose almost intolerable workloads on library staff. Since, as
a practical matter, future intentions and commitment were more impor-
tant than past practice, the development of a universal conspectus cover-
ing all subject areas in all libraries was put on a back burner. Instead
attention has been focused on identifying subject specialists, pulling
together appropriate subject groups, providing them listservs, and in general getting on with the main purpose—i.e., identifying who will be responsible for what subject areas and at what collection level.

Although it has not yet been formalized, there seems to be a growing OhioLINK consensus about the nature of the integrated collection. Core materials—i.e., basic undergraduate collection type of materials and locally heavily used materials needed more than once a semester/quarter—probably need to continue to be purchased for the local collection. The integration comes exclusively at the "research" or "comprehensive" level or for local specialties such as Wright State's collection on the Wright brothers. This additional narrowing of the focus further helps reduce the overwhelming nature of the task at hand.

The second point, and basically a tactical one, is adoption of the "lumpy oatmeal" approach. In the real world, progress seldom proceeds in a smooth and uniform manner. People, being individuals, move at different speeds, have different energy levels, and get fired up about new ideas at different times. There are early adoptors and footdraggers. As a consequence, some of the subject groups have practically formed themselves—e.g., music librarians—while others need prodding and encouragement. Rather than try to force everyone to march at the same pace, however, the idea is just to get everyone in motion and then let the faster moving groups educate and bring along the slower groups.

A third and critical point is the need to fundamentally change local collection development policies. The required change is not just a matter of readjusting subject areas and collection levels but a change in the nature of the collection-development policy. Traditionally, collection development policies have been predicated on the idea of ownership. In crassest terms, a traditional bibliographer collects as much in a given area of responsibility as he or she can until the money runs out. To the degree the traditional policies reflect any reality, they are tied to funding and predicated on ownership. Another model of collecting—corresponding to the consortium-wide concept of an intellectually integrated but physically dispersed collection—is possible, however.

Beginning from the concept of access rather than ownership, the first question this model asks is not how large the budget is, but what are the information needs of students and faculty? Once these needs have been determined, the bibliographer articulates a strategy for meeting these needs. Just as a reference librarian does not need to know all the answers but only where to find the answers, so the new bibliographic role does not require the bibliographer to provide everything on-site but only to establish from where and how the materials may be provided. Of course, part of that strategy continues to be the purchase of locally held materials. But other parts of that strategy identify materials which will be provided from other institutions; identifies which journal articles will be pro-
vided through subscription and which by individual purchase; identifies which materials will be provided from outside or from locally networked electronic sources. In short, the bibliographer's task changes from simply purchasing to providing a complex and comprehensive strategy of access. The deliberate mapping of the "out there" constitutes a key new role for the new bibliographer. Even further, however, the bibliographer's role does not stop with merely identifying the various paths to information but includes creating them as well.

As many of the foregoing comments on OhioLINK activities have indicated, responsibility for creating access can range from working with commercial vendors to create new products and information services for patrons to working with consortial colleagues to define reciprocally beneficial collection areas. Clearly, such a more active and wide-ranging definition of bibliographer responsibilities represents a major shift in the bibliographer assignment as well.

**CONCLUSION**

Joining a consortium, integrating intellectual access, providing for physical and electronic delivery of materials, and integrating the collection-development process are all distinct and important steps in moving toward the twenty-first century library. While the means for accomplishing these steps may be—indeed certainly will be—different for different institutions and consortia, the experience of the OhioLINK libraries may be helpful—either as a positive model or as a warning example. In any case, clearly identified landmarks represent important goals and milestones for measuring our common progress on a journey through a new and unfamiliar landscape.
Building the Infrastructure of Resource Sharing: Union Catalogs, Distributed Search, and Cross-Database Linkage

CLIFFORD A. LYNCH

ABSTRACT

Effective resource sharing presupposes an infrastructure which permits users to locate materials of interest in both print and electronic formats. Two approaches for providing this are union catalogs and Z39.50-based distributed search systems. The advantages and limitations of each approach are considered, paying particular attention to a realistic assessment of Z39.50 implementations. This article argues that the two approaches should be considered complementary rather than competitive. Technologies to create linkage between the bibliographic apparatus of catalogs and abstracting and indexing databases and primary content in electronic form, such as the new Serial Item and Contribution Identifier (SICI) standard are also discussed as key elements in the infrastructure to support resource sharing.

INTRODUCTION

Effective information access within a library and, to an even greater extent, interlibrary resource sharing, both presuppose that library patrons have the ability to effectively identify and locate materials of interest. As library materials include an increasing amount of electronic content, even materials that are part of the "local" collection may not be stored on site. With the growth of resource sharing as an explicit strategic response to the inability to fund sufficiently comprehensive local collections, access across multiple collections is becoming increasingly critical. Specifically, the ability to locate and identify materials in this context implies that patrons must be able to search the holdings of multiple li-
Libraries and to navigate among disciplinary or citation (abstracting and indexing) databases defining logical views of a literature and primary content (both in printed form and electronic formats). Three key technologies to support these requirements are union catalogs, distributed search, and cross-database linkage systems. This article attempts to take a realistic look at these infrastructure components and examines the promises and limitations of the technological approaches available to implement them.

We have come to take the relatively mature and well-tested technology of union catalogs (both in the narrow sense of union catalogs for clusters of libraries and the broader sense of international community-wide union catalogs such as those offered by OCLC and RLG) very much for granted and, at least in our rhetoric, sometimes cast them as archaic constructs that will soon be replaced by fully distributed search approaches enabled by standards such as the Z39.50 computer-to-computer information retrieval protocol. The development of Z39.50 from an experimental protocol to a viable commercial technology has given rise to a great deal of confusion. Z39.50 is a seriously misunderstood standard. Common perceptions of the capabilities of this standard, and of systems that implement it, have shifted from skepticism to unreasonably high expectations. The limitations of Z39.50, both as a protocol and as deployed in current implementations, are discussed in some detail.

This article will make the argument that, in practical terms, the union catalog is far from obsolete—indeed, union catalogs complement the emerging distributed search models by offering substantially different functionality, quality, performance, and management characteristics. The key question for libraries and their patrons is how to use most effectively the two approaches together.

Abstracting and indexing (A&I) databases are now well established resources for library patrons that exist alongside the various types of catalogs; increasingly, the extended functionality of local integrated library systems and the availability of Z39.50 is making it possible to offer access to catalogs and abstracting and indexing databases through common user interfaces. The multiplicity of partially overlapping A&I databases available to users is beginning to raise design issues that have considerable similarity to those involved in the development of union catalogs. In addition, A&I databases need to be linked both to the catalogs and to lists of serials (representing print holdings) and to electronic primary content that is now becoming available on the network. The final sections of the article examine some of these issues.

THE FUNCTIONAL CHARACTERISTICS OF A UNION CATALOG

Union catalogs provide a coherent view of the holdings of multiple libraries or library collections. They go beyond the normal functions of
a single-collection catalog, not only bringing together works by the same author or about the same subject in response to user queries, but also by bringing multiple instances of the same work (perhaps described differently by different institutions) together for the user searching the database. They often offer uniform (or unifying) name and subject authorities as a means of furthering the basic catalog objectives of bringing together works of common authorship or subject; this can compensate for variations in cataloging practice among the participant collections.

Union catalogs provide users with the ability to perform consistent searching of records from multiple institutions, in the sense that these records are indexed consistently. (For example, there is uniformity in the choice of fields from the records used to construct the various search indexes and also uniformity in the way in which search keys such as keywords or personal names are extracted from these fields and normalized for indexing.) In contrast to distributed search approaches, a union catalog almost trivially ensures consistent query interpretation—for example, the application of personal name algorithms and the treatment of case and punctuation in search terms in the user query.

Finally, a union catalog is presented to its users as a high-quality managed information access system. This means that the system should meet standards for reasonably rapid and predictable response time, high availability and reliability, and good communication about outages; and the user should expect its behavior to be highly repeatable from session to session.

To this point, I have described functional characteristics of a union catalog, independent of implementation; in theory, such a union catalog could be implemented by a single centralized database, a distributed database which is centrally administered, or by a user interface to a distributed search system which accepted user queries, derived and dispatched appropriate queries to multiple autonomously managed heterogeneous databases and then post-processed the results for presentation to users. In practice, all of the systems I know about which meet these functional criteria are essentially centrally administered systems. The distinction between a centrally designed and operated system that is implemented as a centralized database and one that is implemented technically as a distributed database is increasingly meaningless; even a single large mainframe is now effectively a set of distributed machines on a very fast local area network. Thus, for the purposes of the discussion here, I will contrast the centrally designed, managed, and operated implementation with the distributed search model, which is characterized by heterogeneity and local autonomy in the design and management of the individual databases.

The next few sections will be an examination of how centralized implementations of union catalogs meet the functional characteristics—the
broad areas of consistent searching/indexing, consolidation of records, and performance/management—described above. I will then examine the technology of distributed search and consider the extent to which it can meet the same functional objectives.

**Centralized Implementations of Union Catalogs**

Online union catalogs have been around since the 1970s. They take three major forms which reflect evolutionary paths of development and, to some extent, the business and organizational models that currently support them.

*Commercial Services.* Commercial services—i.e., OCLC, RLG, WLN—are services where one pays to search (either transactionally or by subscription) and where the databases were at first a byproduct of very large-scale shared cataloging activities. These are the largest of the “union” catalogs, but they really represent multipurpose national or international resources rather than the union catalog of a specific organized community of libraries (though with appropriate search restrictions they can fill that function). These systems do not have real time links to institutional integrated library systems; they cannot, for example, indicate the circulation status of materials at holding institutions. These union catalogs include links to complex sophisticated interlibrary loan requesting and routing systems. Record consolidation approaches in these systems are strongly influenced by the design objectives of the shared cataloging activities that created them rather than the needs of patrons who want union catalog services. OCLC, for example, retains one base record, whereas RLG retains records for each contributing institution; neither approach is optimal from the union catalog standpoint.

*Union Catalogs.* Pure union catalogs, such as the University of California's MELVYL system, were developed specifically as public access union catalogs rather than as outgrowths of shared cataloging systems. These systems are only now starting to integrate with external integrated systems belonging to contributors via distributed computing technology in order to provide patrons with information such as real-time circulation status. These systems typically have at best limited links for forwarding requests to external interlibrary loan systems. In these systems, consolidation is designed specifically to address the needs of users to see multiple cataloging of the same work brought together.

*Shared Union Catalogs.* Shared union catalogs are part of an integrated library system shared by a group of libraries. Here there is very close integration between the catalog and other information about materials contained in the integrated system, such as circulation and serials receiving data. Typically these systems offer sophisticated direct borrowing or interlibrary loan among the libraries sharing the system. Because of the need to maintain individual site records for cataloging purposes,
the emphasis on consolidation is lower than in pure union catalogs. Examples include the Florida State Center for Library Automation and, to an extent, OhioLINK. Many large multibranch public libraries also use systems of this type. The vast majority of these systems still run on large mainframes, typically IBM or IBM compatibles.

Searching and Indexing Consistency

Because all records in a central union catalog are indexed in the same way, and all searches are processed through common software, searching and indexing consistency is almost axiomatic in a centrally managed implementation. Some indexing inconsistencies may appear because of varying cataloging practices used by the contributors; different systems have assigned greater or lesser emphasis on implementing software to smooth over these inconsistencies by performing source-specific record reformatting and/or indexing.

It is worth noting that searching and retrieval technologies based upon forty years of research in information retrieval are starting to appear, finally, in production systems. For example, a tremendous amount of work has been done on ranking retrievals in response to a query. The commonly used ranking schemes assign a rank to each record in the result set based on both the properties of the record and the statistical properties of the database from which it has been retrieved—the most common of these being variations on the so-called term frequency/inverse frequency distribution weighting for each term.

These technologies are all based on single database models which fit naturally with the union catalog environment. Combining ranked result sets from multiple distributed databases, or ranking the results that have been obtained from multiple distributed databases accurately without having a full characterization of the statistical properties of terms in each database from which a result has been retrieved remains an open and difficult research problem.

Consolidation

Just as with indexing, different union catalogs have placed differing emphasis on the importance of consolidation and the lengths to which they will go in performing record consolidation. These choices are strongly influenced by the context in which the union catalog was developed as discussed above.

One of the most striking and little-recognized characteristics of union catalogs that do attempt extensive consolidation is the amount of batch processing time that is typically spent in dealing with database quality and consistency issues. In a real sense this is off-line precomputation to support user needs to see a coherent picture of the union database. OCLC has had a large-scale program underway for some years addressing database quality through algorithmic record editing (sometimes with manual
review) and duplicate detection and elimination—which is their view of consolidation, given that they maintain a single “correct” base record for each work and do not record institutional cataloging variations for these records in their database. As another example, the MELVYL system incorporates a very expensive record consolidation process as part of its loading process; the result of this highly I/O bound process is that MELVYL can only load about 1,000 to 2,000 bibliographic records/hour/load stream on high-end IBM mainframe hardware. This consolidation process actually searches the database for candidate matches as each record is loaded, and then, for members of this candidate match set, performs a very complex field-by-field comparison and weighting to decide whether to consolidate the incoming record with one of the records in the candidate pool; in cases where consolidation occurs, individual contributor site cataloging variations are recorded and maintained on a field by field basis. In some cases, these variant fields are all used for indexing and display purposes; in other situations, a “best” version of a field is selected for display or indexing purposes.

Certainly, high-quality consolidation is possible in centralized union catalogs that have made it a priority, though this is often achieved at the cost of considerable background processing and software development effort.

Performance and Management

The management of large centralized database systems supporting high query volumes is now a relatively well understood process. Except for the network connections out to the end-user, the managers of such a system can typically control all of the variables and add capacity (disks, I/O channels, CPU cycles, etc.) as needed. There are sophisticated tools for measuring response time and system utilization and for performing capacity planning. Typically, there are extensive quality assurance and release management procedures in place for moving new operating system and applications software into production.

Union catalogs scale well. Search response time is typically primarily a function of the number of unique records. To the extent that the union catalog performs extensive consolidation, the number of unique records will grow slowly at the margin. Because indexes typically use B-tree type data structures, the number of additional I/O operations necessary to service a query will grow logarithmically in the number of unique records (or index terms derived from these records); there is also a linear component due to the increased size of the hit lists. When a new institution joins an existing union catalog, the additional load will be determined by the increase in query volume that the new institution generates and the additional per query cost, which is likely to be relatively low. It is only in situations where the union catalog is retrieving circulation status for each
holding institution on each record that the additional load for a new institution will be really significant. Put another way, adding a new institution typically exacts only a small cost in terms of increased resources per query.

**Distributed Search and Z39.50**

In the past few years, the concept of distributed search using Z39.50 has been proposed as a substitute for creating a "static" union catalog. Basically, the idea here is that some method is used to identify a set of online catalogs which logically represent a union catalog, or which are to be viewed as a union catalog for the purposes of a given user query. The remote systems which will contribute to this temporary virtual union catalog might be relatively fixed or highly dynamic and variable. The user then submits a query to a distributed search interface, which might be provided by the consortium offering access to the virtual union catalog or might be provided directly to the end-user by some third party. This distributed search interface translates the user's query into an appropriate query for each of the constituent databases, submits it via Z39.50 to each of the remote systems comprising the virtual union catalog, and retrieves and consolidates the results, which are then presented to the user. The results coming back from the remote systems (which will typically be full-scale locally integrated library systems) may well include information such as circulation status.

**Searching and Indexing Consistency**

Theoretically, in functional terms, the distributed search model should be able to produce results that are equivalent to what can be obtained from a centralized union catalog. In practice, there are two problems. The first is that the query language that can be supported will be, effectively, the lowest common denominator of all of the query languages supported by the systems servicing the distributed search. If even one of these participant systems cannot support a given index or search option against that index (such as truncation), then the search option cannot be correctly supported by the distributed search system or will produce potentially inconsistent results. If the distributed search interface is sufficiently intelligent to recognize the limitations of constituent systems, it may be able to compensate for at least some of these shortcomings by doing additional query processing prior to presenting a result to the user at a significant performance penalty. For example, if the user asks for a personal author query and one of the constituent systems only supports an undifferentiated (personal and corporate combined) author query, then the search interface could in theory filter the records returned by that particular participating system. The more sophisticated the query language supported by the distributed search system interface, the less
likely that, in the general case, all participating systems will be able to support these queries correctly. It is worth noting that to the extent that the participating systems are relatively homogeneous—for example, supplied by the same vendor—the limitations of a lowest common denominator search language are minimized.

The second issue is the extent to which the various systems participating in the distributed search implement common semantics for Z39.50 search attributes and are consistent about how they process these attributes. Z39.50 implementations vary widely, and it is difficult to make any general statement other than to observe that Z39.50 is not a database indexing standard, and current Z39.50 attribute sets are not defined in terms of database indexing. Ultimately, inconsistencies in query processing have their roots in varying choices about indexing of databases on Z39.50 servers. For example, many systems accept and respond to queries that specify the AUTHOR or TITLE use attributes in the Z39.50 query; they do not necessarily use the same fields in their database records to build author or title indexes. There are also problems with extraction and normalization algorithms for search keys with stopword handling and with a host of other messy implementation details.

Consolidation

The second problem in distributed search systems is consolidation. Z39.50 clients are only now moving out of their initial implementation environment, which usually allowed a local interface to be used with a single remote database at a time and thus did not require the client to deal with consolidation issues. Typically, if a Z39.50 interface does anything in the area of consolidation today, it is duplicate elimination based on some sort of unique key like the ISBN or LCCN. Most often consolidation functions are still completely omitted.

It is worth recognizing that to duplicate the level of consolidation quality that is found in a central union catalog like the MELVYL system, for example, it is not sufficient to just process the records retrieved from each of the searches sent to the participating Z39.50 servers. Records retrieved from one participating server might potentially consolidate with records that were not retrieved as part of the search result from another system. To fully emulate the consolidation performed by a union catalog like the MELVYL system, it would be necessary to search for matching records in each participating Z39.50 server using the records retrieved from the other participating Z39.50 servers iteratively until convergence occurred. While there are undoubtedly heuristics that could be used to prune the possibilities and speed convergence, and to trade off the overlooking of remotely possible but unlikely consolidations against extra searches, this is still, as far as I know, an unexplored research area.

Even without seeking this level of consolidation, doing any type of consolidation merge of records from multiple servers will require either
that all result records from all participating servers be brought back to the client for merging or that all participating servers be able to sort their results in a consistent fashion. If the user is to be provided with a query result count for his or her search against the virtual union catalog database, then all records from all servers will have to be examined first—clearly a sizable performance penalty. Yet system design experience suggests that the ability to provide such a consolidated result size report is very important for users.

Performance and Management

The performance of a distributed search system is critically dependent on the performance of the network links between the client and the participating servers; if these links are over the commodity internet, then network performance may be a major problem at times, particularly if consolidation of records is being done at the client, which implies the transfer of potentially large amounts of data rather than just the interchange of queries and search execution reports.

The performance of a distributed search system will be paced by the performance of the slowest participating system in each distributed search, since it will be necessary for all of the distributed queries to complete before consolidation processing can begin and the aggregate results can be reported back to the user.

The scaling properties of a distributed search system can be quite unattractive when compared to a centralized union catalog. Each participating system must be capable of handling the query load that all users of the union system represent, since each search will be sent to each participating system. A local system joining such a distributed search constellation might have to be able to handle a magnitude of more queries in support of distributed search than it needs to be able to support its local patron base. Relatively small institutions joining large virtual union catalogs implemented through distributed search are at a particularly notable disadvantage. And, to the extent that any one constituent system falters under the distributed search load, it will degrade search response time for all searches run through the distributed search interface.

Reliability is also a problem. In any sufficiently large constellation of systems supporting distributed search, there is a high probability that at least one participating system will be out of service at any given time. Some protocol to poll all constituent systems to determine which ones have failed at any given time—a function outside the scope of the Z39.50 protocol—will be needed in order to avoid resorting to timing out Z39.50 connections and searches, which would have a serious impact on response time in such a distributed search environment.
APPROPRIATE ROLES FOR THE CENTRALIZED CATALOG AND DISTRIBUTED SEARCH APPROACHES

In environments where a fixed-scope union catalog needs to be presented to a large patron community as a basic high-quality highly available resource, it seems clear that, with current technology, centralized union catalogs have major advantages both in function and in performance. Yet the power to permit a user to build ad hoc virtual union catalogs for specific searches, and to delegate to a Z39.50 client the tedium of at least first-pass consolidation and duplicate record elimination, is unquestionably attractive, and it seems likely that users who need such capabilities will be willing to pay some performance penalty for them. The ability to create such dynamically defined virtual union catalogs will be used relatively rarely and by fairly serious and sophisticated searchers; these searchers will also likely weigh the pros and cons of using international-scope centralized union catalogs such as OCLC and RLG to satisfy their searching requirements as an alternative and will be prepared to pay the costs of using these services where appropriate (or will be able to have their relatively infrequent searching of these resources subsidized by their host institutions). This kind of searching will complement, rather than supplant, high volume searching of predefined union catalogs that represent the holdings of consortia that offer explicit resource-sharing agreements for obtaining the materials cataloged in these union catalogs.

It should also be noted that while Z39.50 is limited in its ability to support the dynamic federation of databases for distributed searching today, it has been highly successful in the more limited role of extending familiar local user interfaces to remote databases outside a local system, particularly if this is done as a crafted implementation rather than just the ad hoc incorporation of random external databases.

CROSS-DATABASE LINKAGES AND ABSTRACTING AND INDEXING DATABASES

Article citation (abstracting and indexing or A&I) databases and other secondary information resources (such as reviews) are now commonplace services offered to library patrons alongside access to catalogs; they are available from a wide range of sources scattered across the network, from local mounts and from CD-ROM based systems. Increasingly, technologies like Z39.50 are enabling consistent user interfaces to wide ranges of A&I databases accessible through the network. Many of these A&I databases have coverage that overlaps with other competing or complementary A&I databases in complex ways. While most library patrons today search A&I databases sequentially, one at a time, there is a growing need for interfaces that will consolidate records retrieved from multiple A&I databases into a logical "union" A&I database. The characteristics of such
a consolidation process are highly dynamic and are likely to be based more on distributed search approaches than on traditional union catalog style consolidation—although specific popular clusters of A&I databases may be predefined into logical union A&I databases (using centralized union catalog approaches) for performance and functional quality reasons. It is interesting to note that some of the commercial search services, such as DIALOG, have offered such capabilities for consolidation of records from multiple A&I databases for some time, though the implementations of these services seem to be based more on static database architectures typical of union catalogs.

The primary content described by these abstracting and indexing databases is now springing up everywhere in electronic formats: locally mounted databases, publisher-provided servers, and intermediary (third party) aggregation and access services. Of course, not all available primary content is described by the available abstracting and indexing databases (much less the subset of these databases available to a given patron) due to limitations in chronological coverage and editorial policy scoping the A&I databases. This means that while abstracting and indexing databases will be an important path to identifying and locating primary content, they cannot serve as the only path. Similarly, not all of the primary content described by the A&I databases is even available currently in electronic formats, nor is comprehensive availability likely to occur for the foreseeable future due to the wide variation in publisher strategies for electronic dissemination of their materials. Retrospective coverage for many journals may also be slow in coming in electronic form, even after the publisher has made the decision to offer electronic access prospectively. Further, even if the materials are available electronically, many libraries may choose not to pay the price to make them available to patrons. Business relationships and models among patrons, libraries, and publishers in the electronic environment are far from clear; one can readily envision situations where a library will offer a patron a choice between paying directly for immediate access to an electronic copy of an article or having the library obtain it in printed form through interlibrary loan for free or at a lower price. For all of these reasons, abstracting and indexing databases must be linked to databases of print serials holdings as well as to electronic primary content.

While key standards (such as the revised 1996 version of Z39.56, the Serial Item and Contribution Identifier or SICI) to support linkages from abstracting and indexing databases to primary content are now coming into place, actual implementation of such linkages is relatively new, and considerable work needs to be done on appropriate matching algorithms. The revised (1996) SICI code incorporates a number of partially redundant data elements which may or may not be present (and explicitly tagged) in specific database records from which a SICI code is computed.
When using SICI codes to make interfile linkages, one cannot simply do an exact match; rather, one needs to perform a matching computation that is sensitive to these optional data elements in the SICI code. There are numerous other technical issues as well. For example, many of the publishers and third party primary content aggregators are mounting articles on Web sites rather than in Z39.50 databases, so the actual linkage mechanism is a Uniform Resource Locator (URL); one needs URLs that can include SICI codes and invoke CGI scripts or other services in the server that map the SICI code to the appropriate article file, or external published algorithms for computing appropriate URLs from SICIs that can be implemented in the client dynamically or used in programs that build linkages in the A&I files as a batch process.

Even in the presumably simpler case of linking abstracting and indexing databases to serials records in catalogs or union lists of serials, while many of the necessary linkage data elements (such as ISSNs) nominally exist in the relevant files, experience in practice has shown that the data are often inaccurate or incomplete; this problem will gradually fade as more use is made of such linking elements and errors are reported and corrected. Some vendors will improve the quality of the linking elements in their A&I files; others will become known for offering "linkage hostile" files and will consequently face a competitive disadvantage in the marketplace.

The implementation and maintenance of high quality linkages on a large scale presents major challenges; I believe that this will become perhaps the central problem for the next generation of information access systems. These are hard problems even in the relatively controlled environment of a union catalog, where many linkages can be precomputed and validity checked off-line rather than on demand, and where the results of the linkage calculations can be reflected in indexing. For example, users often find it useful to be able to restrict a search rapidly on an A&I database to only those citations that are available in electronic format, or that represent materials held in printed form at a specific library; this would involve the use of an index rather than simply trying to compute and display a linkage to primary content as each record from the A&I database is displayed. Reliably, accurately, and quickly computing linkages in the more anarchic framework of distributed search appears to be quite difficult; using the presence of linking elements as a search restriction is likely to lead to unacceptable performance since the entire result set has to be examined record by record prior to reporting on the results of a search.

Today the problem of creating linkages to primary content is focused on A&I databases, in large part because current networked information access technology can support access to articles in electronic formats reasonably well, while access to digital format books, manuscripts, maps,
sound recordings, films, and similar materials is still problematic. The files representing these kinds of materials are enormous; they are awkward and time-consuming to transfer and difficult to navigate once retrieved. Materials other than journal articles by and large are not practical today in electronic formats; the publishers recognize this reality and have made little of this material available, so there is not much demand to create links to it. Such material is starting to appear slowly, however, in part due to library-based programs to digitize special collections and to employ digitization for preservation purposes. Over time, the set of necessary linkages will expand to include not only A&I databases to primary content and serials holdings and serials holdings to primary content (or, more precisely, to navigational systems for cover-to-cover content of journals, including material not in scope for the A&I databases), but also from (monographic) catalog bibliographic records to primary content (or to finding aids that assist in the navigation of large collections of primary content) and to secondary materials such as book reviews.

**CONCLUSION**

This has been a primarily technical analysis of the comparative benefits and drawbacks of distributed search and traditional centralized union catalogs, and of how some of these issues extend to the integration of abstracting and indexing databases and electronic primary content within the bibliographic apparatus that is needed to support resource sharing. From a technical point of view, it seems clear that both centralized union catalogs and systems that can support intelligent distributed search offer important benefits to users, and that they can be used together in a complementary fashion to great advantage. Centralized catalogs are still the best way to support high volume searching against fixed collections that reflect explicit consortia or other resource-sharing arrangements, and which users will want to search regularly with high precision and performance. Indeed, centralized union catalogs can stand as visible symbols of such resource sharing agreements. Distributed search can be used to provide a way of delivering on the promise that the networked information environment offers for enabling users to define arbitrary virtual information collections that span organizational and geographical boundaries. Both approaches continue to be relevant as we consider the broader environment of catalogs, abstracting and indexing databases, and primary content proliferating in a distributed network environment.

But, as with much of the discussion of interlibrary loan and document delivery, it is essential to recognize that the issues here are not purely technical. They have significant organizational, economic, and political components; the economics are particularly treacherous because the environment mixes explicit costs (for example, the costs of searching an international union catalog like OCLC or RLG, or of actually creating
and hosting a centralized union catalog somewhere for a group of cooperating institutions) with implicit costs (such as provisioning a set of local systems to participate effectively in a distributed search constellation). There are issues of local autonomy and control; these are given the greatest latitude in distributed search architectures, while to some extent they are sacrificed or submerged in centralized union catalog systems. In some cases, distaste for centralized organizations or distrust of centralized control may be the determining factor. The convenience of the user community, particularly when this community is as broad and poorly defined as is typically the case in a resource sharing consortium, may be less important to decision makers than retention of local control and autonomy. The emergence of distributed search as an alternative (albeit a sometimes impoverished one) to centralized union catalogs means that it is now at least possible to permit nontechnical considerations increasingly to dominate design choices. It is hoped that this article will at least provide some insights into what may be sacrificed in such choices.
Resources Description in the Digital Age

JENNIFER A. YOUNGER

ABSTRACT

Resource description, known more familiarly within the library community as cataloging or indexing, is undergoing intense scrutiny with the rapid proliferation of, and access to, digital resources. There are many initiatives addressing a range of issues. The author references the following discussions and proposals: the need for, and definition of, a basic set of metadata elements; the examination of library cataloging objectives and record structures; persistent addresses for resources; and the proposal for a data registry to facilitate interoperability among metadata schemes. The importance of a framework for resource discovery created through formal resource description is reiterated.

INTRODUCTION

Library catalogs began centuries ago with handwritten entries of manuscripts housed in royal libraries, such as those in ancient Alexandria, and medieval monasteries. Individual entries were abbreviated in form and content, a function not only of lesser numbers of manuscripts but also of the fact that the catalog makers knew the collections intimately and were integral in their use. The situation today diverges on both dimensions. Accessible documents number well into the millions, many a result of the ease of electronic desktop publishing. End-users have assumed greater independence in their consultations of a wide range of library catalogs, citation indexes, as well as full text, numeric, and multimedia databases accessible through the national and international bib-
liographic infrastructure, relying for assistance on the organization and structure provided by classification and cataloging.

The fundamental reasons for cataloging remain. Within the system of information exchange, authors and creators want their documents to be found while users want to find information relevant to their needs. Toward that end, the organizers and describers who make possible resource discovery and retrieval are key players. The library community is but one segment of the information system, but one distinguished by its attention to all aspects of making information accessible including its rigorous application of principles for organizing and describing retrieval. In this rapidly changing world of resource discovery and retrieval, this article describes evolving means of making documents and document-like objects bibliographically accessible by the library cataloging community and, without attempting to forecast the future, anticipates their future use.

RESOURCE DISCOVERY AND RETRIEVAL IN THE DIGITAL AGE

Since 1990, the information world has been stunned by the dramatic expansion in popularity and use of the Internet and, more recently, the World Wide Web. Almost overnight, Web browsers burst upon the scene enabling users to search thousands of Internet sites with no more keystrokes than are needed for a typical online catalog search and through software operating from the user's own workstation. Although the significance, authoritativeness, and applicability of the discovered information ranges widely, albeit perhaps no more widely than is true of printed sources if the full range of publications were so readily available, the ease of surfing the Web has made it a first choice of many whether for work or entertainment.

Successive generations of citation databases and library online catalogs incorporated more capable search engines as well as remote access any hour of the day, but the continuing evolution of Internet services has changed forever the landscape of document discovery and retrieval. From the initial offerings of telnet and gopher to the hypertext transfer protocol (HTTP) now known as "the Web," the capabilities for gathering, indexing, storing, accessing, and delivering digital documents have grown more powerful although they have not kept pace with the increase in the numbers of documents. Robots search and index documents daily, making thousands of resources available. Documents are retrievable with a single keystroke activating the link from the bibliographic citation directly to the document. Users visit hundreds of databases in one session, approaching the Internet as if it were a seamless coherent information system. In this climate of rising expectations, there is a hope as well that quantum leaps in information discovery and retrieval reminiscent of the
significance that "moveable classification" had on efficient storage and retrieval of books in libraries lie ahead in the not so distant future.

Recognizing that it requires more than the ability to move swiftly from source to source to endow a robust information system, players in the information community are exploring a host of issues. In setting an ambitious agenda for research and tool development, the CNI White Paper on Networked Information Discovery and Retrieval lists two major categories which are, broadly speaking, issues of architectures and technologies and second, of description and metadata (Coalition for Networked Information, 1996). Of primary interest here, description and metadata encompass new and familiar issues: document description by creators, HTML extraction (webcrawlers), library descriptive cataloging, MARC practices and multiple schemes, GILS and TOPNODE, authority files, the mixing of controlled and uncontrolled vocabularies, access to nontextual media, and the complexities of description for aggregate objects and information spaces such as databases and newsgroups.

The goal is a sustainable, distributed, and scalable approach to resource discovery and retrieval via the networks (Nicholson & Steele, 1996). Many players, including library consortia, libraries, government agencies, scholarly associations, software vendors, and groups, such as the Internet Engineering Task Force, the National Digital Library Federation, World Wide Web Consortium (W3C), to name only a few, are exploring the opportunities made possible by digital and network functionality. From the user perspective, this functionality highlights the interconnectedness of individual catalogs, databases, and search engines and, not surprisingly, many activities are directed toward creating a more coherent global system. The following initiatives, which are only a fraction of those underway, reference important directions and proposals. These include: (1) definition of a basic set of data elements known as the Dublin Core, (2) examinations of library cataloging objectives and record structures, (3) proposals for persistent addresses for resources, and (4) support for the idea of a data registry to facilitate interoperability among metadata schemes.

**SURROGATES AND METADATA**

Before turning to a discussion of the Dublin Core set of data elements, it is useful to start with the role of surrogates and metadata in resource discovery. A fundamental assumption underlying future bibliographic access to digital resources, some networked, some not, is that the demand for surrogates will increase rather than decrease in the information network of the future (Lynch, 1995). Surrogates are cataloging/indexing records that describe the actual resources and inform the searcher of how to access them. Surrogates may be richly detailed in their identification of significant document attributes and relationships
or be so brief their primary function is to indicate the existence and location of a document. Regardless of the amount of information included, however, issues of system scalability, protected intellectual property not available without purchase or contract agreement, and the limitations of automatic indexing are sufficient to ensure ongoing reliance on surrogates at all levels. Certainly automatic data collectors (robots) will continue to gather and index some freely available information but, for these and other reasons, the bibliographic access infrastructure underlying resource discovery will depend on surrogates.

Metadata are documentation about documents and objects. They describe resources, indicate where the resources are located, and outline what is required in order to use them successfully. These data elements can be embedded in fields or tags within a target document or object or they can be put into a surrogate record. Overall, the metadata can be free form or prescribed by a set of rules of which there are literally hundreds of schemes defining how to construct and encapsulate metadata. Gradually, a working categorization of metadata types is emerging, with one typology listing six categories needed to support resource description and retrieval: (1) registration (uniform resource names), (2) terms and conditions for use, (3) document/object structure for instruction in access, (4) history of use, (5) context, and (6) content, which includes description and subject analysis (Michelson, 1995).

There are literally dozens of metadata schemes created by libraries, scholarly associations, government agencies, and commercial entities. Some are broad in scope and widely used, such as the Anglo-American Cataloguing Rules, 2d edition (AACR2), MARC formats, and classification/subject analysis tools from the Library of Congress, the National Library of Medicine, and Forest Press (Dewey Decimal Classification). Others were developed for specialized domains, such as the Text Encoding Initiative (TEI) Guidelines for Electronic Text Encoding and Interchange, including the TEI header as a mandatory element in TEI-conformant texts; the Encoded Archival Description (EAD), an SGML document type definition for encoding finding aids; and the Content Standards for Digital Geospatial Metadata (CSDGM) developed by the U.S. Federal Geographic Data Committee to accommodate the unique characteristics of maps and geospatial resources. Some of these metadata schemes are relative newcomers standardized only in the last decade with others still in the formative stages. Collectively, these metadata content schemes form the basis of a global resource discovery system.

Each of these schemes is constructed from an understanding of specific domains, information resource needs, and unique requirements for describing document-like objects and was developed by experts closely associated with the field. In a digital networked environment, these factors will not disappear. At a recent interdisciplinary research conference
on digital libraries, some 200 librarians and computer scientists agreed that thoughts of “one overarching plan for cataloging, searching and retrieving data from the many trillions of bytes of digital material that tomorrow’s networked collections will contain” is not feasible (Jacobson, 1995a, p. A19). One size does not fit all. The ideal of universal bibliographic control and access can only be achieved through a system of access tools, each occupying a particular niche yet somehow connected to offer a logical and comprehensive set of tools.

**THE DUBLIN CORE**

Sophisticated resource description schemes, such as AACR2, yield a detailed bibliographic record with exact description and access points in standardized form. Despite greater assistance from computers and even declining per record costs, there remains a sense that it is neither possible nor necessarily desirable to bring all Internet accessible documents and objects under the rich bibliographic umbrella created by the application of AACR2 or similar schemes. Libraries and indexing agencies create access to documents selected to meet the needs of their constituencies with the result that, today and in the future, some documents are outside the boundaries of these indexes and catalogs. Some, even many, documents will be “self-indexed” with indexing terms extracted from the documents rather than through assignment by an external cataloging/indexing agent. While indexing and library cataloging processes significantly increase the likelihood for effective retrieval where the keys must be supplied rather than extracted from the title page—e.g., a subject heading or links to other works by the author—there is nevertheless value in the accessibility of all documents without further provision of retrieval keys, a regard to where they may be located, or the kind of decisions made about their usefulness. That assumption prevails in designing the global digital library: “[I]nformation seekers benefit from self-indexing resources” that provide access where otherwise none would exist (Organizing the Global Digital Library, 1995, p. 2).

With the acceptance of a role for self-indexed documents in fostering universal bibliographic access, there is much to be gained from identifying and standardizing a core set of metadata elements that could be completed by the document creator and that is “more informative than an index entry but is less complete than a formal cataloging record” (Weibel, 1995, p. 1). From the OCLC/NCSA Metadata Workshops there emerged a consensus on a simple resource description set of data now known as the Dublin Core. Purposefully kept to a minimum number (13) (see Figure 1), the Dublin Core metadata rest on six principles to achieve ease of creation and broad applicability. The Dublin Core data elements are descriptive only of intrinsic properties, eliminating the use of external references (to cataloging rules or authority files), are extend-
able to include additional specialized information, are syntax independent, are optional as well as repeatable, and can be modified through qualifiers to convey a meaning beyond the commonly understood definition (Weibel, 1995, pp. 3-4).

In a September 1996 workshop sponsored by OCLC and the Coalition for Networked Information (CNI), similar efforts were planned to extend standard data elements, working from the Dublin Core as a model, to nondocument like objects, such as images and image bases. Individual projects in a wide range of disciplines, including art, architecture, engineering, medicine, and physical sciences, are converting large numbers of still images for which discovery and access tools are needed. As with document-like objects, an identification of common requirements and standard descriptors is a step toward consistency in resource description.

For information creators and producers to apply the Dublin Core, a mechanism for embedding the data within HTML documents had to be established. Additionally, there was considerable interest from the perspective of software and database creators/vendors in achieving some level of compatibility with existing browser software and current means for robot collection of data (Weibel, 1996, p. 1). As Weibel reports, a convention was devised at a recent W3C (World Wide Web Consortium) Distributed Indexing and Searching Workshop for encoding metadata in attribute tags in HTML-structured documents. It is anticipated that software developers would, with assistance from those who are experts on the Dublin Core, create templates for assistance in creating such a data set for information creators and producers who are perhaps not accustomed to creating this type of information.

In conjunction with other members of the bibliographic access community, libraries are challenged to expand the use of standard metadata in digital documents and objects (Organizing the Global Digital Library

| **Subject:** The topic addressed by the work |
| **Title:** The name of the object |
| **Author:** The person(s) primarily responsible for the intellectual content of the object |
| **Publisher:** The agent or agency responsible for making the object available |
| **Other Agent:** The person(s), such as editors and transcribers, who have made other significant intellectual contributions to the work |
| **Date:** The date of publication |
| **Object Type:** The genre of the object, such as novel, poem, or dictionary |
| **Form:** The physical manifestation of the object, such as Postscript file or Windows executable files |
| **Identifier:** String or number used to uniquely identify the object |
| **Relation:** Relationship to other objects |
| **Source:** Objects, either print or electronic, from which this object is derived, if applicable |
| **Language:** Language of the intellectual content |
| **Coverage:** The spatial locations and temporal durations characteristic of the object |

Figure 1. DUBLIN core element description
Historically, libraries have addressed universal bibliographic access (at the title level) through national bibliographies, cataloging records, and the sharing of these bibliographic resources. Both as bibliographic access coordinators and document publishers, libraries are asked to “include metadata in digital resources and develop mechanisms for integrating different forms of metadata (MARC, TEI, EAD, etc.)” in online access tools. Libraries should identify incentives to encourage information creators and producers to incorporate standard metadata in their publications. Such incentives might be a function of copyright or patent registration, revenue derived from increased access, or the prestige associated with participation in national programs. One example is the successful Library of Congress Cataloging in Publication Program in which approximately 2,000 publishers send manuscripts for cataloging before publication so that the completed publication carries its metadata with it.

Dublin Core and Other Schemes

To the extent a core set of descriptive data elements (Dublin Core) could be mapped into other metadata schemes—e.g., AACR2, TEI, or CSDGM—these data could be a building block for records where additional description and access points are desired. Investigations underway to assess the feasibility of mapping from the Dublin Core to MARC have identified that the core issue is one of “translating from a simple descriptive scheme to a complex one” (Caplan, In press). Some problems, such as mapping from an undifferentiated personal name to a field that requires explicit identification of entry under surname or not, can be resolved for mapping purposes although not necessarily meeting the demands of the more complex scheme, through the addition of new fields to MARC that will accommodate undifferentiated personal names. All mapping endeavors will of necessity evaluate to what extent a mechanical transfer of data from one scheme to another is cost-effective. Future usefulness will depend on factors including the existence of sufficiently large collections of Dublin Core metadata records such that mechanical conversion is worth doing and, for current cataloging, the level of assistance provided by conversion rather than by rekeying.

Assisted conversion is a second alternative. The Library of Congress Cataloging Directorate’s Text Capture and Electronic Conversion (TCEC) pilot project results in an accurate transcription and less time needed for data entry (Davis-Brown and Williamson, 1996). Using homegrown software, catalogers transfer data directly from electronic manuscripts, not in MARC format, to a bibliographic record they are creating in MARC format. Although not an automatic migration of data from one format to another, this human driven transfer process takes advantage of publisher-
produced metadata and may be a more practical means for the near future in conversion practices.

**Library Catalog Objectives**

In addition to issues of establishing a standard set of metadata and converting these data into a MARC formatted record, the library cataloging community is examining its cataloging objectives and principles. Comparisons with other systems continually suggest adapting cataloging practices to a world populated by computer robots, knowbots, and other intelligent software programs. While conversations hint at the desirability of a future in which intelligent software programs are the basic operators of the information system, the assumption remains that we are still building systems engineered for humans to operate (Lynch, 1995). It is in this context that librarians are evaluating whether the fundamental objectives and principles of library cataloging are valid and necessary.

Searches on the Web frequently result in hundreds or thousands of retrieved documents. While more can be better, the results often contain duplicate listings as well as documents of peripheral or no interest with no assurance that all indexed documents related to the search are found. These largely word indexes are constructed without reference to relationships among documents and little or no control over names or concepts. Frequently, there is insufficient information to determine if the document is what is sought although that disadvantage is partially offset by immediate document availability allowing searchers to scan and make decisions on whether the document is useful. Yet, despite these limitations, users do find relevant information on the Web.

This dichotomous situation (where some users find relevant information but many users, including librarians, consider the indexes or databases to be less than completely successful because successful retrieval depends on the underlying goals and expectations. The activities of searching the Web are the same as those of searching library catalogs, yet the expectations of librarians and many users differ in consulting the Web or a library catalog. They expect to find all documents by an author or on a topic and expect to get assistance in determining whether the document is the edition or character they seek when searching a library catalog, not simply documents which happen to have a prime keyword in the author or title. Searches retrieving many unrelated documents or missing related documents do not satisfy either their expectations of a catalog search or the goals of the catalog. However, from a perspective where such assistance or completeness are not goals, the search is considered successful when judged on that criterion.

Just as other indexing schemes or search engines, library cataloging conceptually is directed toward creating records for resource discovery. Library cataloging differs, however, in that it places discovery in the context
of bibliographic and subject relationships to other works. While library cataloging is not restricted to identifying relationships solely among items in a library's collection, the presence of a collection gives rise to, and visibly reinforces the value of, a contextual framework within which users can make their selections. As surrogates for library collection, catalogs insist it be possible not only to find specific works but also to identify all works related by author, title, or subject and to choose works of interest from among those collected or available.

**FUNCTIONAL REQUIREMENTS OF BIBLIOGRAPHIC RECORDS**

The most often quoted statement of the "objects and means" of library catalogs was made by the renowned Charles Ami Cutter (1904) in his setting forth of cataloging rules in a systematic manner. Formal reference to these objectives disappeared from cataloging codes during the first half of the century but eventually were again explicitly incorporated, now as functions, in the Paris Statement on cataloging principles (International Federation of Library Associations, 1963). The catalog must make it possible to find an item when the author, title, or subject is known, and to find what the library owns by a specific author or on a particular subject.

In 1992, an international Study Group on the Functional Requirements for Bibliographic Records was established with the formidable task of creating a framework that "would serve as the basis for identifying the specific attributes (such as title, date of publication) and relationships (such as translations, reproductions, parts, subject) required to support the various tasks that users perform when using bibliographic records" (International Federation of Library Associations and Institutions, 1996, p. 2). All types of media, applications, and user needs were considered in the Study Group's assessment of the value of individual attributes (and relationships to users in finding, identifying, selecting, and obtaining the desired works).

What emerges first and foremost from their recommendations is a reaffirmation of the assistance library catalogs must provide to users. Users typically enter a catalog or database with words anticipated to be in a document, such as keywords in title or author fields. Users then evaluate the matches or nonmatches to select desired items or reformulate the search to reduce or increase the number of records found. Their ability to evaluate and reformulate a search is dependent on the content of the records. Library catalogs furnish attributes in the way of subject headings, classification numbers, full names of authors, and relationships (such as sequels, translations, and reproductions) so that users can interpret the responses to their initial searches. From this point, they can expand, narrow, or otherwise reformulate their searches and navigate throughout the universe of documents represented in the catalog by methods
more directive than a simple addition or subtraction of words from search queries. In order, however, to go beyond sheer manipulation of the number of words included in the search query, attributes and relationships have to be identified and put into the record. A record without an indication that the item is a translation of another title or that the topic mentioned in the title is discussed from a historical or geographical point of view does not offer help beyond the obvious information found in the statement of authorship and title. Someone must supply the attributes and relationships belonging to the document which are not always stated in obvious places or not necessarily included in the documents.

Cataloging costs remain a concern, however, pushing the IFLA Study Group to examine whether any attributes or relationships could be omitted from the cataloging record without materially affecting the effectiveness of subsequent retrieval. Their qualitative assessment of attributes and relationship; assigned values of high, medium, and low; and, in accordance with their assignment, they identified some of lesser value, such as the intended audience of a musical work and the indication that a work was a summary of another, that could be omitted from a basic level of bibliographic record. The recommended basic records to be done by national cataloging agencies remain nonetheless very full records because most of the supplied attributes and relationships are deemed essential to meeting the objectives of the catalog. Unlike "minimal level cataloging" which was designed primarily to reduce costs, the recommended basic level records do not omit any categorical assistance—e.g., subject access through subject headings or classification.

Within North America, this same approach has been taken successfully in the definition of core bibliographic records for monographic, audiovisual, and serial resources. Defined and promulgated by the Program for Cooperative Cataloging (PCC) and the Cooperative National Serials (CONSER) Project, the core record concept is intended to fulfill cataloging objectives while reducing the cost of the cataloging (Cromwell, 1994). Accordingly, the core record concept suggests reductions are possible in the area of notes—e.g., eliminating the recording of notes to justify added entries—and introduces formally the sense of cataloging as a dynamic and iterative process. Over time and use, core records can be augmented as determined necessary.

OCLC is experimenting in a similar manner in creating its reference service NetFirst (OCLC, 1995, p. 4). NetFirst is a database of bibliographic records describing a diverse group of Internet-accessible resources. Recognizing the value of structured records in resource discovery and retrieval, the NetFirst records explore how much assistance can be provided through a more limited set of information than is found in a full AACR2/MARC bibliographic record. At OCLC, catalogers add structured access points (attributes and relationships in IFLA terminology),
including authors' names, subject headings, and numerical classification numbers to the records for WWW pages, library catalogs, electronic journals and newsletters, to name only a few of the selected resources. OCLC's assessment will include consideration of the adequacy of the data in the record and the relative costs of building NetFirst records (Jul, 1996).

The nature of Internet-accessible resources is a key factor in evaluating how much information is needed in the records. Surrogates, which are cataloging records, furnish sufficient information so decisions can be made about relevance and usefulness without examining the document itself. Where resources can be more easily accessed and reviewed, the amount of information required in the surrogate may be less than is now recorded. The library cataloging community is understandably cautious in considering this possibility; however, the interplay between surrogates and documents (or objects) may lead to new assumptions for some classes of documents as to the need for all attributes and relationships to be included in the bibliographic record.

**National Forms of Headings**

An international focus on library cataloging objectives and principles is appropriate because the exchange of cataloging data among libraries is at the heart of worldwide bibliographic control. Work in harmonizing bibliographic data from national cataloging agencies, such as the recent Moscow meeting on how the Russian cataloging rules and AACR2 might be brought closer, is ongoing (Patton, 1996, p. 16). It is, however, more difficult to reconcile differences among name headings, although the recent signing of a *Memorandum of Agreement on Convergence of Cataloguing Policy* by the Library of Congress and British Library paves the way for a joint international authority file for headings established in the United States and the United Kingdom (Library of Congress, 1996, p. 204). The difficulties of reaching agreement between even these two countries points to another solution where even greater differences exist among cultural and language traditions. To smooth the international exchange of cataloging data, the principle of establishing a single preferred form of name heading for worldwide use would yield officially to the principle of setting up the heading (in each country) in the language and form most preferred by national constituencies. This is happening in practice as the preferences of English, French, German, and Japanese speakers for familiar forms are legitimatized in cataloging name forms despite agreements of the Universal Bibliographic Control Programme. An international access record (authority record) would link the multiple preferred forms, with each identified for use in specific countries or in accordance with specific cataloging rules (Willer, 1996; Barnhart, 1996). Earlier work, such as that done by the Getty Vocabulary Coordination Group (VCG) for the Getty Art History Information Program, has shown the value and
feasibility of this approach. Where preferred name headings for identifying art objects—as described respectively by museums, libraries, and archives—vary in form by language or other aspect, the variant forms are linked to each other in the master authority file (Bower, 1992). The principle of collocation is achieved, the cataloging data can be exchanged, and the preferences of national constituencies are taken into account in the forms of headings.

**CONTINUING DISCUSSIONS ON COLLOCATION**

The reaffirmation of library cataloging objectives and new means for achieving collocation in the international arena have not eliminated questions of whether library cataloging principles can successfully be applied to digital resources and the Internet environment. In 1992, the OCLC Internet Resources Project examined this question and answered it largely in the affirmative. With the addition of a field in the MARC format to accommodate electronic location and access information, including Uniform Resource Locators (URLs), the USMARC format and AACR2 cataloging rules were judged sufficient for cataloging Internet resources (Dillon & Jul, 1996).

About 200 libraries participated in the two-year OCLC Internet Cataloging Project, begun in 1994 and recently concluded, and created just over 5,000 bibliographic records representing Internet resources. Lively and continual discussions on the project listserv (intercat@oclc.org) illuminated problems and solutions, many of which focused on recording access information in the 856 field.

Two factors supported the conclusion, reassuring to many, that the cataloging rules could be applied to Internet resources: the cataloging was done in the context of the library catalog and the nature of the resources. Although initially libraries publicized their offering of access to Internet resources in special printed lists or online menus, just as the selection of Internet resources are gradually being brought into the mainstream of collection development policies, so too is the bibliographic access for some Internet resources being incorporated into the library catalog. This cataloging is done within the context of the library collection and its catalog, not in the much larger and diverse universe of all Internet-accessible resources. Establishing name headings and other cataloging activities is done in the context of the national authority files but not in the context of all names found by Internet search engines.

In a recent thought-provoking article on the difficulties of applying cataloging principles to resources in the Internet environment, Mandel and Wolven (In press) suggest that “simply collocating the forms of names found in such a large and diverse resource as the World Wide Web may not be sufficient.” The universe of names will be so large that the differentiation and grouping of names, even if it is possible to do in this
environment, will not provide users with the means to make a choice among these names. This observation is similar to one often made by reference librarians that a list of authorized name forms presented to a user who doesn’t know which authorized form (is it Smith, Martin D. or Smith, Martin D., 1961- ) is the one of interest, is not really a help. More helpful is a list of authors and titles with the titles providing a context in which to make a selection. One suggestion is to identify the role of the individual or organization, such as author, editor, performer, or programmer (Mandel & Wolven, In press). This would provide yet another way to differentiate among the same or similar names.

The Internet environment may help us understand and accommodate the reality of a large universe. Without questioning the validity of collocation but anticipating an expanded universe of names, the question is being asked whether there are situations where complete collocation is not needed, due to retrieval capabilities, the nature of the resources, or the frequency with which the name occurs. Is the value of collocation more or less when the situation varies? If we could define situations where authority control might be considered less of an imperative and measure the impact on retrieval, what could be learned about where it is most effective in supporting retrieval? (Younger, 1995). An analysis of the largest national database shows that about 40 percent of the personal name headings are correctly established but lack authority records in the national authority file (Calhoun, 1996, p. 2). Further research on the attributes of these individual names may suggest where the presence of an authority record and the impact of rigorous ongoing authority control is or is not critical to retrieval. The assumption that the boundaries of the library collection are also the boundaries for applying cataloging principles is one that will undergo considerable stress with the rapidly increasing diversity and numbers of resources described and accessed through library catalogs.

The second factor is the nature of the Internet resources cataloged by participating libraries. Although not without the occasional Web page, the cataloged resources were first selected for the library collection, according to established criteria applied to other formats, and are more likely to have characteristics analogous to their printed counterparts. Specifically, resources such as electronic journals have a generally fixed form and title page information that are easily fit into existing rules and regulations. The cataloged resources were not, by and large, images without accompanying textual descriptions, five or six versions of the same title, resources with many component parts, or images without titles or authors.

Whether collocation of works is possible arises because many electronic objects and images simply don’t have recognizable titles. Supplied titles can in time become well known, but a greater concern is “linking
works converted into electronic form without an obvious title with the descriptions of their nondigital forms, for example, in linking the description of a hologram letter with an ASCII text or digital image, particularly when those three formats are created and maintained independently" (Mandel & Wolven, In press). The ability to collocate is in doubt in these instances.

Libraries will acquire and catalog some Internet accessible resources. The demonstration that the cataloging principles and rules can be applied in the context of library catalogs to those with characteristics similar to resources in other formats is a step forward in determining how libraries will organize and provide access to other kinds of digital and Internet-accessible resources.

**Restructuring MARC Records**

There is continuing dissatisfaction with the flat structure of MARC and the limitations that puts on handling version and hierarchical relationships in documents. Reproducing documents in microform or digital formats for preservation and access purposes and expanding online access to archival repositories are putting enormous strains on the current bibliographic record structures. In hopes of finding more viable solutions, the suggestions of reconceptualizing cataloging rules and MARC formats into a multiple object orientation are receiving attention from the national and international communities.

Each MARC bibliographic record represents a single information package according to the MARC formats and Anglo-American Cataloguing Rules. The “bibliographic object” is therefore a completed MARC record. Where items have only slight differences—e.g., in file types or formats—from other items, there are multiple full MARC records albeit with clear redundancies in the bibliographic data carried because the “object” of the cataloging is the whole document. There is an advantage in the one-to-one relationship between the document being described and the bibliographic record in the ease with which the cataloging records can be distributed to and from cataloging agencies. A primary function of the MARC formats was and is to support the communication and exchange of cataloging data. The discrete record structure has functioned effectively on the basis of this one-to-one relationship in building national databases and local catalogs. With efficient exchange of bibliographic data continuing to be an important goal in the national and international arena to date, the limitations of the flat structure, while much lamented, have not been sufficient to bring about a change in the MARC structure.

In contrast to treating the whole information package as the bibliographic object, current object-oriented cataloging proposals would deconstruct a single bibliographic object into multiple objects. Objects, which here is used synonymously with entities, fall into three groups in
bibliographic definitions: the products of creative endeavors (works, expressions, manifestations, and items); the parties responsible for the creation (persons, corporate bodies); and the subject (concepts, objects, events, places and, by extension, all of the entities in the first two groups) (International Federation of Library Associations and Institutions, 1996, p. 9). Each object type has attributes and relationships with other entities or objects. Attributes are associated qualities—e.g., for the work *Hamlet*, the date it was written. Attributes for a manifestation (the embodiment of a work) of *Hamlet* include a physical description (for any format) including file characteristics for computer files, and date and place of publication while attributes for an item (a specific copy of a manifestation) include provenance, condition, and access restrictions. Under this approach, a typical bibliographic record could contain many objects including creator(s), titles, and subjects.

Pursuit of a multiple object-oriented approach that would allow the evolution of cataloging rules to be more responsive in distinguishing between bibliographic and authority data (Tillett, 1989) and in handling complex relationships depends on changes as well in the MARC formats (Gorman, 1992, p. 91). The object-oriented cataloging and proposed operationalization as a series of linked records points to significant gains from grounding AACR2 in considerations of access requirements and record sharing rather than in an emphasis on the bibliographical description of a single package of information in a stand-alone record (Heaney, 1995, p. 138). Redundancies now evident in MARC records that describe the same work in slightly different versions could be reduced as the record for the work could be linked to other records describing the different manifestations or items. In that way, a single record for the work *Hamlet* could be created and presented to catalog searchers with accompanying listings of the different versions made accessible by the library. “Dashed on” notes on catalog cards that indicated the existence of photocopies now violated the framework of MAEC and AACR which mandated a separate record for each item. For easing workloads and searching, the old practices were surreptitiously continued, and microform reproductions were “cataloged” through the addition of a local note on the MARC record for the original manifestation.

**Adaptations in Online Catalogs**

Local online systems brought an integration of bibliographic access and circulation activities, item records for each physical piece, and the rudiments of a modular approach to description and access. To accommodate multivolume holdings for one title, up to a thousand or so item records could be attached to a single bibliographic record. Although intended initially for items belonging only to that bibliographic title and manifestation, item records quickly proved to be a means for recording
and controlling reproductions in varying formats—e.g., microform, photocopied, electronic files. Sometimes, the details of reproduction were accommodated in the item record although more commonly this information continued to reside in the local system bibliographic record as a note. This offered an economical means of "cataloging" new versions and avoided lengthy displays of titles often with nothing more than a date of publication on the screen display to indicate the differences. Where necessary, as in preservation microfilming projects, the catalogers would create a new bibliographic record for the master microfilm and send that record to the national databases. The new bibliographic record simply wouldn't be used in the local system.

Nowhere has the struggle with recording variant versions been of more concern than in the realm of serials. User needs and efficient work flows have made this a recurring issue on the CONSER (Cooperative National Serials) and the American Library Association MARBI (Machine-Readable Bibliographic Records) Committee agendas although with no change in the status quo. A recent electronically issued "interim compromise" specifically on the issue of how to catalog remote access versions of printed journals distinguishes between providing access to an online version through a bibliographic record for a print version and cataloging the electronic version (Hirons, 1996). The compromise stresses that the electronic version is not being cataloged; this is not a "single record cataloging approach" but rather a means of noting the existence of the electronic version.

Nationally, the decade-long debate over "multiple versions" has been quiescent as no further resolution seemed attainable. Item records were and are used locally as coping mechanisms, yet the need for an efficiency of exchanging full bibliographic records in the MARC format continued to be an overwhelming force for retention of the current record structure in national cataloging programs and databases. However, experiments in creating digital libraries and online formats for archival materials accelerated the stresses and strains on the MARC record format to the point they could no longer be contained. A groundswell in the library community moved to explore how SGML (Standard Generalized Markup Language) conformant records could be used for content designation of document types beyond bibliographic records and to find relationships between the SGML and MARC bibliographic records in library catalogs.

Hierarchical Relationships among Objects

An early and influential project in the library world had already turned to SGML (ISO Standard 8879, which has been an international standard since 1986) for assistance in recording complex data on relationships. The Berkeley Finding Aid Project (BFAP) had as its aim the development
of an electronic encoding standard for archive, museum, and library electronic finding aids, which typically are narrative documents describing collections and their contents. Of supreme importance is the ability to describe, control, and provide access to collections of related materials, which means providing access through hierarchical levels of analysis: collection-level, subunit, and item. Project participants did not want to create multiple bibliographic records, which would force users to navigate among multiple records with high levels of redundant data, nor did they wish to manage multiple bibliographic records for component parts or versions in the local online system (Pitti, 1994). With no alternative in the MARC structure (Leazer, 1992), the Project turned to SGML to find a means of handling successive levels of analysis.

The capabilities of SGML-based markup languages were known in the library community in part through the previous development of the Text Encoding Initiative and the TEI header. SGML-based markup supports not only a structuring of the text and the relationship of document components, but also allows references to be made from within SGML-based documents to other texts or other kinds of digital objects. While MARC is successfully used in the creation of a bibliographic record for a finding aid as a single document, it does not provide sufficient means for leading users directly to subunit records created and linked to higher level records. Minor attempts had been made to accomplish this within the MARC structure, primarily in the use of subfields and local fields (Davis, 1995, p. 52).

Many types of documents are definable in SGML. The Berkeley Finding Aid Project brought together parties with a shared interest in finding aids as one document type. Under the Bentley Fellowship Program, a team led by Daniel Pitti outlined the basic principles for the design of an encoding standard and agreed that finding aid documents consisted of two segments. The first segment, the header, has information such as title, compiler, etc. about the finding aid and the second segment contains information about a body of archival material, which may be hierarchically organized information describing a unit of records or papers along with its component parts or divisions or information to facilitate their use (Encoding Standard, 1996, p. 11). The Encoded Archival Description (EAD) conforms to the formal SGML requirements and is a document type definition (DTD) known as EAD.DTD.

**SGML Catalog Records (SCRs)**

As did the electronic encoding of finding aids, pilot projects exploring digital libraries are accelerating the search for new approaches toward handling new manifestations and versions. At Columbia University, the RLG Digital Image Access Project (DIAP) dramatically expanded document digitizing activities and quickly focused attention on how “to
incorporate the additional detail, hierarchy, and version information needed to adequately describe digital collections" (Davis, 1995, p. 45). Underlying their experimentation was a commitment to sharing bibliographic records nationally, which meant, therefore, some use of MARC records and led toward a two record approach—i.e., summary MARC records distributed nationally with pointers to locally held SGML Catalog Records (SCRs). As suggested in the name, the SCR would be an SGML-encoded bibliographic record of summary bibliographic information, detailed hierarchical and version-related data, as well as links to the actual or related digital items and related bibliographic records (Davis, 1995, p. 45).

The resultant cataloging data model is comprised of hierarchically related records representing collection, group, subgroup, item, and image cataloging levels. The DIAP participants took into account the unpredictability of the content and structure of archival records together with the need to allow the level of cataloging detail to reflect local institutional practices, making data elements repeatable at all levels and designing record displays that were sensitive to the presence or absence of data elements at various hierarchical levels.

**MULTITIERED LIBRARY CATALOGS**

The modest adaptations as well as the more dramatic changes in new proposals for recording data in bibliographic records are indicators of changes implemented and a sure sign further changes are still to come. To fulfill its function as the primary access tool to library resources, the library catalog is entering an era of new requirements. Without demands for access and delivery, creating bibliographic access to resources in different formats, such as computer files, was accommodated reasonably well in the confines of current cataloging traditions. Today, Michael Buckland (1994) speaks eloquently in pointing out that “the effects of linking online bibliographies to catalog records begins to extend the bibliographic power of the catalog beyond the dreams of catalog code compilers,” and to work effectively, “the future catalog will have to be multtiered and flexible and adaptive in operation” (p. C).

The feasibility of providing immediate access to Internet-accessible resources via the library catalog was explored independently by OCLC and local system vendors. Begun in 1994, the second OCLC Internet Cataloging Project resulted in a functional catalog of Internet resources accessible via web browsing software (Dillon & Jul, 1996). Providing access via the library catalog instead of through a search engine approach brings the power of fielded searching, the benefits of subject analysis, standardized name and subject heading, and other value adding features of cataloging to the discovery and retrieval of Internet resources. When
the point-and-click ease of accessing Internet resources is added, the library model of access is successfully carried to these resources.

Local system catalogs, dubbed "webpacs," also utilize a WWW client to access the catalogs, conduct the search, and report the results back to the user who started the chain of events by initiating a search via Netscape, Mosaic, or other available web browser. During the search, the webpac's WWW client works from the MARC records to create the HTML (Hypertext Markup Language) records that are used to return the results to the user's workstation. HTML is the markup language in general use on the WWW and is an SGML application interpretable procedurally by web browsers, including those employed by users to access the library catalog. These catalogs answer the question in the affirmative of whether library catalogs can offer direct access (hypertext links) to Internet resources.

Earlier options taken by libraries were listing resources on the menus of other information systems, creating separate databases for Internet resources, creating guides to Internet resources or, most recently, establishing Web sites. Electronic full-text books and journals were listed by authors or titles in alphabetical order on "bookshelves" or "reference shelves" (on campuswide or other parent body information systems) to provide direct access to the journals stored or accessible from that computing location. Various types of protocols have been supported, including gopher, telnet, and now http protocols.

Establishing a Web site is popular in libraries for several reasons, not the least of which is because it offers direct access to Internet resources without waiting for a local "webpac." The distinct disadvantage is the separation of access to Internet-accessible resources from access to other library resources. With the technical capability of webpacs eliminating a primary reason for separate access and the expected mainstreaming of the selection of Internet resources in support of library "collections" (Demas et al., 1995), decisions about which and how many access paths the library should create can be discussed in regard to effective retrieval, not technical, capability.

The multitiered catalog described by Buckland would employ a hierarchical approach to descriptions of works, versions, parts, and related works. Many in the library cataloging community recognize the need and believe it may be best accomplished in a format other than MARC. On a local basis, the impact to the catalog's structure could be relatively minor. It is possible today to move TEI header data into a MARC record, to provide links to finding aids which then provide hierarchically interlinked records for levels of analysis—collection-level, unit, subunit, item, etc.—to attach information on various versions of a title to a single bibliographic record for the title through the use of multiple item-specific records, or to provide pointers from summary MARC records to
locally generated SGML catalog records (SCRs) as proposed at Columbia University. The CIMI Cultural Heritage Online Information (CHIO) project is digitizing and encoding art exhibition catalogs and other materials in SGML-based records. Some libraries will acquire these catalogs and could logically catalog them in MARC records but would lose the ability to describe multiple levels. The usefulness of creating a MARC record to point to other records would apply here as well.

Millions of MARC records, however, form the basis of thousands of catalogs but, more importantly from a universal bibliographic access perspective, form the basis of cataloging data exchange, making consideration of even partial change an exceedingly complex matter. In full knowledge then that any change must not be revolutionary in implementation, there are suggestions that a move from total reliance on the MARC format is inevitable (Gaynor, 1996, p. D). This could take several forms, such as using MARC records as pointers to records in other formats and databases, integrating MARC and non-MARC records in a single catalog, or converting MARC records into other formats for use in local catalogs. Although the MARC format has an exemplary history in facilitating bibliographic access, the use of SGML-based records could provide new ways to use the many nonlibrary-based automated systems, standards, and software tools, such as the World Wide Web, and “anticipate future developments in integrating library generated data into the developing local and national information environment as effective inventories of and indexes to the electronic holdings of libraries” (Davis, 1995, p. 46). Data conversion occurs now between USMARC and SGML, and it is possible the need to encode bibliographic data in library systems in only one format may be relaxed. A scenario allowing the use of different or multiple formats in local catalogs would be an important step in adapting the catalog structure to provide multitiered access.

In one other important area, catalogs would benefit from accommodations made for other formats. The Alexandria Digital Library project is creating spatially indexed information that is basically nontextual. As catalogs are, to date, largely text-oriented, there is clearly a need to position nontextual and textual data into a coordinated framework.

**Global Resource Description**

New technology prompts comparisons of old and new approaches and, it is hoped, improvement of existing methods of resource description. Current discussions within the library community are addressing fundamental issues: cataloging objectives and surrogate requirements, a multiple object orientation in bibliographic records, the application of cataloging principles to digital resources and alternative record structures for local catalogs to meet access requirements, making this an enormously productive time in cataloging history.
At the same time, these discussions rest on the assumption that library catalogs fit squarely within a distributed system of resource description and discovery and lead inevitably to issues of how library catalogs are positioned and what kind of system is presented to users. The following three issues have been identified both within and outside the library community as important: names and addresses for Internet-accessible documents, managing multiple metadata schemes in catalogs and local information systems, and presenting a coherent bibliographic framework to information seekers/users.

**Names and Addresses**

While multiple World Wide Web (WWW) data formats exist—HTML, for example, is an important but not the sole format—there is only one naming and address technology on the WWW and that is the family of Uniform Resource Identifiers (URIs) (Connolly, 1996). URIs have three parts: Uniform Resource Locators (URLs), Uniform Resource Names (URNs), and Uniform Resource Characteristics (URCs), which are in different stages of development. URLs are the spine labels of the Internet and as a result of their early development, they are a stable and standard technology.

However, they are subject to change when hardware is reconfigured, file systems are reorganized, or organizational structures are revised. The longevity of an average URL is said to be measured in weeks, not years, giving rise to the specter of broken links as an impossible burden for libraries and other organizations maintaining URLs in databases. It is possible sometimes to find a document in the absence of a recorded URL by knowing the address of the host and browsing through its contents, along the lines of browsing in the stacks, but it is not a method recommended for efficiency.

To assure persistence of URLs across time, two methods of naming have been proposed in the United States: the Corporation for National Research Initiatives (CNRI) HANDLE System (Arms, 1996) and the OCLC PURL Resolution with a joint OCLC/CNRI project for creating a name system (URNs) for objects identified by URLs (Weibel & Jul, 1995). URNs have properties differentiating them from URLs: URNs are location independent, globally unique, and persistent across time. In addition, quick resolution is required because the resolution process inserts a step when documents are requested using HANDLE or PURL. The request goes first to a server that will look up the associated URL and return it to the web browser for subsequent linking to the document's server (Gardner, 1996, p. 48). Since 1994, OCLC has created free software for setting up a PURL server available to any organization and is itself assigning PURLs to records for Internet resources in the OCLC Internet Catalog. When a
URL changes, the associated PURL can be changed once on the PURL server.

Although it is not yet certain how URNs will be mapped to individual resources, there is clear interest in having a specific URN always associated with the same resource even though the resource is located in multiple places (Erway & Weibel, 1996). To construct a framework under which various URN systems could operate and meet this objective, the Internet Engineering Task Force (IETF) URN Working Group reestablished itself in June 1996 and will be discussing such proposals at its December meeting. Under one option, the assignment of names would be designated to naming authorities, who would define criteria for determining when new names are assigned and assign unique names or delegate that authority in turn to subauthorities. A central registry of naming authorities could be a vehicle for some level of cooperation and coordination among naming authorities, particularly for mirrored resources.

Naming versions and formats of an information resource are also issues, not new ones for libraries, which should be expected to bring considerable knowledge to developing criteria for when to assign new names and how to name versions. ISSN, which are names, are administered by the Library of Congress and, in a similar role, national libraries and library associations such as IFLA (International Federation of Library Associations and Institutions) can be expected to take a role in conjunction with government and other agencies.

The last member of the URI family, the URCs, are undeveloped with some question as to whether they are needed. URCs are essentially surrogates—i.e., metadata or cataloging records—containing descriptive data about the resource, including any or all categories of metadata. Many in the computing community, however, are unfamiliar with the capabilities of library cataloging records or those in other metadata schemes, which inclines them toward the creation of a "new type of record," a URC record. Part of the reason is that library records, for example, have not typically contained data on terms and conditions of access, although the records could contain it, making new record types seem more necessary. Though the forum of IETF meetings may be new to librarians, along with other indexing and abstracting agencies, this is an area where the knowledge of library community is much needed.

**MANAGEMENT OF MULTIPLE METADATA SCHEMES**

Managing names and addresses within and across domains is made easier by the existence of only one naming technology for the World Wide Web, unlike the fact that there are already many more metadata schemes with new ones sure to arise. A data registry delineating each scheme and identifying common and unique elements between and
among them would serve several purposes identified at a meeting of the ALCTS Task Force on Meta Access (ALCTS Task Force Minutes, 1996).

First, it would foster the awareness of existing schemes thereby preventing an unneeded proliferation of schemes. The use of an existing scheme would result in more resources accessible via a "standard" approach and serve as an important means of furthering cooperation in providing access.

A data registry would also support conversions from one scheme to another. Several tools for converting records from one to another scheme already exist—e.g., TEI2MARC developed at the University of Virginia. This program achieves "transferring all data found in a TEI-header to a MARC format with all related fixed and variable fields intact" (Shieh, In press). The output can then be used as the basis for a full MARC computer file bibliographic record for subsequent entry into library catalogs. The TEI2MARC was derived from a USMARC.DTD developed at the University of California, Berkeley, for conversion of US MARC records into SGML format and back out again (Larson et al., 1996). Also, the Library of Congress has made available its alpha version of an SGML/MARC and converter, a document numbering hundreds of pages. Others, such as one to convert a Dublin Core set of elements into the USMARC format, are in progress (Caplan, In press). With such tools, one is free to imagine how computer conversion can assist in cataloging—e.g., the Cataloging in Publication process. A TEI encoded document with header is received, the header is converted to a MARC record, which is then augmented with classification, subject headings, and authorized access points, and returned, as is now the case, to the publisher.

Although not the first or only conversion tools, these conversion tools emphasize both the importance in the library community of the sizable investment of records currently in the USMARC format and the desire to make greater use of records created in other formats. Whether they lead toward the development of a WWW-based catalog with SGML rather than USMARC as its underlying record structure, as is suggested by Gaynor (1996), or the reverse movement of data into the MARC format for use in library catalogs, is not prescribed by conversion tools, which in either case provide the straightforward ability to move data from one to another and back again. Conversion tools in and out of MARC will be important in allowing libraries to control in some way their ability to take advantage of the power of newer and more generalizable formats.

Presentation of a Coherent Bibliographic Framework

The third issue of how library catalogs are positioned and what kind of system is presented to users is closely related to data conversion. A data registry would facilitate system management of data residing in various schemes by making it possible for an automated system to know how
data elements carrying different tags relate to each other. Sorting like and unlike data into the appropriate fields for indexing is crucial to the ability to create single or linked databases accommodating records in various formats. The interoperability of library-created records with those based on other metadata schemes is fundamental to proposals suggesting that subject-based databases, rather than source of cataloging or access record-based databases, deserve future consideration (Drabenstott, 1996).

Construction of a data registry inclusive of major metadata schemes is a formidable task. It is, however, one that stands to offer significant assistance both in making more effective use of existing standard metadata schemes and in managing more than one such scheme in local online information systems. As such, it deserves to be considered first by the national and international standards organizations, specifically the International Standards Organisation (ISO) and National Information Standards Organization (NISO). Quite obviously, there are many challenges in determining the objectives of the data registry as well as the most efficient methods for building it.

CONCLUSION

Metadata, library cataloging objectives, record structures, persistent names and addresses for Internet-accessible resources, and the management of diverse metadata schemes are important concerns in building a coherent system of bibliographic access for information seekers. The prospect of "surfing the Web" may challenge some but, for others, it represents a stab in the dark with no sure expectation of success. Millions of objects are available to the searcher. None has been excluded: even "personal pages and other ephemera are accessible without requiring intervening selection, processing and cataloging decisions" (Taylor & Clemson, 1996, p. 1). Yet this same wealth, in its current amorphous and undistinguished state/mass, is a source of dismay and confusion offering little assistance to searchers in their attempts to navigate within and among these resources. In examining whether resource description and organization, which Levy (1995) grouped under the term "cataloging," will remain as important in the future as it has been in the past, he concluded the answer is yes, for without some organization and maintenance, digital collections will not remain either stable or usable. There is little doubt that our colleagues would agree.

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Electronic Collections and Wired Faculty

TONA HENDERSON and BONNIE MACEWAN

ABSTRACT
This article explores the relevance between electronic resources and faculty in their teaching and research. The role these resources play in faculty planning for their own research and their planning for their students' research, individual learning, and classroom activities are all explored. Additionally, issues pertaining to geographically dispersed students and faculty, copyright, and computer skills are included. The discussion uses The Pennsylvania State University as a model, and a spectrum of Penn State faculty were interviewed and provided information about their work and the impact of electronic resources.

INTRODUCTION
There is a natural relevance between academic faculty and research libraries. Without the wealth of resources available in the research library, faculty teaching and scholarship suffer. Without the primary constituency of the faculty, both direct and indirect use of library materials wanes. Each party relies upon the other. The characteristics and activities of an academic library are defined by this interdependent relationship with the faculty and by our desire to be relevant.

"The principal characteristic of a research library is an emphasis on primary resources for advanced study and research" (Mosher, 1994, p. 3). Library collections improve research and instruction by supplying faculty with the intellectual resources necessary to study and teach. Library collec-
tions also correct individual inequities in access and economics and provide a context for scholarly investigation and communication. While some scholars indicate that increasing numbers of faculty are circumventing libraries for direct electronic access, by far a larger number of faculty continue to rely upon the library for well-rounded, representative, and pertinent information. "It is only a handful of scholars who are bypassing their libraries" (Abel, 1991, p. 273).

For all its desired relevance, the academic library does not exist in and of itself. It is not an inherently relevant organization. Academic faculty orchestrate exploration of library materials for their own research and assign library projects to their classes. As changes in the research and instructional environment favor digital materials, the library remains relevant by ensuring collections that meet changing classroom and desktop needs. Ultimately, the relevance of the collection lies within its use to the faculty and to the efforts of their students. A collection unused, whether due to irrelevance or inaccessibility, is not a library collection so much as a packing list. In short, scholars do not exist in a vacuum of resources to use. Libraries do not exist in a vacuum of use. The question of how electronic collections affect faculty is essentially one of utility.

Based on strong mutual self-interests, interdependence, and complementary activities, significant changes in library collections inevitably produce attendant changes in faculty activities. Electronic collections ultimately produce wired faculty. At the Pennsylvania State University Libraries, like many others, electronic resources have exploded in popularity and use. Generally desirable for reasons of accessibility and availability, electronic collections have specific utility and, thus, relevance for faculty. The application and integration of electronic resources into teaching and research form a matrix of inquiry. In this article, discussion and examples of faculty, libraries, and electronic resources will focus on examples at the Pennsylvania State University. Issues with regard to electronic collections and the effects of copyright and computer skills on faculty will also be explored.

The Pennsylvania State University is organized in a way that gives special significance to the access provided by electronic resources. Only half the students, faculty, and staff of the university are located at University Park, the "main campus." The remainder are located around the state at other locations. These other locations are not separate entities in the usual sense but function as a part of the whole or, in the local parlance, one university geographically dispersed. The libraries function as a single entity with all librarians reporting to a single dean regardless of location. Students and faculty, at least in theory, have equal access to resources from all campuses.
Teaching

Electronic resources can and do enable innovations in teaching. The University Libraries pursues a two-pronged approach to the acquisition and selection of electronic materials. First, the Libraries often acquires and makes available broad and generally useful materials. While at one time collection relevance meant acquiring maximum materials for a "just-in-case" scenario, electronic materials are now routinely acquired when they are most heavily, regularly, and generally used by the faculty and students. Based philosophically on a radical shift in collection policy (Shamber, 1996; Smith & Johnson, 1993), the practical result of this strategy is an increased relevance to the classroom faculty.

As a fundamental part of student research, encyclopedias are an initial entry point into the library collection. The heavily used and popular, *Encyclopedia Britannica* was acquired electronically to increase collection relevance to the teaching faculty. In just six months, from January 1996 to June 1996, the *Encyclopedia Britannica* was searched over 140,000 times by Penn State users. Access was made available through an agreement between *Encyclopedia Britannica* and the consortia of Big Ten universities, the Committee on Institutional Cooperation (CIC). Collectively the users of the CIC university libraries searched the system almost 1 million times during the same six month period.

The kinds of uses have in many ways been as interesting and gratifying as the quantity of use. A Penn State art professor has designed a course which depends heavily on the student's ability to connect to the encyclopedia directly from web-based information screens that make up a primary aspect of the content of a course. Teaching students the many terms, names of art movements, and periods in history necessary to understand art history is always a challenge. This course depends on the student's ability to easily click from the content of the course to a description in the encyclopedia explaining such terms. Many students achieved the same goal over the years by sitting down in front of the paper volumes and pulling them off the shelf and looking up term after term. The students and the faculty member find this new capability far more efficient and helpful. A proposal to digitize and provide access to the classic edition of the *Encyclopedia Britannica*, the eleventh edition, should further enhance the ability of humanities faculty to use this resource as an electronic map to the content of their courses.

Likewise, the recent acquisition of the full-text format of *Periodical Abstracts* promises to afford many professors a convenient and timely resource for general classroom use. In just one month, over 7,500 users accessed the system. The librarians at the various campuses are finding the full text of titles especially useful since the local collections are limited. As an additional benefit, the number of intralibrary loan requests is dropping. It is clear from this preliminary test that full-text articles im-
prove library relevance to geographically remote faculty.

For the teaching faculty, an electronic collection strategy that emphasizes broad and generally useful materials affords a commonality of baseline access and content—that is:

- students share access simultaneously and diminish contention,
- electronic materials may not be hoarded by one or more members of the class to the detriment of others,
- electronic materials may not be defaced or mutilated to the point that they are unusable, and
- electronic materials provide a more timely expression of current information pertinent to discussion and learning.

By sharing fundamental materials more widely, quickly, and consistently, teaching activities accelerate based on instructional goals rather than literary logistics. Desktop learning, with proper skills, enables students and teachers to liberate the learning window from the walls of the library or the classroom.

The University Libraries also acquires and makes available electronic resources to support smaller-scale classroom activities. While heavily used materials are the best candidate for electronic format, data-intensive or static historical materials are also considered prime candidates for the electronic collection. *The Pennsylvania Gazette* is a retrospectively converted newspaper available to Penn State history faculty and students. Currently, it is shared between two faculty on our multicampus system and provides an excellent example of the libraries' role in leveraging the maximum use of specialized information by using electronic formats to minimize physical damage and reduce the need for multiple copies.

In this case, two professors at two locations wanted students to look for information in the *Pennsylvania Gazette* during a one-week period in the semester. It was a fairly simple matter to ask them to coordinate their schedules so that the students in each location had access to the resource during the week of the assignment. We sent the compact disks to the requesting locations during the weeks of the assignments. However, as is often the case with electronic issues, the technical issues were a special challenge. The students experienced difficulties with the CD-ROM player at one campus that hampered their ability to complete their assignment but, even with those difficulties, the professor reports that he told the students that: "It's a whole new ball game. It isn't what you can get upstairs in the library anymore. It is what you find anywhere in the world." He tells us that: "It is now possible to have undergraduates do what used to be major research projects for graduate students. They can be assigned projects that would have taken months using indexes and microforms. It opens a whole new world for undergraduates."

He goes on to discuss the challenges the technology presents to him
as a teacher. He says, "I have to start to do things and think differently." As an example, he reports he used to have assignments due at noon but now students report they encounter contention for electronic resources in the morning, so he has made assignments due (electronically) by midnight. They are often date stamped at 11:55 P.M. Despite his enthusiasm for testing the use of electronic resources, he continues to express some skepticism about technology, especially in light of the equipment failures that provided challenges in his classes. However, he finds that the electronic resources and the technology "gets students excited" and anything that "gets students excited about history is well worth the effort [he must put forth] to learn it, help make it work and rethink [his] classes."

More and more frequently, customized electronic collections are assembled on request from existing electronic materials. In one example, recent collaborations between business professors and business librarians resulted in custom-designed web home pages for class use. In the business program, students learn in intensive short sessions. Again, the timely collocation of materials within an instructional context speeds learning and facilitates group discussion. The materials requested, while available on a myriad of Internet sites, were effectively identified and locally organized for convenience and timely use. The professor supplied the activities and assignments, the librarian supplied the resources and the page. Future directions and relevance may be found in the creation of these "micro-collections" that pre-coordinate pertinent materials electronically and include locally licensed materials as well as freely available Internet resources.

The professor clearly outlined the advantages:

Prepackaging the material for a major assignment probably had the most profound effect on my own organization. I really had to think through what I expected the students to be able to do, what resources would be required for them to do it, and how they could interact with me if they had questions about the material. These issues were more important this year because not only was I teaching material that we had normally covered in 15 weeks in 5 weeks, but I was responsible for delivering this material to 147 students instead of 40 students.

The other important outcome of using new technology is only by working with it could I begin to appreciate what else I might be able to do. As a professor who is committed to continuous improvement of instruction, I developed new skills and teaching techniques because I established new avenues for sharing and learning with students and my colleagues. The "structure for inquiry" that was built into the web page also became a common ground for sharing and adaptation. Students showed me new sites and techniques; I could pass these along to others who were interested and our overall knowledge and understanding grew.

In another class-specific example, the Libraries Electronic Reserves
service allows teaching faculty to collaborate with librarians to disseminate instructional materials electronically. At Penn State, the Electronic Reserve system increases the relevance of the library by allowing faculty to literally add to the electronic collections as needed—directly—easily. While the Electronic Reserve system is not a typical electronic resource, it is an example of how faculty and libraries work together to improve relevance. It is also a good example of how a library’s collection can be locally created, customized, and “converted to digital form to make it more useable” (Butler, 1996, p. 493).

The Electronic Reserve system will be particularly important to the work of students in a program called Project Vision. These students are scattered around the Commonwealth and are enrolled in a package of first year classes. Although there are some face-to-face meetings between students and faculty, much of the work of the course is done by computer. Students communicate with their professors via e-mail and with their fellow students in chat rooms and via e-mail. They conduct most of their library research through the computer and submit their papers and receive comments from their instructor online. This year they will use the electronic reserves system to read course-related articles and materials. Although not distance education in the usual sense, this project is an example of the relevance of electronic collections to an increasingly digital faculty and student population.

RESEARCH

Technological innovations comprise, increasingly, a greater role in the research milieu of the university community. Penn State is no exception. Generally, the significant characteristics of this environment include rapidly compressed timelines of research and increased discovery and creation of new fields of inquiry (Brown, 1990).

Timelines of research increase rapidly when electronic formats facilitate baseline data gathering and analysis, identification and retrieval of secondary materials, and publication and dissemination of results. With the availability of electronic formats, data gathering and analysis is accelerated by the phenomenal counting and sorting speed of computers. Beyond the generic advantages of computer-based research are the clear benefits of computer-based extraction for subject researchers. Our membership in ICPSR and our acquisition of databases like COMPUSTAT and CRISP supply faculty researchers with a wealth of information on demand in business, political science, social science, and public policy. By extracting relevant materials, large databases can serve multiple purposes and increase the libraries’ relevance to all researchers. These statistical databases can be combined with the capabilities of our Geographic Information Service lab to provide faculty with the ability to customize their statistical research.
Providing electronic resources for humanities faculty presents special challenges. In our experience, and according to the research of Adams and Bonk (1995), faculty access to electronic technology and information resources is often significantly lower for humanities scholars. Recent innovations like the Electronic Text Center aim to supply both the content and means to analyze humanities texts. Like many, the Pennsylvania State University Libraries sees great advantage in acquiring primary research materials electronically in order to support these faculty in their timelines of research. For the humanities scholars with electronic capabilities, full-text humanities resources are being provided through the network as well as in the Center whenever possible. One English professor tells us:

The real advantage of having primary materials available electronically is that the materials can be accessed as easily from home or office as in the library itself. It's like having unlimited shelf space in your own office. Just as important, these electronic materials can be manipulated by tools that scholars already know how to use—tools like word processors or database packages. The result, I think, is a huge increase in speed and convenience.

One of the most popular research tools made available to faculty at Penn State is MathSciNet. Each Penn State location includes several mathematics professors trying to earn tenure and keep up with their discipline. This group of faculty posed a special challenge and were very vocal in their request for access to electronic information about their discipline. Mathematics departments are often well wired and the faculty very knowledgeable about computers and electronic resources. Once MathSciNet was available, the Libraries immediately subscribed and was rewarded with comments like this one:

I have used MathSciNet extensively.... It is terrific! Speaking for myself, I would happily give up all access to the printed and CD-ROM version for reasonable access to MathSciNet. I currently use the online version from the University of Michigan, but I don't find that anywhere near as convenient as the MathSciNet interface.... I [will] use it on the average more than once a day. By contrast I used the printed version more like once a month.

Other activities to support faculty research include online interlibrary loan requests. The timely acquisition of secondary research materials is greatly enhanced when the request can be made more quickly and the delivery expedited, in many cases, by electronic services like UnCover and Ariel. The Libraries' new e-mail request service facilitates online requests and, like many other libraries, directly harnesses the power of electronic communication. Already nearly 25 percent of all ILL requests are being sent by e-mail. Since implementing these electronic enhancements, the turnaround time had been reduced by five days.
Finally, the emergence of electronic journals as alternatives to scholarly communication contributes significantly to rapid research progress. The Libraries collections include access to a consortia collection of electronic journals. These electronic journals represent a first tangible glimpse into the future effect of electronic resources. As computers enable new fields of research between hitherto distant faculty and as results can be shared instantly, electronic journals accommodate the immediacy of a new research milieu and diminish the financial concerns of print communications. The Libraries no longer collects these materials individually but relies, instead, on the consortia partners to “collect” electronic journals through a project called the CIC Electronic Journals Collection (EJC).

The Electronic Journals Collection project is being developed based on information gathered from an early project, the CICNet E-Serials Archive. The EJC will be a fully managed collection of selected electronic journals shared by all libraries in the CIC. The collection will be actively managed, cataloged, and maintained. The member libraries will be freed of individual responsibility for acquiring, cataloging, maintaining, and preserving the titles. Six libraries will provide cataloging that will be available to all thirteen members through a special OCLC symbol. This project has several goals. First, it should provide an efficient and cost effective method for the libraries to provide these resources to their users. Second, it should provide a testbed for these sorts of resources that will make it possible to expand the project to include fee-based journals and other kinds of electronic resources. And third, it provides a test of the technology and our abilities as librarians and technologists to collaborate to maximize the benefits and capabilities of electronic resources.

The creation of new fields of inquiry is also facilitated, in great part, by the academic libraries’ focus on electronic resources. Electronic resources allow for a simpler mixing and matching of previously disparate information. Desktop researchers can “switch” between literally dozens of large research-oriented databases and freely combine the results to create and discover new ideas, results, and observations. The facility and flexibility of electronic formats acquired by the library results in new uses both unforeseen and unpredicted when ordered.

**Issues**

The rapid and pervasive introduction of electronic materials to the university community has not come without a price. Two distinct issues, among many, stand apart as particularly problematic. First, the library’s electronic collections have precipitated issues of copyright among the faculty. While we have made materials widely available, we have assumed the role of “enforcer” as a condition of acquiring licensed electronic resources. In addition, our electronic materials have also revealed a gap
between faculty computer skills and their abilities to effectively use electronic resources. As many materials are discontinued in print, faculty without training or facility in computer skills increasingly find themselves disadvantaged by our “new” collections.

Electronic copyright issues are unfathomably complicated, tenuously defined, and almost certainly unpredictable for the near future. Yet, in the library, we continue to purchase electronic formats and, subsequently, sign the licensing requirements for these materials. It is maddening to faculty to have such a wealth of resources that are so constrained. Two of the faculty members interviewed reported encountering these frustrations. One describes his greatest frustration as becoming aware of resources which he can’t access either because of costs or access restrictions. He goes on to talk about resources that are restricted by licensing, copyright, or agreement with a donor to a single location even though they are available electronically. At the Penn State Libraries, the Copyright Committee plans to organize and bring together scholars and faculty from across the university community to better explain and detail the licensing and copyright requirements of our electronic resources. Additionally, the Faculty Senate Committee on Libraries has presented an informational report to the Senate and plans to follow that report with an action item outlining faculty concerns around copyright.

Closely related to the issues of copyright are those of pricing and licensing. Increasingly vendors are not selling electronic products but rather licensing them to libraries with a long list of restrictions and requirements. Often the annual fee is coupled to the size of the faculty or the student body or even based on whether or not the library is housed in a single building. Universities organized like Penn State are charged far more than comparably sized universities with all students located on a geographically contiguous campus.

Rapidly looming on the horizon of our electronic future are issues involving faculty computing skills. As many resources become available only in electronic form or, alternatively, are more effectively and efficiently provided in electronic form, faculty computing skills in using these materials will become critical. If, as some have suggested, faculty are especially resistant to the technical and pedagogical implications of electronic resources (DeSieno, 1995; Hardesty, 1991), then it will be a significant challenge to the academic library to develop information literacy skills among the faculty. In an example of an effort to ease this problem, the Libraries, in conjunction with the Center for Academic Computing, embarked on a systematic training program for Internet skills aimed at faculty and graduate students. Met with praise, the Internexus program successfully reached out to researchers and teachers and provided them with a practical and useful orientation. In addition, the Libraries offers many
opportunities for faculty training each semester based on generic or subject specific goals.

CONCLUSION

The relevance of electronic resources to faculty is measured in its utility to both teaching and research. In teaching, the widespread availability of general use or heavily used materials facilitates individual learning and promotes classroom activities. On a class by class basis, electronic materials allow for customizable content, scheduling, and access. For a geographically dispersed university, electronic materials often level the learning field across all locations. In research, electronic collections encourage rapid research advances, instantaneous scholarly communication, and the creation of new discoveries. For a geographically dispersed university, electronic resources level the tenure field across all locations as well. In all cases, however, electronic resources present significant challenges in everything from simple use to intellectual property to faculty computing skills.

In closing, it is worth noting that, like the chicken and the egg, the electronic collection and the wired faculty enjoy a which-came-first relationship. It is unclear whether our electronic collections truly create wired faculty or whether faculty requirements drive our collection formats and philosophy. However, they are not mutually exclusive. In reality, and true to the premise of interdependence, both parties alternate in driving an electronic agenda. It is in our naturally relevant nature to do so.

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REFERENCES


Resource Sharing in the Systemic Context of Scholarly Communication

Czeslaw Jan Grycz

Abstract
The purpose of this article is to examine issues related to resource sharing among libraries within the context of world knowledge needs, economic and publishing realities, and the intersection of conflicting interests of stakeholders in the scholarly communications system as it moves into an increasingly electronic environment. The author surveys the emergence of distinctive attitudes and localized solutions to practical challenges faced by librarians and publishers under the impact of electronic documents, and considers the kinds of technical solutions and impacts that might be expected in the future.

Introduction
One way of identifying the primary constituents of the cycle of scholarly publishing is to name the author, publisher, and librarian as its most essential participants. Each of these stakeholders is affected by digital electronic networks that have emerged as nonpareil vehicles for facilitating scholarly discourse, publishing timely research, and archiving scholarly texts for eventual retrieval.

Each of the constituencies has adjusted to the influence of electronic networks in different ways. Every adjustment, and each solution to a perceived difficulty, is justifiable. But sometimes decisions made within the confines of one group's concerns may be counterproductive or at odds with the overall need of the system of scholarly communication.

One such example may exist in the solution to economic constraints, developed by libraries, known as "resource sharing." Resource sharing is
typically defined as one of two activities. The first is collaborative collection development, whereby subject specializations are intended to be “distributed” among libraries within a clearly defined geographic region so that individual libraries need not attempt to collect in all fields (which generally results in a broad but shallow representation of literature) but can concentrate in depth in a particular field (which results in a more extensive in-depth collection within a narrow field).

The second form of resource sharing is through various document delivery mechanisms. Interlibrary loan might suitably fall into this category, as might reserve reading rooms and subcontracted document fulfillment services.

Clearly, any manner by which libraries can pool their regional or collective purchasing capabilities or agree on subject specializations being “distributed” among consortial members is in the best interest of the library community. Yet, some consortial activities can cause contrary effects than the ones originally intended. Researchers in libraries that have elected not to emphasize acquisitions in a researcher’s discipline area may be disadvantaged (or, at minimum, inconvenienced). Reduced revenues from subscriptions or sales of publications may result in the need for publishers to increase the price of their publications. Ineffective control mechanisms on the proper use of library materials may further erode the revenues needed to support the value-added system of publication.

**Cross Fertilization**

In professional meetings just a few years ago, participation was commonly restricted to one’s own professional associates. Increasingly, meetings of library professionals include panels by publishers; the Society for Scholarly Publishing (SSP) is eager to attract greater participation by librarians in its meetings; and professional academic meetings host sessions in which librarians and publishers are primary presenters.

Today, academic authors appear content to extend the use of the Internet to publishing and archiving, although some voices have raised caution about overconfidence in technology, citing deficiencies in media (bit-drop and media-erosion), the lack of substantial infrastructure aids (online quality indicators analogous to those in print, the absence of bibliographic meta-data, and the difficulty of authenticating an “original” or “archival” text). Some also express concerns about the long-term integration of new electronic repositories with legacy collections.

There continue to exist apprehensions among member of the library community about their viability in an electronic environment. This is sometimes cited under the rhetorical question “Can a public lending library exist in the electronic village?” Issues of fair use, copyright, and ownership of electronic information have arisen and have proven to be complicated matters. Scholarly publishers (both primary and secondary)
are still seeking suitable ways of incorporating electronic publications strategies into their business models and having them make fiscal sense.

**SURVEY**

It is in the context of the system of scholarly communication that the following discussion is undertaken as a means of better understanding individual pressure imposed by distributed networks on existing behavior and conventional relationships. Sometimes condensing the history of a trend into a survey serves to highlight (through exaggeration) the importance of individual events in a way that can be illuminating and bring new perceptions to light. What is being examined is the impact of compelling new modes of electronic communications (the Internet) on each of the three major constituencies in the cycle of scholarly communication—author, librarian, and publisher—and the individualistic responses that have sometimes contributed, sometimes contradicted, the needs of the system as a whole.

**EMERGENCE OF DIGITAL TECHNOLOGIES**

Some two decades ago, academic librarians began observing changing trends in the availability and usage of electronic networks. The Internet had become established in the academic environment, though it was not yet as ubiquitous (nor as globally dispersed) as it would be in the years following. With the expansion of the Internet, a new class of electronic document had emerged. It was, at once, promising and attractive for its obvious advantages of speed and transmissibility, and profoundly elusive and confounding to the library community because of its intangibility and malleability.²

The actual communications mechanism (a distributed network of computers and LANs) which made electronic documents possible had existed many years earlier. An arbitrary starting point of twenty years ago can underscore the rapidity with which substantial change (not merely ephemeral or sensational) has taken place in scholarly communication and in scholarly publishing.

By the mid 1960s, the Internet had expanded to include a sufficiently diverse group of higher education institutions and a large critical mass of active users. Given those conditions, the limitations of infrastructure (and they were real) become insignificant barriers to real implementation and utility on a broad scale by those who found the network highly productive for peer-to-peer communication, collaboration over distance, and remote database access. Within the last ten years, the Internet has become global and ubiquitous. It reaches hundreds of countries on all continents and is featured daily in the business sections of all major newspapers.
The new form of scholarly communication—based on distributed digital network technology—was first exploited by academics and researchers because the ARPAnet (Advanced Research Projects Agency Network) had expanded from its self-imposed confines of the nation’s National Scientific Research Laboratories (where it was first developed and implemented) to reach out to the major academic centers and institutions at which the scientists at the laboratories had professional associations and colleagues. The network (redefined as the Internet) rapidly evolved to include a growing majority of the nation’s higher educational institutions. Once in place, it permitted rapid exchange of information among scholars and researchers, facilitated closer collaboration on research agendas, and offered new forms of informal sharing of research results among members of a given discipline.

These changes served to tighten the bonds among researchers in any given discipline with one another irrespective of geography or location. Conversely, it subtly weakened the researcher’s primary identification with an institution or a university (which was, by nature, locally grounded) and replaced it with greater links to professional and scientific associations and societies (which were national and even international in scope).

Concurrent with the emergence of this new scholarly communications capability, a change was taking place in the existing bibliographic organization—based on print—which has been the dominant influence on scholarship and research for the past 500 years. An unusually steep rise in journals and serials prices began to be noted by librarians. As they monitored these escalations with growing alarm, the situation led, eventually, to what has become known in library circles as the “journals pricing crisis.” The price of serials publications subscriptions, well documented in the literature, has risen so precipitously over the past two decades that journals acquisitions expenses have claimed an ever-larger proportion of the overall collections budget available to librarians for acquiring both serials and books.

Because of the timeliness and perceived importance of serial publications (especially in the sciences) and reinforced by the natural desire to retain continuity within a numbered series of a title which a library might, perhaps long ago, have begun to collect, a gradual reallocation of budgets could be seen to have been taking place which threatened and eroded the capacity of a library to maintain former purchasing levels. The first victims of this pressure were scholarly monographs and nonjournal sources. Subsequently, even journals themselves were not immune from the pressure of insufficient funds.
INNOVATIVE SOLUTIONS

As the trend escalated to the level of a budgetary crisis, it forced a very difficult and trying process among librarians and faculty at academic institutions. Subscription cost/benefit ratios were calculated for heretofore sacrosanct journal series. Usage patterns and statistics for all of a library's journals were gathered and evaluated. A variety of innovative solutions were sought to reconcile the conflicting desires to: (1) preserve the record and collection of publications within fields judged to be important to individual libraries, (2) protect the purchasing capacity of a library for monographic and specialized book-length studies, and (3) balance economic and budget limitations that could not be made to stretch to accommodate both needs and desires. Resource sharing became one by-word in efforts to accommodate new economic realities. Cooperative regional collections development strategies were suggested. New forms of sharing (interlibrary loan and document delivery systems) became increasingly popular.

PSYCHOLOGY

In general, it must be admitted that collection development strategies have not succeeded very well as cooperative efforts entered into voluntarily by libraries. One librarian characterized contemporary efforts in this way:

True resource "sharing" may not be the right word for it, but it is cooperative decision making with regards to datasets for either 1. local loading, or 2. contract for distance access....WE are also, with both public and academic libraries, contributing funds to support some of this.

It's the most cooperation I've seen in terms of resource sharing since I've been a librarian. (Chuck Hamaker, personal communication, July 31, 1996)

Another wrote:

So, I think there is resource sharing going on, but it may not be the kind some people expected. The impetus may not be the "pricing crises" but rather easier access to low cost technology, electronic products, network connections at the desktop, simple access tools such as WWW browsers, etc. (Danny Jones, personal communication, August 1, 1996)

Cindy Hepfer, editor of Serials Review, quotes a review of a book that will appear in Serials Review:

While there is a core collection of both journals and monographs that support the curriculum at ASU West, access to other information is provided through document delivery/interlibrary loan, utilizing both the Main campus and commercial suppliers to the end user. (Mitchell & Walters, 1995)
One of the participants in OhioLink in Ohio, which is generally regarded as the leading exemplar of resource sharing on a statewide scale, confided that it was not libraries' needs that ultimately motivated OhioLink to come into being. Rather, a legislative mandate overcame natural reluctance to change and actually forced it into existence, even though it is now more popular than not with the majority of participants (Julia Ann Gammon, personal communication, September 24, 1996).

Librarians are justifiably possessive about their collections. Their collections have been an important part of the identity of their parent institutions. The expertise developed in knowing the requirements of certain fields is an asset that establishes a library as a user-oriented and professional center in that field. It appears that there is insufficient impetus within the library community itself to share collection strategies.

**Importance of Digital Works for World Knowledge**

This is further reinforced by the behavior of libraries within Third World and developing countries with which the author is familiar. Even though such libraries have been under the constraint of enormous budget restrictions, volunteer collaborative collection development cannot be observed to have taken place among libraries in Central or Eastern Europe nor among similar libraries in India (two areas with which the author is slightly familiar). Specialized libraries have been established, to be sure, with specific collections mandates in particular fields of interest. But academic library collection decisions are as personal and subjective as the individuals who work in the libraries.

However, despite the fact that budgets were severely limited, once the global Internet became available within these regions, libraries suddenly found resources, albeit not without difficulty, with which to provide connectivity to the Internet, support the educational requirements of their staff, and master the tool sets that permit access to remote databases in electronic formats.

In contrast to collaborative collection development, the impetus for access to network resources is a compelling one. As we enter the new century (which is already being identified as the "Information Age"), there is a greater awareness that applied information products, targeted to specific business, industrial, or legislative needs, will be the most important ingredient for economic self-sufficiency. An argument may be made that the consensus decision-making governance model of the Internet is one of the most effective demonstrations of democratic decision making in action. Given the perspective of global needs, investment in knowledge resources made available on the Internet to promote the self-sustainable, ecologically sensible, and socially responsible development of companies, governments, and communities ought to have any nation's highest priority. The availability of electronic resources on a global basis heightens
the imperative that libraries obtain access to the Internet and master its intricacies for their own good and that of their patrons. Libraries, in general, and those in developing countries in particular, can obtain information from the Internet from one of three sources:

- another library,
- a publisher who has mounted its information on the network in one form or another,
- an individual professional academic or researcher with sufficient stature in the field to be a recognized authority, thus providing a semblance of reliability in the information available from such a source.

Each has different responses to new global demands for information. What are the practicalities of these retrieval solutions?

**Library**

Clearly, the unlimited distribution by one library of its information resources to others on a global basis would not only tax the library but would run counter to any business model that attempted to recover costs. Libraries could become document delivery service centers (some, like the British Library, may be said to have already done so in large part). But this often runs counter to the principal mandate given the library to store and provide reliable access to its collection. One of the redefinitions taking place within the library community is precisely whether its focus should be on its own collection or on providing patron access to collections wherever they exist.

**Publisher**

Until some of the business infrastructures are put into place to satisfy the publishing community, primarily having to do with document security, usage metering, and incremental billing mechanisms, there will be hesitancy in providing much formally published material on the Internet. When publishers do begin making their properties available, it may be assumed that access will be provided for a price. This business logic is unlike the reason that libraries were given specific and limited exemptions from the Copyright Act. But the idea of providing information at a price is not, inherently, disagreeable. If the price can be made sufficiently low, then most consumers would not object. Here, the problem is that the present cost of financial transactions is so high on the network that it is difficult to foresee a mechanism for billing small amounts of transactional cost.

**Individual**

Individuals, departments, and institutions are indeed rapidly populating the Internet with a wealth of information and knowledge resources through the process known as “self-publishing.” However, with the absence of the quality assurance imprint granted by a professional publisher,
it is hard to determine what is valuable and what is chaff on the Internet. In addition, today’s crop of search engines is miserably primitive by contemporary bibliographic standards, and it appears that it may be some time in the future before the generation of sophisticated natural-language query engines will perform as well in refining a search as do contemporary bibliographic techniques.

There are also examples of centrally mounted repositories of preprints, notably Paul Ginsparg’s Physics Preprint Database in Los Alamos, New Mexico. Is this a model for the future? The objections raised in editorials in the journal Science suggest that more study is needed about the economics of such a discipline-specific database. The preprint database is currently supported by a major grant from the National Science Foundation. While this money is being well used to help define the proper storage technology, search and retrieval engines, and automated review processes, it remains to be seen whether an ongoing service like the one that has been developed can be self-sustaining.

**NATIONAL PERIODICALS CENTER**

Ten years ago, the patterns first observed by the library community had been recognized as being real, not anomalous. In partial answer to questions such as those posed above, Scholarly Communication: Report of the National Enquiry was published (National Enquiry, 1979). It articulated anew a much older idea that had never reached consensus: that a “national periodicals center” be established.

As recommended by the National Enquiry, a center should be established which would act as a national library agency. Amassed at the center, a far more robust collection of journals literature could be gathered than any single library could ever hope to afford. Having centralized oversight mechanisms to this real or virtual warehouse could make it possible to coordinate bibliographic controls, facilitate the development of national and international bibliographic standards, and ensure access to “published information of all kinds and formats which are needed by scholars but which their libraries are unable to acquire or retain” (National Enquiry, 1979, p. 156).

In retrospect, three characteristics of the electronic age conflicted with this idea.

1. “Centralization” had, in the meantime, given way in all spheres of public and social life to more popular “distributed” models of authority and governance.

2. The economics of a national periodical center, while clearly advantageous when viewed from the perspective of the consumer (researcher/library), had not been so well considered from the perspective of the producer (author/publisher).
3. The legal implications were challenging if not daunting. Concurrent with the Report of the National Enquiry, discussions had been taking place between libraries and publishers under the aegis of the National Commission on New Technological Uses of Copyrighted Works (CONTU). These deliberations, including a broad base of participants, attempted to define, through limits on practice, what “fair use” meant in the context of interlibrary loan and reserve reading room use of published documents. The CONTU discussions brought to light the practical difficulties associated with the enforcement (of any agreed upon policies) within library settings, which were characterized by reduced staff and greater availability of coin-operated copying machines. Perhaps more important, they identified the magnified and highly exaggerated problems that could be anticipated as fair use was applied to the collection, accessibility, and sharing of electronic documents.

Circular Effect of Cancellations

Inevitably, the budgetary and economic realities among academic and public libraries, heightened by institutional budgetary constraints, led to the cancellation of journals subscriptions. This entirely sensible decision, based as it was within one segment of the scholarly communications cycle, initiated tensions upon the economic models that publishers had previously relied upon to capitalize their value-added services on behalf of the scholarly community.

As subscriptions declined, the unit cost of publications naturally rose. In response to declining subscriptions, the publisher had no recourse but to increase costs on those and remaining journals in order to cover fixed expenses. This decision, considered locally within the publishing industry, also could be seen as logical, even though, within the larger context of the scholarly communications cycle, it was counter-productive since it caused a spiraling effect (increased prices equaled budgetary difficulties among libraries; library's efforts to balance their budget equaled canceled subscriptions to expensive journals; canceled subscriptions equaled increased prices to cover escalating costs; and so on).

The Nature of Electronic Documents

Early pioneers in Internet development—notably Douglas Engelbart—had, in the early 1960s, published descriptions of a new kind of hypertextually linked “document” that was envisioned within a distributed network (and only possible when such networks had been widely deployed). These types of electronic documents were increasingly practical in a networked environment that had reached critical mass and extent, and whose participants perceived and experienced real values of immediacy, timeliness, and convenience.
Engelbart had wondered about how such electronic documents would change our notion of fundamental elements in scholarly communication such as authorship, peer review, verification, authentication, permanence, and archiving. He had concluded, as had many others, that a shift was inevitable and potentially dramatic. Scholarly researchers and academic authors would, without doubt, be attracted to such new capabilities as efficient and productive and would come to rely on them in preference over existing bibliographic information systems. The existing bibliographic systems—while admittedly elegant—supported the complex and highly difficult tasks of classifying, cataloging, providing access, and managing printed documents. In contrast to author-centered electronic communications, it was turgid as compared with an environment where instantaneous communication, measured in nanoseconds, was possible.

Indeed, because the infrastructure existed among academic institutions to facilitate e-mail, electronic discussion groups, remote job control, and the development of online databases, scholars and researchers demonstrated a capacity to put up with the irregularities and inconsistencies of nonstandard software tools and the lack of sufficient documentation. They showed an enthusiasm for new methods of working with one another coupled with new methods for research in all fields.

Entirely New Research Areas

These changes were by no means restricted to the sciences, although the capability for computer-aided modeling and visualization was of particular interest to the scientific community. The applications in the sciences are also so compelling as to draw considerable attention by popular media and the press. As early as 1980, however, Robert Oakman at the University of South Carolina had published his “Computer Methods for Literary Research.” New computerized concordances, for example, virtually eliminated a heretofore brisk publishing business in typesetting and publishing printed concordances to literary works, indicating the frequency of word use and relationships among idiomatic phrases. This work was far better done by computer, and new forms of computer-aided literary analytical tools drove even the resisting humanities scholar to appreciate the advances of computer capabilities in all fields.

Shoshanna Zhubov, in her doctoral dissertation, “In the Age of the Smart Machine,” documented her comprehension that computers should not be viewed merely as tools for facilitating traditional forms of work (or scholarship) but as changing the very kinds of work (and scholarship) that could be conducted.

By 1987, Oldrich Standera (University of Calgary Library) would publish an encyclopedic compendium of nonprint-based varieties of electronic publishing, which he perceptively titled The Electronic Era of Publishing.
The Electronic Era of Publishing was a more appropriate title than "The Era of Electronic Publishing," for, in fact, a number of barriers existed that restrained traditional scholarly publishers from enthusiastic adoption of electronic publishing methods. These barriers still exist today.

- The first barrier is the formulation of an economic model for revenue generation in an electronic environment, which provides comparable revenues to those generated by print.
- The second barrier to adoption derives from the first. It is the lack of a mechanism for adequately monitoring the use of intellectual property that is encapsulated within an electronic document (of whatever sort).

Publishers must work within very tight constraints of economics as do libraries. Ironically, many society publishers who have distinguished themselves from commercial scholarly publishers by fulfilling their mandate to publish—at favorably reduced cost—society members' works, find their operations are dependent on the revenues generated by print subscriptions and the sale of print publications. Many society publishers can no more easily adopt electronic mechanisms than can their commercial counterparts without the tools and protections desired by commercial publishers.

In the emergence of distributed networks, publishers have been at a distinct disadvantage. As institutionalized self-sustaining business entities, they have been less able, for example, to experiment with "beta" versions of software or risk development on products that might not survive in the marketplace. While academic and research institutes can find independent sources of funding for infrastructure and R&D experimentation, businesses must depend on revenues generated from sales. Given their own experiences with technology and in the marketplace, they were understandably cautious about implementing technologies before they were completely proven and stable.

Preparing Documents for Electronic Publication

Another element in publishers' reluctance to adopt advanced electronic technologies is the fact that preparing texts for distribution in electronic form requires a specific form of manuscript object tagging known as SGML (Standard Generalized Markup Language). SGML can also be used effectively for generating print, but there are alternative, more popular methods that can produce print-ready pages, and most publishers use the latter.

Under pressure by consumers and authors to publish electronic versions of products, publishers who may want to do so are nevertheless caught up in the dilemma that additional expenses will be necessary in
order for them to provide such products. Needless to say, such expenses would have to be borne just at a time when price resistance in the marketplace has become an issue.

AVAILABILITY AND DEMAND

Many publishers have engaged themselves in voluntary experimental projects by which to learn more about business models, technical issues, and end-user behavior with respect to electronic publications.

- "CORE" was among the first of these, a joint venture between Cornell University and Bellcore Labs, attempting to resolve issues around display requirements on computers for SGML tagged files.
- "Red Sage" is a collaboration jointly entered into by Springer-Verlag (Heidelberg, Germany), AT&T Bell Labs (New Jersey), and the University of California's San Francisco Medical Campus (UCSF). It now boasts over twenty publishing participants in addition to Springer-Verlag, given the recognition that a critical mass of desirable content was essential for users to overcome the initial barrier in learning any new system, however easy to use.
- TULIP (The University Licensing Program), jointly participated in by several universities each of whom adopted various methodologies for retrieving and printing documents provided by Elsevier Science Publishers, has just concluded and issued its final report (Borghuis et al., 1996).
- The IEEE/UC-Systemwide partnership, by which 1 million pages of IEEE publications in electronic form are being delivered annually to the University of California, which is undertaking to mount the pages, link them to the automated library catalog MELVYL, and make images available for downloading to the desktop of engineering faculty, staff, and students within the nine-campus UC system.

Each of these, and others, has its purpose in providing quantifiable usage statistics and information that can assist in developing financial models and user behavior information that can inform publishers about the kinds of electronic products that might be most successful in the electronic marketplace.

There is an in-built reluctance to engage in such experiments, however. It is well documented (and should be a source of considerable comfort for publishers) that the mere availability of electronic forms of information substantially increases its use. Yet, an experimental prototype is destined, by design, to conclude within a span of several years. So publishers and institutions who engage in such experiments raise the expectations of patrons and users who find utility in the services provided. It is very difficult then, even with advance foreknowledge, to end the experiment or to transform it into a business model that is self-sustaining.
The next era of experimental prototypes will undoubtedly involve universities, libraries, and publishers in developing real solutions in usage metering, transactions billing, and mechanisms for monitoring distribution of electronic files.

CONCLUSION

This broad survey of ways in which individual constituencies of the scholarly communications system have been influenced by the emergence of electronic information technologies may have teased out many of the most perplexing difficulties, as well as several of the important opportunities, provided by electronic networks. What are some of the critical areas of development that might suggest future innovation or breakthroughs?

Financial Models

The best thinking about Internet publishing models suggests that publishers (and "content providers" in general) will generate revenues sufficient to sustain operations (which is interpreted to include administrative costs as well as the costs of sustaining peer-review, quality assurance, and document preparation suitable for distribution electronically) only through a variety of income-generating mechanisms.

Part of the costs may be returned from site licensing fees, part from individual subscriptions, part from advertising revenues, part from institutional subventions or member fees, and part from subsidiary rights to third party publishers.13

Unauthorized Redistribution

Most publishers fear the unauthorized redistribution of electronic intellectual property known as "downstreaming." There are usually fairly manageable and practical methods for obtaining fees for the use of electronic information at the first instance of transfer. This is to say, there exists many mechanisms for a user to purchase a license to legally download electronic text (or sound clips, animations, or executable code) to the user's computer. What is less clear are mechanisms for preventing the legal user from redistributing the downloaded material to other colleagues, friends, or associates or, indeed, from posting the file on multiple large redistribution lists like ListServ or MajorDomo. Publishers legitimately fear the loss of downstream revenues and confront possible erosion of income by two legal techniques.

Legal Techniques

The first deterrent to misuse of electronic publications is to replace the use of Copyright Law, into which these media may not easily fit, with Contract Law through which legal obligation and performance and usage standards are established between the contracting parties.
The second is to employ various developing technologies like IBM's Cryptolopes, electronic watermarking, or secure encryption.

- "Encrypted Envelopes" contain rights and permissions header information which can provide access or restrict it to a class of users (individuals, members of a company, participants in an ad hoc project, etc.). Cryptolopes can also authorize or restrict what an individual can do with an electronic document (print it, share it with others, mount it, incorporate it into another file). The Association of American Publishers (AAP) has recently announced the development of a Digital Object Identifier (DOI), a project administered by AAP's Enabling Technologies Committee and recently subcontracted to R.R. Bowker, a division of Reed Elsevier, Inc., and the Corporation for National Research Initiatives (CNRI). This technology will facilitate identification of the owner of any electronic file, and the methods by which rights and permissions might easily be secured. It is one of the building blocks of a system by which transactions involving electronic documents can be implemented.

- Electronic Watermarking is a system that has little social appeal. It electronically "stamps" a document as belonging to a specific individual. If that individual should share the document with hundreds of friends, each copy will contain the watermark bearing the original purchaser's identification. This may serve as a disincentive for downstreaming because it would make enforcement and criminal prosecution easier.

- Straightforward encryption is another possibility. And a number of companies are working on projects that will not offend the resistance of federal law enforcement agencies to implementing true encryption technologies by which it would be impossible for legitimate law enforcement officials to "wire tap" (even for legitimate reasons) electronic document transmissions.

Financial Tool Sets

As mentioned earlier, many of the barriers that exist to electronic publishing implementation derive from the lack of a cost-effective mechanism by which to collect small increments of change in return for the purchase, use, or citation of electronic documents. Several institutions are working with financial networks to develop such mechanisms, some by aggregating low volume transactions until a sufficiently large sum is involved to justify billing, others by means of a debit account by which the user pays in advance of use.

One can be sure that the mechanisms and tool sets needed to provide for electronic commerce will develop and become available in the
immediate future (a one- to two-year span of time). Such enabling technologies will provide the basis for a brand new electronic marketplace. Given the right price point (and the incentives exist to make it reasonably affordable), many individuals, small organizations, libraries, and research units could afford to avail themselves of such transaction mechanisms to become "electronic publishers."

Software encryption envelopes will permit the exchange of information in ways that permit a user to receive royalties on a sale of a file wherever it happens in the life of a document. This suggests that intermediaries in the process (an "agent" who encourages a sale on behalf of a document found to be interesting, for example) might share in such royalties. So, as was described in a research paper presented to the Library of Congress Networking Solutions Committee in 1979 called "useright," technology will soon exist for an individual to act as author, publisher, agent, and buyer at various times and receive or pay token amounts of money, the aggregate of which might be sufficient to support the costs of a different kind of electronic information distribution system than the one we enjoy presently.

REMAINING QUANDARIES

Given the likelihood of such developments, what finally are the principles we can derive from the various vested interests which have been described in the survey above that should be our guiding principles as we move into the electronic future?

Copyright

Principles of copyright should be of particular importance to authors, publishers, and libraries alike. Many behavioral attitudes on the Internet presently undermine these principles. Because it is possible (and desirable) to download elements, files, illustrations, and texts for one’s personal use and for use in building new products and modules, the users are lulled into believing such data is "free" and certainly "free of copyright." Nothing is further from the truth.

While the practice is responsible for many of the developments on the Internet and is a behavior that is altruistically-based, collaborative, and needs to be preserved, the data itself are undeniably copyrighted and are someone’s valuable intellectual property. It is very important that all members of the academic, library, and publishing community hold the same awareness of the value of intellectual property in electronic form and recognize that it exists—in the moment of its tangible expression—as the valuable property of the individual who created it.

It is entirely possible that many individuals in specific circumstances will choose to "license" use of their work by others. But copyright is so
important an underpinning of all the structures needed to make the creation and dissemination of scholarly information possible, that our communities must take an active role in educating our constituencies about the role of copyright in the protection of works of intellectual property.

**Fair Use**

To the extent that content providers succeed in supplanting copyright law by contract law in licensing and contracting obligations and restrictions on use for electronic property, to that extent we undermine the principles of fair use which, in fact, have been one of the primary ways of providing access to information for the disenfranchised, the small entrepreneur, and the motivated individual in our country. Maintaining a reasonable understanding and implementation of fair use needs to be a high priority. Articulating precisely what fair use means in an electronic environment is not only a challenge for librarians, but is one that—if we do not rise to it—may result in the obliteration of the concept and, with that, much of what libraries stand for.

**Piracy**

Evidence of piracy is pointed to among foreign nations and offshore pirating organizations. Clearly, the global information infrastructure we know under many names (e.g., the Internet, the Matrix, or the Global Information Infrastructure [GII]) is breaking down geopolitical borders and is making it necessary for there to be a global harmonization of intellectual property laws. To establish uniform understandings about intellectual property, and to aggressively stamp out pirates both at home or abroad is an effort that will strengthen, rather than diminish, the ability of those with information to provide it on a cost-effective basis to those who most need it.

**Disenfranchised**

Electronic networks level the field of access to needed information. In focusing on our own needs, we must ever be aware of the importance of providing information to emerging free markets and democracies that provide for the same level of creative intellectual achievement as we ourselves enjoy. It is easy to become chauvinistic and insular in thinking about our knowledge resources; it would be foolish to act on such impulses given the needs of the world today and the efficacy of information to redress commercial, environmental, and legislative limitations. A major effort to provide solutions by which developing countries can be provided with access to information will only reflect back on the economy and security of the United States, difficult though it may be to implement appropriate mechanisms.
Content

It is seductive to become involved in issues of transport, transaction, visualization, and format. Ultimately, the librarian's guiding principle should be an emphasis on content of information—its fair and open availability, verification, authentication, evaluation, and identification. It is these values that the library community most brings to the cycle of scholarly communication. Concentrating on how we can transform the skills developed over so long a period in print, and adapt them to the needs of the electronic environment should be our foremost endeavor.

NOTES
1 Complicating discussions on such topics is the fact that some might argue for a different constituency of primary partners in the scholarly communications process (e.g., one could argue with some validity that the National Science Foundation, the Departments of Energy or Defense, or universities should be identified as primary constituents). Others would quibble over the definitions of the constituents named here, claiming that the "author" is usually also the primary "consumer"; that the publisher's role is challenged by self-publishing capabilities or other institutional forms of academic publishing and should therefore be redefined; or that the library can no longer identify itself exclusively with "liber" (book) (or that it must do so in order to circumscribe its task).
2 Librarians who face the ongoing challenge of integrating new electronic forms of scholarly publication have been known to print copies of electronic journals in order that the, now physically expressed, journals could be accessioned and shelved with standard collections.
3 The costs of journal production can be influenced by many externalities, including the cost of labor, capital expenses for production and manufacturing technologies, increased subcontractor costs, and the rising risks associated with publishing in less well-established fields.
4 While it is not clear that the influence of electronic journals played a dominant role in the price escalation in journals prices, it is certainly true that publishers were aware of the challenge potentially represented by new online electronic professional and scholarly journals. At least one component of the cost increases that translated into higher prices for journals was the need for journals publishers to combat this new competition with increased R&D of their own in the area of electronically published journals.
5 Psychologically, there is a certain comfort in the shared standards that can be expected from another professional librarian, although there are certain legal questions (see later) about the rights of a library to distribute beyond a certain restricted site.
6 The availability of electronic versions of published materials has been skimpy, to date, given that the network instrumentation for usage control and billing have not yet been put in place.
7 The Internet contains a wealth of information resources, but it consists of an undifferentiated chaos in terms of quality. Librarians would prefer to rely on the "imprint" of a bona fide publisher, in whose procedures of peer review and selection they can rely. Absent that, a recognized authority can also provide scholarly validation. The absence of encryption technology that guarantees that an electronic file contains what it purports to contain is, however, another deterrent to libraries.
8 As of this writing, Netscape has announced a major effort to solve this problem (common to many businesses who would like to conduct commercial transactions on the Internet), through a special CyberCoin effort.
9 The effect of decentralization was manifest ubiquitously in politics, university governance, social organizations of all kinds. It was not merely a phenomenon of the distributed electronic networks, though it may fairly be said that the emergence of the network not only coincided with movements towards decentralization, but propelled them, as well.
In print-based manufacturing environments there exist economies of scale, such that increasing a print run, for example, reduces the unit cost of each individual copy in that run. Conversely, when print runs decrease beneath certain plateaus, the price of an individual copy increases, sometimes sharply. This effect, while observable in individual print runs of any given title, is also manifest in a publisher's overall profit calculation. An increasing number of titles amortizes the startup, editorial, overhead, and marketing cost in such a way as to favor the journals publisher that publishes a large number of individual titles. This is one reason for the perceptible consolidation of titles in the hands of a smaller and smaller number of mega-publishers.

To be sure, there were questions concerning "scalability" of the theories proposed on smaller network models. Subsequent experience has proven the validity of the notion that the theories were "scaleable," for the software engineering community has consistently supplied technical solutions to accommodate the astounding rapidity of growth and size of the distributed network community.

Publishers, during the same period, encompassed by this survey had practical experience with the instability of technical progress. The typesetting industry with which publishers were inexorably linked went through profound changes. In the 1960's, there were still to be found hot metal typesetting firms which set type for scholarly books and journals by hand, and by mechanical typesetting equipment like Linotype and Monotype casting machines. The introduction of the Merganthaler V.1.P. (variable input phototypesetter) permitted machines to be controlled by paper tape, modem transmission, or magnetic information contained on floppy disks. But these changes made it possible for faster photo-optical machines to be implemented. Their success (even though photo-mechanical typesetting machines had notoriously bad throughput) encouraged the development of computer-generated typesetting systems. No sooner had these come onto the market, than the personal computer revolution spawned the development of "Desktop Publishing," challenging the primacy of dedicated typesetting systems. For CFOs attempting to determine at which point and in which technology to invest was a trying experience, at best.

Typesetters themselves had to "reinvent" their businesses as they experienced the erosion of traditional sources of work. First, they began to extend their expertise to encompass "pre-press" capabilities (these have to do with the preparation of materials for reproduction—a task traditionally accomplished at a commercial printer), and more recently typesetters have marketed their keyboarding and coding skills to publishers interested in producing electronic by-products of printed work, such as CD-ROM versions of books or online versions. In September 1996, a foremost typesetter of academic and professional books released its own first CD-ROM, having reinvented itself completely by turning into a publisher.

Much has been written recently about the emergence of new information "consolidators" who might license (on a nonexclusive basis) information from a wide variety of resources, but within connected fields of interest. These new "publishers" may be unusual corporate organizations who might not—at first glance—be thought of as publishers. The best example of this is, perhaps, Intuit Inc., the producers of the personal financial software program called Quicken. Intuit has entered into agreements with a number of providers of information in the area of economics, finance, stock information, business news, etc. presuming that its marketing outreach, and its Internet savvy will be able to add value to such information by making it available in aggregated form on its own Intuit site. Thus, Intuit would become, in effect, a secondary publisher of primary information by consolidating it and providing all the information in a user-friendly interface. Some analysts predict that more examples of this kind of subsidiary publishing will be available in the future.

REFERENCES


Interlibrary Loan and Resource Sharing: The Economics of the SUNY Express Consortium

BRUCE R. KINGMA

ABSTRACT
This article presents an economic analysis of the SUNY Express consortium and the potential savings from consortium delivery of scholarly articles and joint collection development. An economic model of consortium collection development is presented. Data on the cost of interlibrary loan, journal prices, and journal use are provided to determine the potential savings of the SUNY Express consortium. While considerable savings are possible using consortium delivery of scholarly journal articles, savings from joint collection development are small.

INTRODUCTION
Resource sharing is considered by many librarians to be a solution to the financial problems within the academic library community which include the continued rise in journal prices. The causes of journal price escalation are outlined in Tenopir and King (1996) and Kingma and Eppard (1992), among others. These price increases have forced many academic libraries to cut journal subscriptions. Typically, high-priced low-used journal subscriptions in the sciences and mathematics are targeted as the major culprits in the journal price escalation. Cutting a few major science journals provides significant savings to any academic library, although it may also impact the quality of the academic programs which depend on these subscriptions.

Library consortia are considered as a possible solution to these financial problems. Consortium delivery may provide lower cost and higher quality access to scholarly information than journal subscriptions and
commercial document delivery services, although the cooperative nature of a consortium may lead to bureaucratic problems of finance and implementation. Many of the benefits and costs of library consortia are discussed in Eaton (1995), Hirshon (1995), Hightower and Soete (1995), and Lowry (1990).

While consortium savings have been mentioned in the library literature, there has been little modeling of the economics of library consortia including the costs and benefits of joint collection development and the costs of consortium delivery of journal articles. In addition, a complete economic analysis requires modeling not only the financial costs and benefits to the libraries within the consortium but also the costs and benefits to library patrons of consortium services. Providing access to journal articles via a consortium service instead of subscribing to a journal requires patrons to wait for access. This time spent waiting has an opportunity cost to patrons which should be measured and incorporated into any economic analysis of consortium delivery.

**AN ECONOMIC MODEL OF A LIBRARY CONSORTIUM**

In theory, a consortium of libraries which offers members joint collection development and priority access to interlibrary loan can provide savings to library members relative to commercial document delivery, traditional interlibrary loan, and journal subscriptions. There are two sources of potential financial savings for libraries within the consortium. First, if consortium delivery can be achieved at a lower cost than alternative sources of interlibrary loan and document delivery, then libraries within the consortium will save on interlibrary loan services. In addition, if libraries within the consortium identify journal subscriptions for which access can be more efficiently provided by the consortium sharing a subscription rather than every library within the consortium owning one, then consortium delivery and joint collection development can be economical.

**THE ECONOMICS OF ACCESS VERSUS OWNERSHIP**

The first source of potential savings from consortium delivery comes from the lower cost of access via consortium delivery than from other sources of delivery or purchasing a journal subscription. This source of savings only occurs if consortium delivery is the lowest cost method of access. If traditional interlibrary loan delivery via the OCLC network or a commercial service such as UnCover costs less than consortium delivery, there would be no reason to use a higher cost method of delivery.

If consortium delivery is chosen, each library within the consortium must decide whether to subscribe to a particular journal or provide access to their patrons via the consortium. To determine these potential savings, it is first important to understand the basic decision of access
versus ownership when another library within the consortium will be subscribing to the journal. Getz (1991), Kingma (1996), and Palmour et al. (1977) illustrate the library decision rule for access versus ownership.

The decision of providing access via interlibrary loan versus ownership of a journal subscription is shown in figure 1. The figure illustrates the "break-even" level of use and subscription price which makes ownership of a journal subscription more economical than providing access by interlibrary loan. In figure 1, the horizontal axis represents the present discounted value of the expected lifetime use of a single year’s subscription to a particular journal. The value of a journal subscription is not only the benefit from this year’s use of the journal but also of all future years’ uses. This year’s subscription to this journal may generate twenty uses this year and ten uses next year for this year’s subscription. If the subscription was never used again, in total this journal would have thirty nondiscounted lifetime uses. Discounting future uses by an appropriate discount rate to reflect the present value of these uses would result in a present discounted value of expected use less than thirty.

The vertical axis in figure 1 represents the total cost of a journal subscription—the subscription price plus fixed costs—or the total costs of access by interlibrary loan for a single volume or year of a journal. Fixed and marginal costs of journal subscriptions and interlibrary loan

![Figure 1. Library's Decision Rule to Subscribe or Borrow](image-url)
are taken from Kingma (1996). A journal with a subscription price of $500 and $63 in fixed costs of shelving and processing is illustrated by the vertical line "A." Line A assumes the marginal costs of using a journal subscription equals $0.94 per use which includes the cost of reshelving the journal ($0.07) and the expected cost of a photocopy of the article ($0.87). Line "B" represents the costs of providing access to journal articles by interlibrary loan. Each delivery by interlibrary loan costs the lending and borrowing libraries resources plus has an opportunity cost to the patron of having to wait for access to the article. Line B assumes the marginal cost of interlibrary loan to be $16.47 per request.

The break-even level of use is the present value of the level of expected lifetime use such that the cost of providing access by interlibrary loan equals the cost of providing access by purchasing a journal subscription. In figure 1, this is thirty-five uses. If the expected lifetime use of this journal is less than thirty-five, it is economically efficient to provide access by interlibrary loan rather than by purchasing a journal subscription. If expected lifetime use is thirty-five or greater, then it is economically efficient to purchase a subscription to this journal.

The break-even level of use depends on the costs of interlibrary loan, the price of a journal subscription, the number of expected lifetime uses, and the costs of in-house use of the journal. As the full cost of interlibrary loan increases, the break-even level of use decreases, making ownership more efficient. Likewise, as the costs of ownership increase, the break-even level of use increases, making access more efficient over a greater level of lifetime use. As journal prices continue to escalate, access by interlibrary loan or document delivery becomes more cost efficient leading to additional journal subscription cancellations and an increased use of interlibrary loan and document delivery.

THE ECONOMICS OF CONSORTIUM ACCESS VERSUS CONSORTIUM OWNERSHIP

In theory, a group of libraries can form a consortium and develop their journal collections jointly to provide savings to the group. There are two potential sources of savings; the savings from consortium delivery which may be at a lower cost than other methods of delivery, and the savings from the consortium owning a single copy of a journal in order to provide access to it by other members of the consortium.

The first source of potential consortium savings assumes that the group of libraries in the consortium can provide delivery at a lower cost than alternative sources. The consortium may use more student labor for consortium delivery than for traditional interlibrary loan or the consortium may ask patrons to search the catalogs of other libraries within the group, saving staff time in locating journal subscriptions at other libraries. Geography may also play a role in lowering shipping and delivery
costs. However, while geographic closeness may play a role in lowering
the cost of consortium delivery of monographs, delivery of journal arti-
cles by facsimile and Ariel implies that geography has little to do with
lowering the costs of delivery for journal articles.

The second potential source of savings from consortium delivery
comes from joint collection development by consortium members. There
are many journal titles for which patron use is too low to justify a sub-
scription at an individual library. However, many of these titles might
generate sufficient use among all the libraries within the consortium to
justify the consortium purchasing a subscription. In this case, one library
within the consortium might purchase a subscription, perhaps financed
by a subsidy from other libraries within the consortium, and provide ac-
cess to patrons at other member libraries.

This decision rule by the consortium to subscribe is illustrated in
figure 2. The horizontal axis in this figure shows the expected level of
lifetime use by all members of the consortium. The vertical axis rep-
resents the total cost of providing access to a journal by a subscription,
consortium delivery, or an alternative method of delivery. Line “A” rep-
resents the cost of a subscription to this particular journal. Figure 2 as-
sumes that this journal has the same subscription price and other costs as
in figure 1. Line “C” represents the cost of consortium delivery to the
member libraries. Line C assumes that the marginal cost of consortium
delivery is $7.80 per article. Line “B” represents the cost of delivery of
articles from this journal by an alternative method of access with a higher
marginal cost of delivery per article than the consortium’s marginal cost.
Line B assumes that the marginal cost of the alternative method of deliv-
ery is $16.47.

In figure 2, library number one’s expected level of lifetime use is
twenty uses. Libraries two, three, four, and five have an expected lifetime
use of ten uses each. Given library one’s level of use, this library would
not subscribe to this journal if it were not a member of the consortium.
However, given twenty expected lifetime uses of this one-year subscrip-
tion, the cost of delivery by the alternative method of delivery is $329.

We can determine the cost of consortium subscription and delivery
using line C. If libraries one and two were the only members of the con-
sortium, it would not be worthwhile for this two-library consortium to
subscribe to the journal. The cost of consortium ownership and access
would be $563 for library one and $97 for library two’s access. Together
the cost to the consortium of $660 would exceed providing access to the
journal through the alternative method of delivery. Line B shows that
the thirty uses generated by library one and library two would cost $494
by the alternative method of delivery. Only if all five libraries are mem-
ers of the consortium does consortium ownership and delivery cost less
than the alternative method of delivery. In this case, the sixty expected
lifetime uses of all five libraries costs $894 for consortium ownership and delivery. However, these sixty uses cost $988 by the alternative method of delivery.

The break-even point of consortium delivery is the level of cumulative expected lifetime use by the members of the consortium such that consortium ownership and delivery costs less than the alternative method.

Table 1. The Cost of Access to Scholarly Articles at a Research Library

<table>
<thead>
<tr>
<th></th>
<th>Borrowing</th>
<th>Lending</th>
<th>Patron*</th>
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</thead>
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<td>$18.62</td>
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<td>$3.92</td>
<td>$3.21</td>
<td>$1.68</td>
<td>$8.81</td>
</tr>
</tbody>
</table>

*Notes: Patron costs include the opportunity cost of time spent waiting for delivery minus the value of the photocopy received without charge. For the ARL/RLG average cost estimate, see Roche (1993). SUNY Express consortium is now called Empire Express.
of delivery. In figure 2, the break-even level of use for consortium delivery is forty-nine uses. If the cumulative use of the members of the consortium is forty-nine or more, it is more economical to provide access by consortium ownership and delivery.

There are several assumptions used in figure 2 that are important to note. First, if the alternative method of delivery has a marginal cost of delivery less than the consortium's marginal cost, then there is no reason to provide access by the consortium. In other words, a consortium is worthwhile only if it provides a lower cost method of delivery. Second, if a library within the consortium would subscribe to a journal regardless of whether it is a member of the consortium, then consortium ownership is assumed and there is no reason to determine the potential savings for the consortium to purchase this subscription. It is only when no library within the consortium is willing to subscribe to a particular journal title that joint collection development within the consortium becomes relevant. Finally, the level of use by each library within the consortium influences the consortium cost of ownership and access. In figure 2, if library one has a higher level of expected lifetime use, line C will shift to the right, and the break-even point of consortium delivery will decrease to something less than forty-nine. Library one as the "subscribing library" within the consortium provides savings relative to other methods of delivery for every use, therefore the level of use at library one increases the savings from consortium ownership and delivery and lowers the break-even level.

While theory predicts that there may be some journal titles for which joint collection development is economically efficient, there are no estimates of the potential benefit from joint collection development for academic libraries. In addition, it is unclear whether consortium delivery is at a lower cost or whether other methods of delivery might provide similar levels of access at a lower cost.

**SUNY EXPRESS AND THE COST OF INTERLIBRARY LOAN**

In 1994, the University Libraries of the State University of New York at Albany, Binghamton, Buffalo, and Stony Brook received funding from the Council on Library Resources to do a cost analysis of access versus ownership for low-use high-cost journal titles in mathematics and the sciences. Kingma (1996) reports the results of this project.

This study provides guidelines to assist academic libraries in their decisions on providing access to scholarly articles by ownership or interlibrary loan. This study also provides estimates of the costs of access by the SUNY Express consortium of libraries, commercial document delivery, and traditional interlibrary loan. A selection of these cost estimates is shown in table 1.

Table 1 shows the full economic cost of access. This cost includes the financial cost to the borrowing library, the financial cost to the lending
Table 2. The Potential Savings from Canceling Journal Titles in Mathematics and the Sciences at a Research Library

<table>
<thead>
<tr>
<th>Decision Rule to Cancel</th>
<th>ARL/RLG</th>
<th>UnCover</th>
<th>SUNY Express</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Cost of ILL</td>
<td>Cost Estimate</td>
<td>Cost Estimate*</td>
</tr>
<tr>
<td>Number of Titles for which Access is Economically Efficient Relative to Ownership</td>
<td>453</td>
<td>565</td>
<td>218</td>
</tr>
<tr>
<td>Mean Price of Canceled Titles</td>
<td>$1,140</td>
<td>$1,082</td>
<td>$839</td>
</tr>
<tr>
<td>Mean Number of Uses of Canceled Titles</td>
<td>14</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>Savings from Canceled Subscriptions</td>
<td>$545,243</td>
<td>$647,393</td>
<td>$197,030</td>
</tr>
<tr>
<td>Added Cost of Interlibrary Loan</td>
<td>$113,824</td>
<td>$158,092</td>
<td>$51,386*</td>
</tr>
<tr>
<td>Opportunity Cost to Patrons</td>
<td>$10,270</td>
<td>$17,801</td>
<td>$10,623</td>
</tr>
<tr>
<td>Financial Cost to Lending Library</td>
<td>$66,815</td>
<td>--</td>
<td>$20,297</td>
</tr>
<tr>
<td>Total*</td>
<td>$354,334</td>
<td>$471,500</td>
<td>$114,724</td>
</tr>
</tbody>
</table>

*Note: SUNY Express Cost Estimate is based only on journal titles for which one of the other four SUNY Express libraries would retain a subscription. The additional costs of interlibrary loan for SUNY Express include $26,600 in copyright clearance fees assuming a $5 charge for every article over 5 articles requested from the same journal title. Total economic savings assumes savings relative to purchasing a journal subscription.

library, and the opportunity cost to the patron. The opportunity cost to a patron is the value of the time spent waiting for delivery of the information rather than having immediate "on-the-shelf" access to a journal subscription and having to pay for a photocopy of the article. This opportunity cost of access was measured by surveying interlibrary loan patrons about their willingness to pay for priority delivery of journal articles. On average, patrons were willing to pay $2.55 for immediate access to the journal article. The opportunity cost to library patrons of interlibrary loan relative to a journal subscription is $2.55 minus $0.87. Table 1 also assumes that the opportunity cost to patrons for the different methods of delivery is the same since the difference in the days for delivery between these three sources is trivial. The
cost of delivery for UnCover is included in the delivery fee charged to the borrowing library.

Using these cost estimates, the potential savings from canceling journal subscriptions can be estimated. These savings estimates are based on a journal use study conducted in 1992 for journals at the University Libraries at the State University of New York at Albany, Binghamton, Buffalo, and Stony Brook. Funding for this study was also provided by the Council on Library Resources. Journal use for the entire journal run of each journal title is used to proxy for the expected future use of a journal subscription. In other words, present use is employed as an estimate of this year's use of the current journal subscription. Present use of a one-year old journal subscription is used to proxy for the expected use of the current journal subscription in one year—i.e., when that journal is one-year old. Data on journal prices were previously collected at the Library of the University at Albany and were cross-matched with the journal use database. The level of use, journal price, and cost of delivery were used to identify journal titles in the database for which interlibrary loan provides a more cost-efficient method of access than a subscription. Table 2 shows potential savings from canceling these journal subscriptions.

Table 2 uses three different cost estimates for a decision rule to cancel journal titles: (1) the ARL/RLG average cost estimate, (2) the cost of UnCover, and (3) the cost of delivery by the SUNY Express consortium. If the ARL/RLG cost estimate is used, there were 453 journal subscriptions in 1992 that could have been more economically provided by interlibrary loan. The estimated financial savings from canceling these journal titles is $545,243. This estimate includes the savings from canceled journal subscriptions and the fixed and marginal costs of these subscriptions. The added cost of providing access by interlibrary loan is $113,824 while the opportunity cost to patrons of waiting for access is $10,270. The additional cost to the lending libraries is $66,815. The total economic savings from canceling these journal titles would be $354,334 per year.

Using the lower cost estimate for delivery by UnCover, there are an additional 112 titles that could be canceled. The total economic savings from providing access by UnCover rather than by journal subscription is $471,500.

While the marginal cost estimate for SUNY Express is lower than the marginal cost of UnCover, not all of the titles to be canceled would be available at one of the other three SUNY Express libraries. Only 218 titles could be canceled and more efficiently delivered by another SUNY Express library. However, the lower marginal cost of delivery by SUNY Express implies that some titles which would not be canceled if UnCover were used as the method of delivery would be canceled if SUNY Express were used as the method of delivery. The SUNY Express consortium
Table 3. Consortium Savings and Joint Collection Development.

<table>
<thead>
<tr>
<th>SUNY Express</th>
<th>All Titles</th>
<th>Titles Such that Another Library Would Retain a Subscription</th>
<th>Titles Such that Joint Collection Development is Economically Efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Titles</td>
<td>218</td>
<td>185</td>
<td>33</td>
</tr>
<tr>
<td>Mean Price</td>
<td>$839</td>
<td>$899</td>
<td>$503</td>
</tr>
<tr>
<td>Mean Number of Lifetime Uses</td>
<td>29</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Number of Titles with Number of Uses Greater than Five</td>
<td>186</td>
<td>156</td>
<td>30</td>
</tr>
<tr>
<td>Financial Savings to borrowing Library of SUNY Express Relative to Purchasing a Journal Subscription</td>
<td>$145,644</td>
<td>$133,355</td>
<td>$12,288</td>
</tr>
<tr>
<td>TOTAL Economic Savings to the University at Albany of SUNY Express Relative to Purchasing a Journal Subscription</td>
<td>$114,724</td>
<td>$106,392</td>
<td>$8,332</td>
</tr>
<tr>
<td>TOTAL Economic Savings to All Libraries within the SUNY Express Consortium of Consortium Delivery Relative to UnCover</td>
<td>$47,239</td>
<td>$30,528</td>
<td>$16,711</td>
</tr>
</tbody>
</table>

provides reliable, timely, and high-quality access to journal articles at a lower marginal cost to SUNY Express libraries than UnCover.

For these 218 titles, there is a potential savings of $197,030 from canceled journal subscriptions. The added cost includes the cost of SUNY Express delivery of $51,386 of which $26,600 would be copyright clearance fees associated with use in excess of five per year. This assumes that there is a copyright clearance fee of, on average, $5 per article and that all use in excess of five per year would qualify for a copyright payment. In addition, there would be an opportunity cost of $10,623 to patrons waiting for delivery and a financial cost of $20,297 to the lending libraries...
within the SUNY Express consortium. In total, the economic savings of SUNY Express would be $114,724 per year for the university library.

Table 2 shows that, regardless of the method of delivery, the level of potential savings from canceling journal subscriptions in mathematics and the sciences and providing access by interlibrary loan are significant. The other potential source of savings from consortium access comes from joint collection development. Joint collection development may provide additional savings to these libraries if they can identify the journal titles such that consortium purchase and delivery provides a lower cost method of access.

Table 3 shows the savings from joint collection development. Of the 218 titles for which consortium delivery provides the lowest cost method of access, 185 titles would have been subscribed to by a library within the consortium other than the University at Albany. For these 185 titles, there is no need for joint collection development because at least one library would not have canceled their subscription. These titles have a mean lifetime use of thirty. Of the 185 titles, 156 have a lifetime use of over five. While this level of use is high, the mean subscription price of $899 makes it more economical for the University at Albany to provide access by consortium delivery rather than by purchasing a subscription.

Of the 218 titles, there are thirty-three titles for which joint collection development is worthwhile for the SUNY Express consortium to consider joint collection development. If these libraries were not members of a consortium, it is more economically efficient for each library to cancel these thirty-three titles and provide access to their patrons by interlibrary loan. However, the level of use within the consortium makes it more economical for the consortium to purchase these subscriptions and provide access to the member libraries. The lower cost of consortium delivery relative to UnCover for the libraries which do not own the subscription, along with the lower cost to patrons of having access within the library which does own the subscription, offsets the subscription price and other costs of ownership.

However, while there exists a set of titles for which joint collection development is worthwhile, the potential savings from having the consortium purchase these titles relative to providing access by UnCover is only $16,711 per year. This is the total economic savings to the four libraries within the SUNY Express consortium of purchasing these thirty-three subscriptions. The savings per library is $4,175 per year.

While these savings are real, it is unlikely that they are sufficient to cover the costs of joint collection development. Joint collection development within the consortium would require staff time and other library resources. In addition, there are managerial problems of financing journal titles purchased by one library for the use of the other members of the consortium, even though the “subscribing” library would not otherwise subscribe to the journal.
CONCLUSION

Library consortia can provide a lower cost method of delivery of scholarly journal articles. This article has shown that, for the academic libraries which participated in this study, consortium savings are significant and an increased use of consortium delivery and decrease in the number of journal subscriptions is worthwhile. However, savings from a decrease in journal subscriptions must be used, in part, to finance the expected increase in demand for interlibrary loan by library patrons.

In theory, joint collection development by consortium libraries may provide additional savings. However, for the libraries in the SUNY Express consortium, the potential savings from joint collection development are limited and may not be sufficient to cover the costs of coordinating consortium collection development.

Of course, if all academic libraries were to cancel significant numbers of journal titles, publishers would stop publishing some titles and increase prices on other titles in order to cover the lost revenues from journal cancellations. However, it is not good management policy for an individual library or library consortium to purchase low-use, high-cost journal subscriptions in order to prevent publishers from raising prices or ending publication of titles. Economic analysis dictates that the market equilibrium in the supply and demand for scholarly journals should be determined by individual libraries, library consortia, and publishers maximizing the benefit to their patrons, member libraries, and stockholders. If consortium delivery, commercial delivery, other methods of delivery, or electronic journals provide a lower cost method of access to scholarly articles, it is sound management for academic libraries and library consortia to cancel low-use subscriptions and provide patrons access by these other methods.

REFERENCES


Issues in Commercial Document Delivery

RANDALL WAYNE MARCINKO

ABSTRACT
FIFTEEN YEARS AGO, DOCUMENT DELIVERY was a cottage industry looking for its niche in the information marketplace. It has grown exponentially as publishers, clients, and vendors grapple with the future of article-based information delivery. The history of document delivery is discussed from a business perspective, and the author examines the most important factors in choosing the best document vendor. Assisted and frustrated by rapid advances in technology, document delivery has matured. The industry has seen large corporations acquire individually owned enterprises, infusing capital and supporting growth to keep pace with client demands. From the perspective of a document delivery pioneer, a number of key issues are examined. Fundamental in the new order is intellectual property. Today's vendor must negotiate with primary publishers, reproduction rights organizations (CCC, CANCOPY, etc.), and authors in an attempt to work within the new and evolving copyright paradigm. Scanning and imaging technology, photocopying, hardware, software, and cost analyses are among the other factors evaluated for their influence on document delivery.

HISTORY OF DOCUMENT DELIVERY

In 1980, I founded Dynamic Services, a document delivery company later known as Dynamic Information Corp. One of the service's stated goals was to provide documents for less than $5.00 and with less than a two-hour turnaround. I knew it would not be possible immediately but was certain that it could be achieved during the ensuing few years.
Dynamic's original price was $2.50 per document plus copyright. We believed that volume and new technology would allow for lower prices.

Technology was running wild. We purchased a new and wonderful 300-baud modem that allowed us to download orders from Dialog's DIALORDER before the much beleaguered topic of downloading hit the information industry press. Our first fax machine was still three years in the future and would cost nearly $4,000. We started by using computers (Heath H-89s) purchased as do-it-yourself kits from the then-thriving Heathkit corporation.

I was a graduate student in natural products organic chemistry when I started Dynamic Information. While working on my thesis project, I needed a document and was told that interlibrary loan (ILL) would be able to obtain it in three to six months. It was a mission-critical document, without which my research would have been unavoidably delayed. However, it was unacceptable to extend my stay in graduate school by six months while I waited for six to ten pages of paper. What could I do? I picked up the telephone and, after some hunting, was able to chat with the chemist who authored the paper in Bombay. He was delighted that a colleague should be so interested in his research.

After some negotiation, good old North American capitalism persuaded the gentleman to trade a copy of his article for two bottles of California wine (as I recall, one was a Beringer Cabernet and the other a Mondavi Chardonnay). Fax would have been great, but in those days, neither the Stanford Chemistry department nor the university in India owned a telefacsimile machine. We resorted to courier. The document was in my hands less than five days after I had left the library, disheartened at the prospect of interlibrary loan. The wine was sent via airmail to India.

If I could get such an obscure document in days, how hard could it be to start a company and change the face of this industry? As any young graduate student cum entrepreneur knows, the appropriate response can only be "No problem. Just give me a minute or two."

Sixteen years ago, there were no more than ten significant document delivery competitors in this undeveloped market. While aggressive, the handful of companies were also busy with marketing, market education, technology, and business development. Dynamic Information grew as a full-service document supplier, as did Information Store and Information on Demand. ISI grew with a large in-house collection, and UMI grew with an in-house collection, an artifact of their international microfiche business. Major national libraries, such as CISTI and The British Library, filled documents from their in-house collections. Customers were libraries, researchers, students, and those ubiquitous end-users. Document delivery was paper-based. In retrospect, the world was more or less predictable and challenges clearly stated.
Today, more than fifteen years later, the business has changed. Technology has become a force to be reckoned with. Document delivery has come of age and has grown beyond a cottage industry—it is starting to mature. With its rites of passage come competitors from all walks of life, from the far corners of the information industry and far beyond.

Big companies have acquired small ones. EBSCO Industries, Inc. purchased Dynamic Information Corp. from the author of this article and continues to grow and develop it under the name EBSCO\textit{doc}. UMI purchased The Information Store from Georgia Finnegan. Robert Maxwell had previously purchased Information on Demand from Sue Rugge and later Article Express acquired it following the demise of the Maxwell empire. Article Express having been jointly founded by Dialog Information Services (now Knight-Ridder Information Services) and Engineering Index, was brought totally under Knight-Ridder's ownership. Individual founder/owners have been routinely bought out by large corporations.

A handful of document suppliers that were founded in the 1980s continue to grow and mature. Scores of new document delivery ventures began in the 1990s; however, at several points, more firms were closing than being established. Many firms were established out of the simple belief that "they too can sell documents." After all, how hard can it be? Even academic, public, and corporate libraries started document delivery organizations seeking to make money on their collections.

\textbf{HOW HARD CAN IT BE?}

New entrepreneurs usually approach document delivery with the attitude that it is simple. They are certain of success through the application of their special expertise—they will create the document delivery organization to triumph over all others. Society and the marketplace allow new entrepreneurs to enter on the strength of their individual beliefs and convictions. Some will succeed and dominate. Others will not; they will find the business to be much more complicated than expected. This parade of companies into and out of the marketplace makes product analysis by the consumer very difficult.

Companies with a longer history have repeatedly battled the hard realities—issues such as copyright, labor costs, and source library relationships, to name a few. Technology has continued to spiral forward, giving us tools hardly imagined in the early 1980s. Technology has also caused the capital costs in document delivery to soar equally rapidly. Demand has grown dramatically, and document delivery has become one of the buzz words of the 1990s.

Albeit in a different format, the problems and challenges of today's document delivery companies are remarkably the same as those of fifteen years ago.
DEMANDS OF THE CLIENT: HAVE THEY CHANGED?

While the magnitude of each client demand and its relative importance has changed with time, three basic demands have remained unchanged.

1. I want that document NOW.
2. I want that document for FREE.
3. I want PERFECTION in customer service.

We would all like to purchase from a store that delivers in real-time, that has clerks who mold themselves to our every wish, and best of all, that doesn't charge. It is the "holy grail" of the consumer. Most of us realize that it is impossible to find the grail. We are seeking the company that helps us the most.

The Heisenberg Uncertainty Principle is fundamental in science. It states that, in the process of viewing an event, we cannot avoid having a measurable effect on it—we change it. Analogously, as consumers of documents, we impose our deadlines and constraints. We thereby alter the price the vendor must charge and change the parameters affecting delivery. Before we look in depth at the issues in document supply and what they mean to the consumer, let us address the basics.

WHAT IS DOCUMENT DELIVERY?

In its simplest form, document delivery is the transfer of a photocopy to an end-user. But today, it can also refer to the routing of an image to the e-mail account of the end-user. In the real world, document delivery is complicated. It involves citation verification, source location, publisher relations, copyright clearance, customer service, and numerous other concerns.

New technology is an important factor. It is now insufficient for a document supplier to use mail as its only delivery method. Faxing, scanning, image transfer, and MIME attachments are regularly requested by clients. In addition to implementation and maintenance, new technology demands significant research and development by the vendor.

Traditional interlibrary loan started with the submission of a document request and was followed by a waiting period defined entirely by the source (supplying) library. Today's document delivery client imposes strict turnaround, price, copyright, order method, transmission method, and other related restrictions on the supplier. Such restrictions greatly increase the level of difficulty for the supplier.

While most of the larger and better equipped document suppliers have automated many of their operations, document delivery remains labor intensive. To fully understand document delivery, both technology and human processes must be analyzed.
**Document Delivery—The Process**

**END-USER REQUEST**
- made by e-mail, fax, telephone, or mail
- facilitated by the patron reference interview conducted by the library

The process begins when a patron contacts an intermediary to obtain a document. Today, this step is sometimes bypassed when the end-user places the request directly with the vendor. While the patron traditionally talked with the librarian or perhaps submitted an "ILL slip," the patron of today frequently uses e-mail or the company intranet.

As anyone involved in document delivery knows only too well, problems often arise when the patron conveys either incorrect or incomplete information. Depending upon the subject area, document delivery companies receive between 2 and 10 percent of their requests with problems. The patron might list the publication title as *Journal of Washington State University* when Washington State is actually the author affiliation. The requested article might be a hybrid of two citations found next to each other in a list. Abbreviations cause horrendous problems when patrons take it upon themselves to expand the letters into complete words. Biol Ind becomes *Biology and Industry* when it should have been *Biologia et Industria*. The document vendor is sent on a frivolous chase only to find that the article requested is not in the cited journal. The librarian of times past often spotted inconsistencies and errors in the patron's citations.

Technology now eliminates much of the human scrutiny. Nevertheless, it remains the job of the document vendor to unravel citation problems and locate the desired document.

**INTERMEDIARY REQUEST**
- made by e-mail, ARIEL, fax, electronic order box, telephone, or mail
- facilitated by a reference interview handled by the document vendor

The vendor interfaces with the librarian or other intermediary who is placing the request on behalf of the end-user. This step can be of great assistance to the document supplier, since the intermediary is often an information professional. However, it is still the source of occasional transcription and other errors, further compounding the problems for a vendor.

In today's world of intranets, e-mail, and automated WWW order forms, problems can be introduced by computer systems that have character limits on request templates or that allow for entry of only some of the data fields. Each element missing from a request increases the likelihood that the vendor will need to do costly and time-consuming citation verification or again contact the intermediary and possibly the end-user.
While often downplayed, the reference function is at the core of the unique expertise of the document vendor. Many companies have automated a large part of this task. Fifteen years ago, reference departments consisted of a well-trained group of information professionals who used books, microfiche, microfilm, the telephone, and a limited number of online resources to find locations from which to retrieve copies of requested documents. Library catalogs were largely still in print or on microfiche. The availability of the union list of California academic libraries, on a fiche product known as CALLS, was a landmark development. Over time, the larger suppliers developed elaborate in-house programs and technology to automate a high percentage of the reference process. Speed of lookup, as well as accuracy, have been dramatically increased, and turnaround for the client decreased.

The reference department of today contains both information and systems professionals. It places a high emphasis on information obtained from library and bibliographic catalogs, which come in a variety of formats including print, fiche and, most importantly, electronic data. The department must be able to accept these data on almost any media, including via the World Wide Web and FTP through the internet. Outside bibliographic utilities such as OCLC, WLN, and RLIN are important resources.

While a high percentage of requests is automatically sourced, a finite number still needs special attention. Just as automation brings new resources to the vendor, it also gives the end-user the ability to find citations from the most obscure publications. For the full-service document delivery vendor, it is necessary to maintain a highly skilled group of professionals who are experts at tracking down documents. Transcripts of meetings, corporate gray literature, audiotapes, computer programs, and FOIA documents are just a few sources requiring special handling. Following examination by the reference department, some requests need additional information from the client, either factual data or an amendment to the price or time limits.
Verification is necessary when a citation is incorrect or incomplete. This might be obvious when the request is received, or it might become obvious later in the process of filling the request.

Citation verification, like reference, is a cross between sleuthing and information science. The vendor is charged with deciphering what the requester "really meant." The skilled document delivery professional often finds clues from the tiniest bits of data. If the cited journal title is for a new publication, but volume 234 is being requested, something must be wrong—perhaps the journal title has been incorrectly stated.

Many resources are utilized in the verification process. Tools include printed works such as *New Serial Titles*. They also include databases such as INSPEC and BIOSIS and more obscure techniques including telephone calls to authors and corporate sources. The number of resources is only limited by the skill, experience, and creativity of the information professional.

In the process of citation verification, issues arise that sometimes require the vendor to contact the client. Perhaps it is necessary to tell the patron that the full paper was never published and that only the abstract is available. The vendor could continue by contacting the author directly; however, the client would likely need to authorize an additional charge.

- runner sources (e.g., libraries)
- electronic sources (e.g., primary publisher servers)
- request transmission to the source location
- second and third sources if the document is unavailable at the first source
- client price & time limits
- delivery method

Document vendors spend considerable time evaluating and choosing among sources for the requests they handle. Today, this involves a significant commitment to technology. Holdings data are often mounted on in-house servers providing access to the entire staff. Special connections are made to the outside world where data on many collections are available.

Staying abreast of all of the sources is an arduous task. The vendor still needs to access paper collections, usually found in prestigious academic and public institutions around the world. However, they now need to connect to publisher servers, full-text online sources, and documents resident on the World Wide Web.

Documents are obtained from worldwide locations of all types:
• public and academic library collections (e.g., Boston Public Library, Stanford University)
• relationships with document fulfillment groups in other libraries (e.g., Linda Hall, The British Library)
• specialty document vendors—commercial, public, and government (e.g., UMI, ISI, Los Angeles Public Library, EPO, NTIS, JICST)
• associations (e.g., SAE, AIAA)
• primary publishers (e.g., Reed-Elsevier, Doubleday)
• authors
• electronic consortia (e.g., ADONIS)

A large number of relationships must be established in order for the vendor to maintain access to a broad range of source locations. Such relationships require interpersonal skills as well as business acumen. Today, they also require programming, hardware, and sometimes elaborate bookkeeping systems. Depending on the source, the vendor must also develop the systems and technology to transfer the documents from the source to the vendor or sometimes directly to the client.

In an academic or public library, the document supplier usually places an employee as a “runner.” The runner receives requests, usually electronically, checks for availability, and makes a copy to forward to the vendor or client. Even ten years ago, Dynamic Information had runners in diverse locations, from Stanford University locally, to the Beijing National Library internationally. Orchestration of many runner locations is very demanding and has significant attendant costs.

Relationships can be creative and positive for both parties—they can range from simple to very complex. After ten years of negotiating, I was able to design a contract with UC Berkeley providing for unlimited access to its library and even office space on the campus. While the long-term benefits to the company can be great, the short-term costs, including negotiations and deal making, may be high.

Traditionally, runners mailed copied documents directly to the client or shipped them to a central location using an overnight courier, either a commercial carrier like Federal Express or a bank courier. Today, document scanning is becoming common and companies like CISTI, EBSCOdoc, KR Sourceone, and others, are taking advantage of this technology at one or all of their source locations. Materials are scanned, followed by transfer of the image to the company for ultimate delivery to the client. Direct source-to-client delivery is used in some document delivery operations.

The full-service document delivery vendor is responsible for using as many sources as are necessary to satisfy the client’s request. While the vendor tries to locate the desired material at the first location, it is frequently necessary to look to additional sources. Many of the larger suppliers have devised elaborate programs—part artificial intelligence—
which assist the vendor's reference staff in efficiently routing the request to the best location first. While costly, such programs greatly reduce turnaround by increasing precision at the first location.

Keeping the client aware of progress is vital when the original time or price limits cannot be met. The request might be canceled, it might be escalated to a rush, or the price and time limits might be amended.

**QUALITY CONTROL**

- during source location
- during citation verification
- paper/photocopy image quality
- electronic/scan image quality
- maintenance of client time/turnaround limits
- maintenance of client price limits

No operation, whether public or private, for-profit or non-profit, can survive without attention to quality control. In document delivery, there are quality issues that follow the document through the entire process.

- percent retrieval of the correct document at the first source tried
- percent retrieval of the correct citation following verification
- control on quality of the image (paper or electronic) delivered to the client
- success rate at staying within the client's preset limits
- client satisfaction with the customer service department and status process

Quality control should begin when an order is placed. If information is inadequate or incomplete, it is often least expensive to query the client for additional detail. However, it is a fine line, a judgment call, that dictates when a vendor should do added request verification versus calling the client. Also, price and efficiency are both concerns—added verification increases the price of the document but will reduce turnaround.

A good reference department is critical. The document vendor must ensure prompt location of a source. Many of the large and successful vendors are now able to boast that most incoming requests are sourced and routed within hours or minutes of arrival. The first source must be the one most likely to have the material available and on the shelf. Going to additional sources greatly increases turnaround. Some vendors charge the client more as the number of sources tried increases. Most charge more when a second or third, and more expensive, tier of sources is utilized. Using the U.S. Library of Congress or Linda Hall and making telephone calls to authors are examples that usually imply a higher price for the client. When there is an unavoidable delay or a price increase, the client needs to be notified.
While quality control dictates precision in the sourcing process, it must be acknowledged that some requests are extremely difficult. Perhaps the desired article is in a supplement to a very old publication acquired by very few libraries and rarely listed in their holdings. The vendor will need to try several possible locations.

Verification is a cost center for the vendor and usually implies an added cost for the client. Most vendors handle some verification for free as part of their basic service. Transposed page or volume/issue numbers can normally be ferreted out by the runner or reference staff. Some vendors will do minimal database verification at no charge. Good verification is an art. With a better citation, the vendor will need to try fewer locations. The quality of the staff doing the verification is in direct proportion to the money spent and charged back to the client. Document delivery citations sometimes come to the vendor with extremely little information. All clues are important. For example, most online searchers have never worried about which databases permit searching on page numbers. For document verification, to be able to search on page number is sometimes vital—perhaps the requester has omitted the article title and there is a common author name.

Just ask anyone with a history in document delivery how often patrons submit sketchy citations. Dynamic Information once received a request critical to litigation in an intellectual property lawsuit. The citation contained only a brief subject with a volume and page number. It was time consuming and expensive, but Dynamic located the document which proved to be instrumental in winning the case.

The product of most document requests is either a piece of paper or an electronic image. When paper, the desired product must be clean, legible, straight on the page, complete, and inclusive of the bibliographic citation. When the document is routed from the source (usually a library) to the vendor before going on to the client, there is usually a quality control department. Some vendors proof each page, and the citation is confirmed. Preceding this in-house scrutiny, most successful vendors have implemented quality control procedures with their runners. Every mistake costs the vendor dearly in time, out-of-pocket expense, and reputation.

In today’s electronic world, quality control is equally important. When the vendor scans the document, the same concerns apply. People are involved in the process and errors must be controlled. New technologies bring great advances in speed and service; however, they also create new issues that the vendor must learn to deal with.

The client wants rapid delivery of the correct document. However, with the number of transactions, it is inevitable that there will be an occasional error. Document delivery quality control remains an important differentiating feature between suppliers.
Today a few vendors deliver some electronic and/or scanned documents directly from the source to the client. This presents new challenges. The vendors are grappling with these issues and are finding ways to scrutinize images on the fly and design electronic safeguards. Document delivery is evolving rapidly.

When a vendor makes an error, it affects turnaround time and sometimes the cost to the client. Quality control, as monitored by the client, usually begins with a rating of price and calculation of turnaround time. “Did the vendor adhere to our price and time limits?” Likewise, when shopping for a supplier, clients eliminate vendors who cannot stay within time and price limits. Within the acceptable pool, the vendor with the best price and turnaround statistics is most often selected.

Throughout the fulfillment process, the vendor must keep the client apprised of the order’s progress. I remember years of educating new employees with the statement: “The client comes to us to buy information. What they want is the document—fast and cheap!” However, if there is a delay or price change, the client values this information almost as highly as the document itself. Sometimes all we can do is explain to the client that the requested document was never published in the desired language. Information is what we sell—we must pride ourselves on speed, accuracy, and completeness. The communication of information to the client is called “request status.” It is often the decisive factor in differentiating between two document suppliers.

**TRANSFER DOCUMENT TO CLIENT**

- e-mail, fax, mail, scan and transfer, overnight courier, ARIEL
- might first have to transmit the document to the vendor (from the runner) and then on to the client
- must adhere to client price and time limits
- reliability

While inextricably linked to customer service and quality control, there are special concerns which surround delivery of the document to the client. Some of these concerns are similar to those involved in transferring the document from the source to the vendor. Others are unique.

Whatever method is used, it must stay within the client’s time and price limits and be reliable. Traditionally, documents were mailed from the vendor to the client. Today’s clients also request documents by fax, e-mail, courier, scan, transfer, and ARIEL. In addition to supporting capital investment and understanding the technology, the vendor must be willing to learn and understand the client’s particular situation. The vendor must now contend with corporate intranets, firewalls, and proprietary e-mail systems. When transmitting a document electronically from a source to a central office, the vendor chooses a method on the basis of technology,
simplicity, and cost. However, if a client needs to receive scanned images as MIME attachments to e-mail, only those vendors who can meet this demand will remain in the running for that client's business.

Clients are more and more frequently choosing only among vendors who can mesh their technology with the clients' in-house systems. Over time, most vendors will offer most formats. For now, there will be significant disparities.

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Customer service is mentioned throughout this article because it is an integral part at all stages of the document delivery process. Document delivery results in a tangible product. However, it is better viewed as a service with the ultimate product, the document, being an artifact of hard work, intellectual processes, and technology. As in any service organization, communication with the client is vital. It is neither simple nor cheap for the vendor to maintain an ongoing dialogue.

Customer service is one of the most difficult skills to impart to employees. It requires clear communication, friendliness, knowledge, accuracy and, of course, diplomacy. The customer service agent is frequently a new client's first contact with the vendor, supplying both education and information. At the same time, the agent is an arm of the marketing department. For example, when a client is told that an article is only available in Russian, the customer service agent is perfectly situated to advertise the translation services offered by the vendor.

Although the vendor tries to eliminate errors whenever possible, when they do occur, it is most often the customer service agent who must discuss the problem with the client and make amends. While it is not an easy process, it differentiates the average from the superior vendor. I remember an occasion when a skilled diplomat took a call from a client upset that Dynamic had accidentally supplied the wrong paper in a series of publications by a prestigious author. The customer service agent had the correct document delivered by courier the next day. In addition, by the end of the call, the agent informed the client that there were other publications in the series. A week later, the client called to order the other twenty-three items.
Respecting the client is important. Even small details, such as the document identification number, can make or break the vendor-client relationship. While easier for the vendor to use an internal number, it is more than just polite for the vendor to refer to the order by the client's number during conversations. It is part of good service.

Customer service becomes more complex as technology advances. While it might have been simple for an agent to discuss items delivered by mail, it is much more involved to explain to the client how the document was sent by MIME attachment to their e-mail. The agent must understand the technological environment at the vendor site as well as at the client's site. Of course, all of this is in addition to "The customer is always right."

**INVOICING & BILLING**

- follows delivery of any product
- must interface with customer service
- clearly presents the vendor's pricing algorithm to the client
- important in today's world of client in-house charge backs

No document delivery transaction is complete without the invoice. While no one is anxious to part with their hard-earned money, the invoice is critically important to the client. Many clients use the invoice to charge back to their end-users. Most clients also use the bill to monitor budget expenditures on document delivery. Every client uses the invoice to "check up" on the vendor and to evaluate their true pricing. Invoices must have several features:

- adequate detail to identify the client's request;
- clear pricing with a total for each document;
- clear explanation of each and every add-on charge;
- clear cost accounting that shows price by client charge code;
- the ability for sub totaling by department, user, project, code, etc.; and
- instructions on who to call regarding any problems.

While not essential, it is becoming very common for the vendor to include statistics for the client on the average/median price per document, price per type of document, turnaround, and other calculations to assist the client in better evaluating the service. These calculations save the client a great deal of time and can also accent the vendor's strong points. The wise client will use common sense and augment these statistics with some of their own data to make the best-informed evaluation.

The client should also remember that the invoicing process, especially as it gets more and more elaborate, is a nontrivial cost for the vendor. However, it is a cost that has become part of doing business.
As alluded to above, research and development is both the hallmark of the successful forward-thinking vendor and the bane of each vendor's financial success. Document delivery is a rapidly growing industry. Unfortunately, the volume of orders received by most vendors is not yet high enough to easily defray the costs of R&D.

Today's most successful document suppliers have invested heavily in the development of complex in-house systems to automate their operations, from order receipt to production of the invoice. Customer service agents use computers to call up orders and discuss details with clients. Costs spiral upward as vendors must acquire larger and larger pieces of hardware and software to handle data entry, databases, telecommunications, and graphics technology.

Because clients are constrained by their in-house MIS departments and available technology, they are forced to request electronic delivery in various formats. They frequently have no flexibility and are limited by firewalls and other in-house restrictions. There is little standardization in electronic transmission of scanned images. For the vendor, this implies considerable R&D as well as investment in technology. Maintaining multiple platforms with their associated customer service issues is unavoidable.

Many document vendors are involved in research and development on these new technologies, involving both software and hardware. However, today's successful vendor must also address the attendant issues of copyright and publisher relations. Negotiations and relationships with copyright owners require significant additional investments of time and money.

While impossible to be everything to every client, document vendors are rallying to new challenges. Nevertheless, the expense of R&D must be amortized over a large enough number of requests to keep costs low. Clients demand that electronic delivery be cheap because the incremental cost of each transmission is so low. Therefore, the costs of R&D are a major drain on the cash flow of today's document delivery vendor. Note the number of individually owned document delivery companies that have been acquired by large corporations with large capital reserves.

COPYRIGHT

- set by the owner of the intellectual property
- often dependent on the delivery method
- reproduction rights organizations (RROs)
We have all heard discussions about Fair Use, CONTU guidelines, CCC, CANCOPY, RROs, and other aspects of the payment for, and protection of, intellectual property. This article will not delve into what is right and what is wrong. Nor will it delve into who is right and who is wrong. At this point, there are a variety of contradictory (but valid) opinions on these issues. Publishers, academics, authors, end-users, and intermediaries continue to have many lively arguments on the subject. New law, more discussions, legal test cases, and time will undoubtedly settle these disputes. In the interim, it is clear that copyright will be an important concern for all document vendors.

It is necessary for the document delivery company to spend a large amount of time to keep up with the law. Protracted discussions with primary publishers and Reproduction Rights Organizations, like the Copyright Clearance Center in the United States or CANCOPY in Canada, are unavoidable.

Today, each and every document that is delivered must first be scrutinized for copyright due the owner of the intellectual property. Prices range from free to hundreds of dollars per document. Over the past few years, copyright prices have soared, with average increases of anywhere from 5 to 20 percent per year. Increases on some publications have been several hundred percent.

Some document vendors find it better to negotiate copyright directly with the publisher, sometimes arriving at a preferential rate. While a few publishers continue to forbid copying at any price, most publishers are exploring their options and wish to find the price that will maximize their profit. Recently, individuals and groups of authors (such as the Author’s Guild) are also trying to secure copyright payment when they have not previously assigned their rights to the publisher. Many battles have yet to be fought. Interestingly, with the many negotiated agreements and nuances in the price of copyright, some document delivery customers are now shopping for vendors based on the price they are able to charge for copyright.

These complex issues will not be resolved quickly. It will remain costly for the document vendor to stay abreast of copyright issues and to negotiate with publishers. Charges for downloading of images from publisher servers will only add to the confusion.

**Document Delivery—More Issues**

The most important concerns of the client remain those that affect cost, turnaround, and customer service. This article has discussed processes and factors that impinge on these criteria. While not intending to
be comprehensive, the remainder of this article will focus in detail on some of the issues of document delivery which fall into five general categories: (1) general cost considerations, (2) technology and its impact, (3) turnaround, (4) price limits and other client-imposed restrictions, and (5) copyright and publisher-related considerations. Many of these important issues are seldom discussed and are poorly understood by the librarian and rarely understood by the end-user. It is hoped that a better understanding will make it easier to be an informed purchaser of document delivery services—i.e., to get a good price and high quality.

A Call to the Customer Service Department—a Necessary Curse?

Customer service is a mission-critical function in the document sale. Let's examine a call to a vendor to inquire about the whereabouts of a document ordered a week ago. The length of the call could easily be six minutes (often more), including greetings, specific request details, and a discussion of the resolution. If the customer service agent is paid $12 per hour, the cost to the vendor with overhead (including workstation, department manager, and other equipment) can conservatively be estimated at $24 per hour. The call probably came in on an 800 number. Following the call, work will be required to right the situation. Let's estimate ten minutes at $10 per hour with overhead bringing the follow-up labor to $20 per hour.

Agent Labor during telephone call: $24/hr. x (6/60) hr. = $2.40
Cost for 6 minute 800 telephone call: $0.09/min. x 6 min. = $0.54
Follow-up labor to right the problem: $20/hr. x (6/60) hr. = $2.00
MINIMUM Total Cost = $4.94

This is the minimum cost to the vendor based on conservative time estimates. Frequently there are additional costs that might include another copy of the document, extra postage, or added courier fees. The client asked a simple question and the vendor spent $5. What does this mean? It means that the vendor lost money on that request. More importantly, it means that the wise vendor must minimize the number of such calls. This is only possible by attention to quality service. Note that every time a vendor picks up the telephone and talks with a client about a request, that request is a loss.

The Client Requests Delivery of Scanned Documents in TIFF 4B Format

If the vendor is not already delivering scans in the requested format, a minimum of five days of programming time would be needed. The cost for a programmer could be estimated conservatively with overhead at $85,000 per year. Testing, maintenance, and communications with the client would require another five days of customer service and programming labor. The cost for staff performing these functions could be estimated with overhead at $40,000 per year.
Cost for the programmers time: $85,000 \times (5 \times 8) / 2080 = $1,635
Cost for testing and maintenance: $40,000 \times (5 \times 8) / 2080 = $ 792
Total Cost: $2,427

If the vendor wishes to make this change for one client, it would cost $2,427. The client would have to be very large to make this a no-loss proposition. If the costs are considered in terms of numbers of requests, the vendor would need to provide approximately 25,000 documents per year or 2,000 documents per month before the incremental cost of the new delivery mechanism would be reduced to less than ten cents per document. It is important to understand that this is still a large sacrifice against marginal profits (a client of this size would already receive a substantial discount).

**What about the Pharmaceutical Client Who Needs an Average per Document Cost of $7.50 or Less?**

Copyright makes it impossible for the commercial vendor to meet this demand. In the past several years, average copyright has increased substantially. Although copyright varies by publisher and individual work, averages are consistent by field. Average copyrights are lowest in the humanities and highest in the pharmaceutical and hard sciences, ranging from below one dollar to more than six dollars. From 1978 to 1996, average copyright increased steadily from less than fifty cents to nearly $3.00 per article.

While it is a reality that copyright is here to stay, it will be some time before a long-term paradigm will evolve. Authors have started to seek their own copyrights. Publishers are grappling with the question of the correct value of copyright as subscription-based sales are eroded by article-based sales.

**Why can't Vendors Reduce Document Prices as Technology Advances and Sales Volumes Increase? Common Lore is that Vendor Costs are Decreasing**

It is true that with the advent of scanning technology and electronic transmission, many incremental costs have decreased. However, the fixed costs and capital costs to enter the industry have soared dramatically. Until document sales increase by orders of magnitude, the burden on the vendor will remain daunting.

In addition to the costs of new technology, there are other significant costs that are frequently overlooked by the consumer:

- over the past several years, the costs of photocopying in libraries have steadily increased from an average of $.05 per page ($0.40 per average eight-page document) to over $0.15 per page ($1.20 per average eight-page document);
- for vendors who copy from an in-house collection, the past few years have seen a doubling in the cost of paper;
- labor costs have increased.
As is frequently the case in nonprofessional service businesses, the profit margin in document delivery is low. Any increase in the price of a raw material, including labor, has a direct and profound effect on the profit margin and/or the price of the final product.

Why Can't the Vendor Deliver All Documents as Electronic Images?

Since many publishers are starting to make their publications available in electronic format and since scanning technology has advanced to the point where it is no longer prohibitively expensive, some clients expect the document vendor to deliver everything electronically. However:
- the number of publications currently available in electronic format is a tiny percentage of the total;
- for the vendor to scan all paper documents, a large effort is required, with high attendant capital and labor costs;
- telecommunications costs are only now dropping sufficiently to make their value competitive with wholesale shipping of paper documents by post or via courier.

Clients are rarely equipped to receive a significant number of documents in electronic scanned format. The most common obstacles are large amounts of storage, high bandwidth, software, and hardware to handle the received documents at the client site.

Certainly, many full service document vendors are moving toward the day when complete electronic transmission will be a reality. Some specialized vendors, using a limited number of sources, are already trying to ship all documents electronically (including fax). With time, new standards will definitely supplant the old.

Why can't the Document Vendor Reduce the Price when They Deliver Documents Electronically when the Cost of Delivery on the Internet is Negligible if not Zero?

Of course, the incremental transmission costs are nearly zero. However, when the costs of the entire process, including hardware, software development, the labor to scan, the staff to do quality control, and the labor to oversee the electronic transmission are considered, there are few savings, if any. Costs to the vendor will remain at these levels until the number of documents delivered electronically increases significantly.

I want Perfection; I will Never Tolerate a Document with a Missing Page

As consumers, we all want perfection. Document delivery is a labor-intensive business. A great many steps are involved in the production of each document; therefore, the number of individual tasks performed per week is extremely high. Some errors will occur. If the vendor were to continue to improve to the point of zero errors, the costs would increase exponentially. Tolerance of a minimum number of errors is required. However, in comparing competitors, the number of errors per thousand documents is a meaningful parameter.
Why did the Vendor Go All the Way to TU Delft Instead of Getting the Document at the Denver Public Library where I Know that They had the Document?

Document vendors strive for efficiency. Each has a stable of sources that it uses regularly and additional sources that are called on when needed. To keep costs down, vendors rely most heavily on sources that are best adapted to their particular systems. Unquestionably, quality document vendors can fill requests more quickly and cheaply than could the client.

Since it is not possible for a document supplier to treat each document as a special case, unless correspondingly high prices were charged, there will be instances when the closest source is not the vendor's standard source for a particular title.

Why didn't the Vendor call the Author; his Telephone Number is Listed in Several Directories, and it would have been much Faster?

The vendor must balance turnaround and price. Within the boundaries of the client's price and time limits, only certain procedures may be feasible. If the price limit is adequate or if the request is made as a rush order (with attendant higher prices), all reputable vendors can put a large number of additional resources to bear on the process.

The client must choose between competitors. Such decisions are frequently influenced by the success of the vendor at obtaining the more difficult and obscure documents. Reputable full-service vendors strive to control costs and find new and creative ways to employ the most powerful techniques to quickly access documents. Changes in telecommunications costs are starting to make it more economical to make telephone calls than to write and post letters. In addition, document vendors are learning to make good use of communications through the Internet.

Why can't the Vendor Deliver Everything in Less than Two Hours when Many Articles are Available in Real Time on the WWW?

The answer to this question is a combination of several of the previously discussed issues. Technologically, rapid delivery is possible; however, costs are still prohibitive and the equipment at the client site is often insufficient.

Relatively few documents, especially from commercial publishers, are available on the World Wide Web. Moreover, only a tiny fraction of the available documents are complete, including all photos, charts, and graphs.

CONCLUSION

Most people would like documents supplied in real-time by a friendly staff and for free, but one must realize that there are many issues that
make document delivery more difficult than is readily apparent. Do not stop searching for the perfect (or at least the best possible) document supplier. It is only through selection by the consumer and competition between vendors that quality will increase.

The aim of this article is to heighten understanding of document delivery, from a historical and operational perspective. A more in-depth understanding of the real problems and issues faced by document vendors will make it easier for the client to deal with, negotiate with, and evaluate a vendor. As consumers, we must also recognize that the demands which we place on document suppliers seriously impact the price, turnaround, and level of customer service that can be offered.

In order to maximize efficiency in dealing with a vendor, the consumer should:

- ask probing questions to better analyze the vendor;
- ascertain whether the explanations offered to support a price or service limit are realistic;
- evaluate the technological capabilities of the vendor; and
- try to understand problems when they occur. You will be able to differentiate problems which are beyond the vendor's control from those which are the result of poor internal vendor operations.

Is document delivery such an odd business? Not necessarily. It is the aim of this article to show that the document delivery industry is young and just starting to grow beyond its adolescence. All industries experience similar problems—it is a part of maturing.

What does all of this mean for the client who must navigate the document delivery marketplace? It means that there will be continued rapid growth. Attendant to this growth will be problems. Technology, persistence, and the promise of a profitable industry will spur improvement. Fifteen years ago, researchers waited weeks for documents—today, days and hours are a reality. Publishers, authors, traditional document vendors, clients, producers of technology, and others will undoubtedly continue to spar with each other. I am certain that, ten years from now, we will look back on a very complex, but interesting, story.
Commercial Document Suppliers: How Many of the ILL/DD Periodical Article Requests Can They Fulfill?

Chandra Prabha and Elizabeth C. Marsh

Abstract
Commercial document suppliers have been capturing an increasing share of the document supply market. New data on the availability of periodical articles at five frequently used commercial suppliers are presented. The findings are based on samples of periodical requests processed through the OCLC PRISM ILL service over a recent twelve-month period. Of the 373 sample articles, 92 percent are available from at least one of these suppliers. Other related findings are: approximately 40 percent of all requests pertain to articles; one-fifth of all the articles are published in the preceding year; and 64 percent are published within a five-year-period. Date and format variables, taken together, can serve as a starting point for programmatically selecting and directing requests to commercial suppliers.

Introduction
Commercial document supply firms have served as an alternative to libraries for procuring copies of periodical articles for over twenty-five years. Given that photocopying technology was widely deployed only in the late 1960s, it is apparent that the private sector has been quick to find a market for document supply. Commercial document suppliers "generally operate for profit, do not support on-site borrowers, and are accessible in many ways, including online search services such as DIALORDER, bibliographic services such as OCLC and RLIN,..." (Hurd & Molyneux,
Interlibrary loan (ILL) literally refers to the act of one library lending an item from its collection to another library in response to a request from the latter. Loaned items are then returned. Once photocopying became affordable, libraries began to send copies of requested articles instead of loaning the source periodical. Copies of articles are not returned. Thus, erroneously, we have for a long time continued to use the term "interlibrary loan" to refer to the request or supply of copies of periodical articles. Just in the last few years have we begun to see the use of the term "interlibrary loan and document delivery (ILL/DD)" which fully reflects the services rendered.

The explosion in the demand for ILL/DD service during much of this decade and the previous one has been well documented (e.g., Farr & Brown [1991]; ARL Annual Statistics). The resultant financial and organizational strains and the increasing awareness of the cost of the ILL process are all prompting the profession to reassess the current uses of ILL/DD services (Roche, 1993). Incorporation into the ILL/DD operation of recent developments in technology, such as e-mail and the World Wide Web (WWW), which allow patrons to present requests electronically, has portended questioning of the best application of library staff labor. Unmediated access (without the ILL/DD staff effort to identify and select a lending library for each request) goes a step further in programmatically choosing a lending library for the sought item. Where consortial arrangements have been made, patrons borrow (or check out) a book directly from an off-site library (e.g., ILLINET online or OhioLink libraries). If unmediated access is possible for books, why not for periodical articles?

Baker and Jackson (1993) envision a future when requests for mainstream periodical articles are directed programmatically to the most cost-effective supplier (p. 9). The library staff would specify or modify the criteria for this automatic redirection. The expectation is that the commercial document supplier may be a cost-effective alternative to libraries. The hope is that automatic routing of qualified requests to commercial suppliers might relieve the ILL/DD staff from the labor-intensive task of identifying libraries which have the wanted items, request by request, and then selecting those libraries which meet the guidelines developed by the ILL/DD units.

This study presents new data on the availability of periodical articles at five frequently used commercial document suppliers. The research is based on the premise that, before exploring the feasibility of developing software for the unmediated processing of article requests, we need to investigate whether commercial document suppliers can handle the range of article requests ILL/DD units routinely receive from sister libraries. Availability data become useful interpreted in terms of the characteristics of the article requests and of the periodicals in which the articles appear. Characteristics of article requests and of periodicals are therefore pro-
vided, along with characteristics of the libraries which requested the articles.

Since copies of articles are not returned, the term "request" instead of "borrow" is used in this article. This study focuses on requests submitted to the OCLC ILL PRISM service over a recent twelve-month period. With the exception of public libraries and those which support specialized programs, requests for articles comprise a sizable volume of the ILL/DD activity in many types of libraries. Equally important, what is generally referred to as the serial crisis is felt most with respect to periodicals. These factors led to the choice of article requests over requests for other types of library materials.

**COMMERCIAL DOCUMENT SUPPLIERS**

Recent literature has drawn attention to the role of commercial document suppliers. In their book *Access versus Assets*, Higginbotham and Bowdoin (1993) devote an entire chapter to cover in depth the nature, scope, and characteristics of commercial document suppliers. In the book *Document Delivery Services: Issues and Answers*, Mitchell and Walters (1995) likewise devote a chapter to discuss commercial document suppliers. A study by Arthur D. Little in 1979 noted that the volume of document delivery by commercial document suppliers was increasing at a higher rate than interlending among libraries (Miller & Tegler, 1988, p. 352). Special libraries routinely use commercial document suppliers. In a 1994 survey of its members, the Association of Research Libraries (ARL) found that 87 percent of the respondents used commercial suppliers and 62 percent of respondents reported an increase in the use of document suppliers from the previous year (ARL, 1994). A slightly higher percentage of respondents projected a further increase in the following year. Even smaller community colleges are using commercial suppliers to either supplement or to completely replace libraries as suppliers, which is what the County College of Morris in New Jersey did (Kelsey & Davenport, 1993). Clearly the use of commercial document suppliers is on the rise (e.g., Leach & Tribble, 1993, p. 359).

Some commercial document suppliers (CDS) provide a range of services, including procurement of any type of document (e.g., periodical articles, government documents, patents, reports); libraries, however, tend to use CDS mainly for getting periodical articles. Even though CDS firms seem to be capturing an increasing share of the document supply market, it is probably fair to say that many libraries continue to obtain articles from sister libraries. Their preference for choosing sister libraries as suppliers seems natural and even valid because purchasing articles from commercial suppliers adds to the cost of ILL/DD service.

There is a brewing opinion, however, that it may be cost effective to purchase articles, given the requesting library's cost of labor for selecting
other libraries which provide articles for “free” (or minimal charge) and the supplying library’s cost of retrieving, copying, and dispatching articles. An ILL/DD Performance Measures Study, funded by the Mellon Foundation and directed by Jackson from the Association of Research Libraries (ARL, Press Release, June 21, 1995) is expected to provide comparative data on the cost of obtaining periodical articles from libraries and commercial sources.

Although the majority of CDS firms do not have in-house collections of periodicals, the ready availability of periodicals may be critical for fulfilling a large volume of requests in a guaranteed timely manner. Based on the ARL survey finding (ARL, 1994) pertaining to selection of suppliers by its members and based also on consultation with Mary Jackson, an ILL national expert, five suppliers were selected: the British Library Document Supply Centre (BLDSC), The Canadian Institute for Scientific and Technical Information (CISTI), the Institute for Scientific Information (ISI), University Microfilms Inc. (UMI), and UnCover. Except for UnCover, all have a dedicated collection.

The British Library Document Supply Centre

The British Library Document Supply Centre was conceived as a centralized backup resource center for United Kingdom libraries. Begun as the National Central Library in 1916, it was merged with the National Lending Library for Science and Technology (NLLST) in 1973. The division was renamed the British Library Document Supply Centre in 1986. The BLDSC has an impressive number of documents within its broad collection including 220,000 journal titles, 500,000 theses, 300,000 conference reports, and 3 million books. The BLDSC also collects a large number of government documents from the United Kingdom, United States, Europe, and Asia.

The Canadian Institute of Scientific and Technical Information

The Canadian Institute of Scientific and Technical Information is an arm of the National Research Council of Canada. Begun in 1916, the National Research Council of Canada is the leading agency for research and development in Canada. The National Science Library, which began in 1957, became CISTI in 1974. The collection is strong in science, technology, and medicine. Although CISTI has many branches, its main collection (over 50,000 serials) is housed in one building in Ottawa.

University Microfilms Incorporated

University Microfilms Incorporated began in 1938 as a resource for microform editions of rare books. Purchased by the Xerox Corporation in 1962 and subsequently by Bell & Howell in 1985, UMI expanded its collection to include serials (periodicals and newspapers), dissertations, and out-of-print books. UMI currently provides document delivery from nearly 25,000 periodicals in any subject field with particular strength in
computer science, engineering, life sciences, medicine, business, education, humanities, and social sciences.

The Institute for Scientific Information

The Institute for Scientific Information was established in 1958 by Eugene Garfield who pioneered citation indexing for articles. The document supply service is an offshoot of its primary citation indexing service. The ISI collection covers 16,000 international journals, books, and proceedings in the sciences, social sciences, and the arts and humanities. ISI keeps recent periodicals (those published within the last five years) in-house for ready access. Older periodicals are housed off-site.

UnCover

UnCover is the database and document delivery service that has grown from the Colorado Alliance of Research Libraries (CARL). Begun in 1978 as an alliance of eastern Colorado academic libraries, it grew to encompass academic and public libraries, including those of the Colorado Western slope and Colorado State University. In 1993, CARL Systems joined with The Blackwell Group to form The UnCover Company, which was purchased subsequently by Knight-Ridder Information in 1995. The UnCover database includes over 16,000, mostly English-language, journal titles. Almost two-thirds of the titles pertain to science and technology.

Summary

Each supplier was contacted to obtain printed or electronic indexes to its periodical collection. The BLDSC sent us a CD-ROM copy of its serial collection; ISI and UMI provided their holdings information on diskettes. Indexes of CISTI and UnCover were searched via the WWW. All of the suppliers helped resolve ambiguous entries.

Periodical Article Requests

Approximately 8.5 million requests were processed through the OCLC PRISM ILL system between December 1994 and November 1995. OCLC samples 1 percent of ILL requests on a daily basis. From this 1 percent sample of ILL requests, 2,000 were randomly selected. The cataloging codes in fixed fields of matching bibliographic records in the OCLC World Catalog were used as filters to limit the sample to requests for articles from periodicals.

Figure 1 shows the distribution of the 2,000 ILL/DD requests by format. Requests for monographs, 47 percent, were removed. From the remaining 1,058 requests, monographic series and newspapers were eliminated. The technical definition of periodical includes annuals, semi-annuals, and irregular serials. In common usage, the term “periodical” usually refers to journals and magazines which are published at a regular
interval several times a year. Because the serial crisis is most pronounced for "periodicals" as commonly used, requests which referred to annuals, semiannuals, and irregularly published serials were further disqualified. The remaining 734 requests (approximately 37 percent of 2,000 ILL/DD requests) were for "periodical" articles.

The objective was to examine about 300 to 400 requests for regular "periodical" articles. As noted above, 734 of these requests were obtained. For analysis, 390 of these were randomly chosen. From this working set of 390 requests, 4 percent of the requests were disqualified because citations were incomplete (no volume, year, and/or pages). The findings presented herein are based on the remaining 373 article requests.

PROFILE OF REQUESTING LIBRARIES

Figure 2 shows that academic libraries generated 66 percent of the 373 requests. Of these requests, 14 percent were from major academic research libraries; junior college and medical libraries contributed 7 percent each; federal and public libraries accounted for 5 percent each. All other types of libraries together accounted for the remaining 10 percent of the requests. Four-fifths of the 373 article requests examined seemed to originate in academic environments.

ILL request forms require library staff to enter the library's preferred method of delivery and the maximum cost the library is willing to pay. Of the requesting libraries, 66 percent indicated a preference for receiving
the article via U.S. mail library rate; 16 percent via courier service; 8 percent via first class U.S. mail; 5 percent via fax; and 1 percent via air mail. Another 1 percent was willing to pay for the fastest method possible. The remaining 3 percent did not indicate a preference.

How much are libraries willing to pay? Of the libraries surveyed, 29 percent wanted the article at no cost, while 14 percent of the libraries were willing to pay in the range of $1 to $5 with another 16 percent willing to pay $6 to $10. A quarter of the libraries were willing to pay anywhere between $11 and $20. Seven percent indicated that they were willing to pay between $21 and $50 while the remaining 9 percent were willing to pay any amount. Overall, nearly 60 percent wanted the article at $10 or lower.

That two-thirds of the libraries indicate a preference for article delivery via U.S. mail at library rate, and nearly 60 percent want the cost to be $10 or lower suggests that, while libraries may be trying for operational efficiency of ILL/DD units, they are not really allocating money for faster modes of delivery.

**Profile of Requested Articles**

Three attributes of wide interest were selected for characterization: (1) article publication date, (2) periodical scatter, and (3) subject dispersion.
Publication Date

Table 1 presents percentages of articles for selected intervals and the corresponding cumulative percentage. One-fifth of the 373 articles was published in the year preceding the year of the request. This percentage drops gradually as the articles age. Note that 64 percent of requests were for articles published within the previous five years, 88 percent within the previous fifteen years, and over 95 percent within the previous twenty-five years.

Table 1. Percentage of Article Requests by Publication Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage (n=373)</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>1994</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>1993</td>
<td>14</td>
<td>43</td>
</tr>
<tr>
<td>1992</td>
<td>12</td>
<td>55</td>
</tr>
<tr>
<td>1991</td>
<td>9</td>
<td>64</td>
</tr>
<tr>
<td>1990</td>
<td>6</td>
<td>70</td>
</tr>
<tr>
<td>1989-1990</td>
<td>18</td>
<td>88</td>
</tr>
<tr>
<td>1979-1970</td>
<td>9</td>
<td>97</td>
</tr>
<tr>
<td>1969 or earlier</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Number of Requests per Periodical (Periodicals [n=120])

<table>
<thead>
<tr>
<th>Number of Requests</th>
<th>Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>2-3</td>
<td>23</td>
<td>71</td>
</tr>
<tr>
<td>4-5</td>
<td>13</td>
<td>84</td>
</tr>
<tr>
<td>6-9</td>
<td>10</td>
<td>94</td>
</tr>
<tr>
<td>10 or more</td>
<td>6</td>
<td>100</td>
</tr>
</tbody>
</table>
Periodical Scatter

In contrast to the concentration of requests for current articles, the requests are scattered with respect to periodical sources. Table 2 shows that 48 percent of the 120 periodicals received one request each. Eighty-four percent of the periodicals were requested by member libraries five or fewer times during a twelve-month period.

Subject Dispersion

The articles were categorized according to the subject area of the source periodical. Dewey Decimal Classification (DDC) is chosen over the Library of Congress Classification scheme because of its simplicity. Table 3 shows that one-third (32 percent) of the articles came from periodicals classed in social sciences (DDC 300). Nearly one-fourth (23 percent) of the articles pertained to applied sciences and technology (DDC 600) while another one-eighth (12 percent) were from mathematics and pure sciences (DDC 500). If the articles classed in DDC 500 are grouped with those classed in DDC 600, then the percentages of requests in sciences and social sciences are roughly equal.

Table 3. Subject Dispersion of Articles

<table>
<thead>
<tr>
<th>DDC Classes</th>
<th>Percentage (n=373)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>000s Generalities</td>
<td>6</td>
</tr>
<tr>
<td>100s Philosophy &amp; Psychology</td>
<td>9</td>
</tr>
<tr>
<td>300s Social Sciences</td>
<td>32</td>
</tr>
<tr>
<td>500s Natural Sciences &amp; Mathematics</td>
<td>12</td>
</tr>
<tr>
<td>600s Technology (Applied Sciences)</td>
<td>23</td>
</tr>
<tr>
<td>700s The Arts</td>
<td>4</td>
</tr>
<tr>
<td>800s Literature &amp; Rhetoric</td>
<td>1</td>
</tr>
<tr>
<td>900s Geography &amp; History</td>
<td>2</td>
</tr>
<tr>
<td>Unknown</td>
<td>11</td>
</tr>
<tr>
<td>All</td>
<td>100</td>
</tr>
</tbody>
</table>

*No article requests fell in either the 200s (religion) or 400s (languages)

While strong demand for recent publications is not surprising, the extent of this skew is illuminating. Were it not for this phenomenon of article dispersion among a vast array of both subject-direct and ancillary periodicals, user needs could be fulfilled to a greater degree from the collections of the requesting libraries.
Profile of Periodical Titles

Periodicals can be characterized in a number of ways. We selected four common attributes of periodicals: (1) country and language of publication, (2) age of periodical, (3) type of publisher, and (4) price. An examination of these attributes may explain why it has been necessary to obtain the periodical article through the ILL/DD service.

Country and Language of Publication

Country and language of publication should not be significant barriers to subscribing to periodicals. Major publishers tend to be multinationals, and the English language is predominant in scientific and scholarly communication.

Age of Periodical

Age of a periodical is obtained by subtracting the year the periodical was launched from the current year. Older periodicals, especially those launched fifty or more years ago, are likely to pertain to classical disciplines of study. An example is the Transactions of the American Entomological Society, which began publication in 1879. An older periodical may also be of general interest, such as Donahoe's Magazine, which also began in 1879. The former ceased in 1889, and the latter ceased in 1908. Both appeared in the study sample.

As new knowledge is gained, new specialties are born, which in turn give rise to periodicals in the new areas of study. New periodicals are also started sometimes as vehicles for communicating social issues or concerns. In this study, two articles were requested from two new periodicals which began in the same year as the requests for ILL/DD were placed. Two periodicals, Narcotics Enforcement and Prevention Digest and Violence Against Women, began in 1995.

As is the case with many bibliometric distributions, the age distribution of the periodical titles is not normal (see Table 4). Note that nearly 50 percent of the periodicals were started in the most recent twenty years; 25 percent of the titles began publication in the most recent ten years. These data seem to support the fact that emerging periodicals add to the financial strain libraries face in view of upward spiraling serial prices.

Type of Publisher

Publishers of periodicals were grouped into four categories: (1) for-profit (e.g., Blackwell, Academic Press), (2) professional or trade associations and societies (e.g., Central States Speech Association, American Entomological Society), (3) universities and colleges (e.g., Harvard University, National College of Teachers of the Deaf), and (4) civic or cultural institutions (e.g., The Whale Museum).

For-profit publishers comprised the largest category, producing over 50 percent of the periodical titles in the sample. One-third of the peri-
Table 4. Percentage of Periodicals by Starting Years (Periodicals \([n=120]\))

<table>
<thead>
<tr>
<th>Start Years</th>
<th>Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-1990</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>1989-1985</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>1984-1975</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>1974-1950</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>1949-1900</td>
<td>14</td>
<td>94</td>
</tr>
<tr>
<td>&lt; 1900</td>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

Periodical titles (33 percent) were published by professional associations or societies and 11 percent by universities. The remaining 5 percent of the periodicals were from civic or cultural institutions.

**Price**

Subscription prices of periodicals were obtained from reference sources, primarily EBSCO. The median subscription price of a periodical is $98.50. The price distribution is not normal as revealed by the average subscription price of $289. Periodical prices by the three major publisher types are shown in Figure 3. Note that the median price of periodicals from for-profit publishers ($175) is more than three times the median price of periodicals from professional/trade associations ($55). Periodical prices were also broken down by broad disciplines based

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Figure 3. Median and Mean Subscription Prices
on DDC classification. The median subscription prices for three large classes of periodicals were: social sciences, $96; technology, $165; and sciences, $305. A comparison of prices based on the number of library holdings for each periodical title did not reveal any pattern.

In summary, an overwhelming majority of the periodicals are published in the English language in a handful of Western countries. Because this is a well-recognized fact, percentage breakdowns are not included. Most periodicals needed for article references were of recent publication and over half were produced by for-profit publishers. The average periodical subscription price varies by publisher type, with the for-profit publisher price being substantially above the others.

**Availability of Articles at Selected Suppliers**

Checking for article availability from suppliers results in three possibilities. The supplier may: (1) have the specific issue of the periodical in which the article was published, (2) have the periodical title but not the specific issue in which the article appeared, and (3) not have the periodical title at all. UnCover alone provides indexing at the volume and issue level. Although in exceptional cases the cited volume could be missing at suppliers, these collections (except UnCover) do not have on-site users as libraries do. Based on inquiries to staff at BLDSC, CISTI, and UMI, it was assumed that the supplier had the volume unless otherwise indicated. Whenever holdings descriptions were ambiguous, the respective suppliers were contacted, and the problems were discussed and resolved.

ISI indicates whether the volumes are held on-site, off-site, or whether other collections are used. ISI stores periodicals over five years old at a remote site. Retrieving an article from off-site storage increases turnaround time. Because the focus of this study is availability, not speed of delivery, the availability score for off-site collection was collapsed with the score for on-site collection. In instances where outside collections were given as a resource, we recorded that article as unavailable.

Percentages of article availability at the suppliers which are presented here should not be interpreted as performance indicators. Whether a supplier is likely to have the sought article, as noted, depends on its primary mission and the scope of the collection which reflects its mission.

Overall, 92 percent of the 373 sample articles were available from at least one document supplier. All five suppliers held 7 percent of all the articles. At least four of the five suppliers held 17 percent of all the articles. At least three suppliers held one-third (33 percent), while at least two held one-fourth (24 percent) of all the articles, while none of the suppliers could offer 8 percent of the articles.

The percentages which follow refer to scores based on volume availability. As shown in Figure 4, the BLDSC has 81 percent of the articles; CISTI, 39 percent; ISI, 53 percent; UMI, 57 percent; and UnCover, 53
percent. As also shown in Figure 4, small percentages of articles were not available even when the suppliers carried the periodical titles, since the specific volumes were unavailable. At BLDSC, 13 percent of the articles were not available because it did not collect the periodical (Figure 4). The corresponding percentages for CISTI, ISI, UMI, and UnCover are 58 percent, 37 percent, 39 percent, and 21 percent, respectively. Eleven periodical titles required for article requests were not available at any of the suppliers, as shown in Table 5.

Table 5. Periodicals Not Available at Any Supplier

<table>
<thead>
<tr>
<th>Periodical Titles</th>
<th>Article Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donahoe's Magazine</td>
<td>1899</td>
</tr>
<tr>
<td>Teacher of the Deaf</td>
<td>1975</td>
</tr>
<tr>
<td>Ancestry Newsletter</td>
<td>1986</td>
</tr>
<tr>
<td>Cetus</td>
<td>1987</td>
</tr>
<tr>
<td>The Plough</td>
<td>1990</td>
</tr>
<tr>
<td>The Teaching Professor</td>
<td>1990</td>
</tr>
<tr>
<td>M Inc.</td>
<td>1990</td>
</tr>
<tr>
<td>Communications &amp; Strategies</td>
<td>1991</td>
</tr>
<tr>
<td>Choice</td>
<td>1991</td>
</tr>
<tr>
<td>The Common Boundary</td>
<td>1994</td>
</tr>
<tr>
<td>The Psychotherapy Letter</td>
<td>1994</td>
</tr>
</tbody>
</table>

Since the late 1980s, a few studies have measured performance of commercial suppliers (e.g., Miller & Tegler, 1988; McFarland, 1992; Pederson & Gregory, 1994). Fill rate or success rate (i.e., the number of articles received from a supplier as a percentage of the number of articles requested in the study) comes close to measuring availability. In several of these studies, the supplier was selected for the subject strength. It would be erroneous to compare the findings of this study with those of the aforementioned studies, since this study focused on the availability of a common pool of requests at each of the suppliers in a uniform manner.

**Key Findings**

**Availability of Articles at Suppliers**

The primary purpose of this study, as noted at the outset, was to examine whether commercial suppliers can handle the range of article requests ILL/DD Units routinely process. Again, the following data do not
Figure 4. Availability of Periodical Articles at Selected Suppliers

- BLD: 81% Article Available, 6% Title Available, but Not Article, 13% Title Not Available
- CISTI: 58% Article Available, 3% Title Available, but Not Article, 97% Title Not Available
- ISI: 53% Article Available, 10% Title Available, but Not Article, 89% Title Not Available
- UMI: 57% Article Available, 4% Title Available, but Not Article, 93% Title Not Available
- UnCover: 53% Article Available, 26% Title Available, but Not Article, 74% Title Not Available

n=373
reflect upon supplier performance, as article availability is significantly affected by the individual supplier’s primary mission. The findings suggest that the five suppliers together can fulfill 92 percent of all article requests. Of the five, the BLDSC alone can respond to 81 percent of the article requests. The BLDSC's score is nearly 25 percentage points higher than that of UMI, 28 percentage points higher than that of both ISI and UnCover, and 42 percentage points higher than CISTI (see Figure 4). Why is the availability score for BLDSC so much higher than for others? Perhaps because BLDSC was conceived as a resource center to serve other libraries in the United Kingdom. The underlying notion was that it would be more efficient to send a patron request directly to a centralized source instead of one library trying to borrow from another.

While CISTI’s primary function is also to serve as a national resource (for Canada), its explicit mandate to support science, technology, and medicine lowers its overall score. As noted, unlike other performance studies, the requests were not presorted by collection strength. Each request in the sample was checked for availability at all five suppliers. Although UMI and ISI are key players in the document supply business, they were not founded for operating primarily as resource centers for libraries of all types.

UnCover, like BLDSC, was formed to operate as a document supplier. Although it does not have a unified physical collection in one place, UnCover’s arrangement with the participating libraries is such that the availability score for UnCover is impressive. Given that it was started in the late 1980s, a score of 53 percent for availability is striking. A distinguishing feature of UnCover is the availability of indexes for searching periodicals at the volume and issue level.

Magnitude of ILL/DD Requests for Periodical Articles

As noted, this study began with a comprehensive sample of requests submitted to the OCLC ILL PRISM System. Requests which were not appropriate for the study objective were systematically eliminated—to examine requests for articles from periodicals, i.e., periodicals as commonly used. Instead of filtering step by step, the initial sample could have been limited to periodical articles. However, the approach used provided insight on the magnitude of demand for ILL/DD in various formats (e.g., books, newspapers, and so on). Because the findings are based on just one sample, the corresponding format percentages for about 85,000 requests (1 percent of 8.5 million requests) were compared at the close of the study. Remarkably, the proportions are exactly the same, except for the “periodicals” category which was 5 percentage points higher in the 1 percent sample than in the study sample (refer to Figure 1 for study sample percentages). It is therefore a safe assumption that approximately 40 percent of the requests processed through the OCLC ILL PRISM System relate to periodical articles.
Share of Article Requests by Library Type

Among OCLC membership, academic libraries constitute the largest group, accounting for 26 percent of the membership. It is worth noting that 66 percent of the 373 requests were placed by academic libraries. The public libraries comprise roughly 13 percent of the membership, whereas their share of article requests is 5 percent. The percentage of requests from junior college and medical libraries, however, were about the same as their relative size in the membership (roughly 7 percent each).

Measure of Demand for Recent Articles

The finding pertaining to the distribution of article publication dates merits mention. Based on age as derived from the year of publication, Table 6 compares the distribution of the data in this study with that of the 1 percent sample and that of the Williams and Hubbard study (1991). The heavy demand for articles published within five years (two-thirds or more of total article requests) is pronounced in all three sets of data. While many of us may have had a general sense that recent publications are in much demand, this collocation of data offers empirical evidence of this trend.

CONCLUSION

The findings of this study suggest that criteria can be specified for developing software which could relieve libraries of the labor-intensive task of identifying suppliers which fulfill typical periodical requests. Just

Table 6. Distribution of Age of Article Requests

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Study Sample n=373</th>
<th>1% Sample n=30,198</th>
<th>Williams &amp; Hubbard Data* n=3,208</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cumulative Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>29</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>43</td>
<td>43</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
<td>54</td>
<td>53</td>
<td>56</td>
</tr>
<tr>
<td>4</td>
<td>63</td>
<td>61</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
<td>66</td>
<td>72</td>
</tr>
<tr>
<td>6-15</td>
<td>88</td>
<td>89</td>
<td>96</td>
</tr>
<tr>
<td>16-25</td>
<td>97</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

* Source: Williams & Hubbard (1991)
two variables, the format and date of the request, together can go a long way in selecting and batching requests which have high probability of being supplied by the commercial segment. In any real operation, speed of delivery and cost for the service will obviously be included in choosing an appropriate supplier.

Commercial document supplier availability information for periodicals at the volume/issue level is important. Ideally, a union catalog of periodicals which are available at the major document suppliers would be developed. In the absence of such a tool, library staff must search indexes of one supplier after another. Perhaps this is one of the reasons which is contributing to libraries' preference for working with sister libraries. Although the periodical holdings information of libraries is inadequate, what is available is at least brought together in the form of union catalogs.

It is now well established that users are reluctant to pay any more than $2 to $4 for an article. This reluctance may stem partly from the fact that the user requests an article with some uncertainty that it will contain the "information" desired. If users were able to read an abstract first and develop a higher level of confidence in receiving the desired information, they might be willing to pay more. This ability to browse the abstract first would also tend to reduce requests for articles which were not pertinent.

The overwhelming demand for recent articles suggests that, in the long run, the stress ILL/DD units face may perhaps lessen as periodicals released in full text via online or CD-ROM grow in number. As Cornish (1991) notes: "The future for document supply is full of change and challenge" (p. 133).

ACKNOWLEDGMENT

We would like to thank Patrick D. McClain, Systems Analyst of OCLC for extracting, preparing, and organizing a sample of ILL requests and the corresponding bibliographic records for this study.

REFERENCES


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addressing issues of cataloging, authority control, professional education, and the management of technical services.
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