Resource Sharing in the Systemic Context of Scholarly Communication

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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.
COHERENCE WITHIN DISCIPLINES

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).

SHIFTS IN COLLECTION DEVELOPMENT

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.9
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 whenever 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 cre-
ation and dissemination of scholarly information possible, that our com-
unities 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 copy-
right 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 intel-
lectual property laws. To establish uniform understandings about intel-
lectual 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 our-
selves enjoy. It is easy to become chauvinistic and insular in thinking
about our knowledge resources; it would be foolish to act on such im-
pulses 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 pro-
vided 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 journal 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 photomechanical 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