Scholarly Electronic Publishing on the Internet, the NREN, and the NII: Charting Possible Futures

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Introduction

Global computer networks, such as the Internet, have created a complex electronic communication system that has significantly changed the way scholars informally exchange information and has started to change formal scholarly publication activities.[1]

This paper examines how scholarly electronic publishing could be conducted on the Internet, the National Research and Education Network (NREN), and the National Information Infrastructure (NII); and it reviews existing proposals for change. It does not consider how the broader electronic publishing industry should be structured to distribute general interest magazines, popular fiction, or other nonscholarly material.[2] Nor does it assume that print-based scholarly publishing efforts will disappear or radically diminish in the near-term future. Rather, it envisions network-based electronic publishing as initially augmenting conventional publishing efforts and then gradually displacing them.

Models for Network-Based Electronic Publishing

What future options are there for structuring scholarly network- based electronic publishing efforts? This section will explore selected models that have been suggested by authors in the last few years, focusing primarily on models for noncommercial publishing ventures.

The CNI Models

In 1991, the Coalition for Networked Information (CNI) held a workshop where seven economic models for networked information were developed.[3] Six of these models are briefly summarized here. (The Corporation for Scholarly Publishing Model is described in detail later in this paper.) Not all of the models are complete enough to warrant further discussion in this context; hopefully, future contributions to the literature will expound on them further.

> **Benchmark Print-Based Model**—The existing activities of print publishers provide useful baseline data against which emerging electronic information models can be compared.

> **Acquisition-on-Demand Model**—Scholarly articles would be available on network file servers, offered at variable prices. Users would retrieve articles as needed. "Quality signifiers," such as the number of prior retrievals, would aid users in determining the importance of papers. Miriam Drake has noted that this model raises a variety of questions, including who will act as service providers, what role mediated access plays, whether index and abstract information will be available, and how copyright issues will be resolved (including fair use of downloaded materials).[4] Bailey has suggested that the model has at least ten possible dimensions: type of information, information scope, quality filtering, information fixity, information structure and packaging, frequency of publication, distribution strategy, information pricing, intellectual property rights, and type of publisher.[5]

> **National Site License Model**—Publishers would license electronic information to major redistributors for state-wide, regional, national, or other large-scale use. If the

model is put in place, Karen Hunter has suggested that authors may have wider distribution of their work, publishers may have larger readerships of their journals, libraries may have lower unit costs (technical infrastructure and user support costs may negate this benefit), and users may have access to more information. However, publishers and libraries would need to be concerned about adequate control over information use, libraries would face ownership issues, and major legal, pricing, and technical issues would need to be resolved.[6]

Discipline-Specific Literature Base Model—Comprehensive electronic information systems would be established for each major academic discipline. An example of this model is discussed in the "American Physical Society's Vision 2020" section of this article.

Augmented Print Model—Publishers would market both print and electronic products based on the information needs of users.

Distributed Information Model—A wide variety of publishers would compete to provide diverse electronic information products on a government-subsidized network.

Since they look at electronic publishing issues from a variety of perspectives, these models do not appear to be mutually exclusive. For example, a discipline-specific information system could use acquisition-on-demand file servers.

Scholarly Communication System

Sharon Rogers and Charlene Hurt have recommended the development of a comprehensive, interdisciplinary Scholarly Communication System.[7] The system would be created using a mix of foundation, government, and university funding. Ongoing funding would come from annual membership fees paid by academic institutions and hourly use fees.

A paper would be initially be published for a six-month period. During this time, the system would monitor both usage of and citations to the paper, and scholars could append signed comments to it. At the end of this period, the author would have up to ten days to revise the paper. Within 15 days after completion of the revision process, the paper would be evaluated by a review board, which would assign the paper to one of seven categories. Two of these categories would be the equivalent of the paper being rejected from a traditional refereed journal, and the author could appeal the use of these categories. Once the review process was complete, authorized scholars could add "research notes" to the paper and the author could enter correction fields. Usage and citation data would continue to be gathered indefinitely.

Corporation for Scholarly Publishing

Peter Young has suggested the establishment of a Corporation for Scholarly Publishing (CSP), which would be modeled on the Corporation for Public Broadcasting (CPB).[8] The existing CPB distributes federal funds to member television and radio stations for program development and acquisition, supports a national technological infrastructure, and provides other centralized services. To supplement federal funds, CPB affiliates raise funds from corporate and private donors. Young envisions the proposed CSP functioning in a similar fashion to support scholarly electronic publishing efforts; however, he notes:

CPB's role in providing an alternative to network broadcasting is not exactly analogous to the CSP model. CSP would provide an intersectorial group representing those differing values and interests of the research, academic, society, publishing, communications, information technology, and commercial communities.[9]

University-Based Publishing System

Jerome Yavarkovsky has proposed a university-based electronic publishing system based on a broadcasting model.[10] As members of a larger electronic publishing organization, each university would both publish electronic documents and acquire third-party electronic documents for local use, acting like affiliate stations of a broadcast television network. Unlike the CSP model, this model appears to be solely a university venture without explicit federal or corporate involvement. Affiliation with a larger organization would offer universities a variety of potential benefits, including more effective electronic document purchasing and marketing capabilities. Depending on circumstances, several independent, competing university publishing systems may be established.

American Physical Society's Vision 2020

The American Physical Society's (APS) Task Force on Electronic Information Systems has written a lengthy report on electronic publishing in the year 2020 and APS's role in this activity. A brief overview of this report is presented here.[11]

The Electronic Information Systems Task Force (EISTF) envisions the possible development of a progression of sophisticated information systems: a National Physics Database, a National Physics Information System, a World Physics Database or Information System, and a World Scientific Database or Information System; however, the report primarily focuses on the first two systems.

EISTF anticipates that physics journal and book publishers would continue to perform the same role in the scientific communication process as they do today, but they would submit their publications to the National Physics Database as hypermedia documents and they would use electronic communication to support all editorial work. Preprints and public comments on documents might also be included in the database; however, EISTF feels this possibility raises many issues. Utilizing the National Physics Information System, scientists would access the National Physics Database, which would be mounted on a central server or on regional servers, via powerful networked workstations with high-resolution displays and printers. Advanced searching techniques would allow users to pinpoint needed information, and users would be able to view and manipulate color 3-D displays, follow and create hypermedia links, retrieve numerical data, perform calculations, and annotate documents. The system would maintain detailed document use records. The report suggests a variety of possible administrators for the National Physics Information System, ranging from government agencies to commercial database services.

User fees may vary according to the characteristics of the organization or individual user, including geographic location. Payments to publishers by the National Physics Information System may be based on actual use, flat rates, publisher characteristics (e.g., commercial nature of publisher), negotiated value of individual documents, or other factors.

Several authors have commented on the proposed system. Stevan Harnad has noted the importance of using the system to accelerate the speed of the scholarly dialogue between author and reader through the dissemination of peer-reviewed brief articles and responses to those articles ("scholarly skywriting"), and he has pointed out that direct contact between scholars should be encouraged by providing the e-mail address of the author in the paper.[12] Vickey Reich has suggested that the initial costs of establishing the system are likely to be high and physicists may not support its establishment or want to participate in it.[13]

"A Circle of Gifts"

Acting both as authors and editors, faculty and academic staff are the primary source of scholarly information. In recent years, they have taken advantage of the relative ease of distributing electronic journals, books, and other documents on the Internet and other global computer networks and set themselves up as publishers.[14] Often utilizing existing campus technological infrastructure and free software tools (e.g., list servers and Gophers), the start-up cost of these ventures is low. It is up to end-users to produce any

desired printed copies of these publications, which are often simple ASCII files. Although these electronic documents are usually primitive compared with print publications, it has been demonstrated that existing technologies can be used to effectively disseminate a surprisingly large subset of scholarly information. However, scientific, engineering, and medical disciplines may require the use of PostScript, TeX, and other document distribution formats, and users may need special hardware and software to utilize documents encoded in these formats. It is not uncommon for these publishers to have unusually liberal copyright policies that allow authors to retain control of their works and readers to freely utilize them for noncommercial purposes. Electronic documents are distributed at no or low cost, encouraging widespread use.

Ann Okerson eloquently characterizes this model as a "Circle of Gifts," and she perceives significant benefits resulting from a system where scholars, who both create and consume scholarly information, also publish it.[15]

Conventional publishers have sometimes reacted to this trend with alarm, viewing it as leading to a kind of scholarly publishing anarchy. By contrast, some academics herald it as the return of publishing to where it belongs-the university-with the benefit that scholarly information can be more freely exchanged.

Possible Goals for a Scholarly Electronic Publishing System

As we have seen, it is possible to envision many useful models of a future electronic scholarly publishing system. Each model has implicit and explicit goals it is designed to achieve. Presumably, we would want a future electronic publishing system to be at least as good as our current system and, hopefully, to remedy some of the serious problems that our current print- oriented system faces. Leaving aside implementation issues for the moment, what goals should a future electronic publishing system try to accomplish to meet the needs of scholars and librarians? Drawing upon prior discussion, this brief list suggests some potential goals for such a system:

Electronic documents should be accessible on all major computer networks, and they should be available 24 hours a day, seven days a week.

Scholars should be able to quickly identify needed documents using powerful search techniques, pinpoint where they are stored, and easily retrieve them.

There should be a free exchange of scholarly ideas, without undue censorship or bias.

A range of editing options should be available in the electronic publishing system (e.g., totally unedited, edited, and edited/refereed documents).

A variety of use measures should be available to help scholars determine the importance of a work (e.g., counts of the number of times a work is used and cited).

Scholars should be able to easily and rapidly exchange ideas in a structured manner through review and comment on brief position papers (scholarly skywriting), pre-publication comments, post-publication notes, and other mechanisms.

Electronic documents should be distributed at the lowest possible cost (or at no cost).

Through subsidy or profit, publishers should have adequate resources to support necessary editorial, peer-review, and information distribution functions.

It should be possible to easily authenticate users and to bill them as appropriate.

Scholars should be allowed to hold the copyright for their works and to determine what use restrictions, if any, would be imposed.

The rights of copyright holders should be enforced.

Scholars should be able to use electronic information for noncommercial purposes with at least the same freedom that they enjoy under "fair use" guidelines for print

materials.[16]

It should be easy to determine if an electronic document is copyrighted, what use restrictions apply to that document, and how to obtain any required permissions to use the document.

It should be easy to detect plagiarism.

Authoritative master copies of documents should be safe from unauthorized tampering.

An author should be able to correct, update, and otherwise change his or her document; however, the original document should be preserved, and the original and subsequent versions of a work should be clearly identified and distinguished from each other.

If end-user copies of master documents are edited, this alteration should be evident to anyone who may receive the changed document.

Electronic documents should be preserved and made available in a usable form forever.

Electronic documents should at least have equal information display capabilities as print documents, and they should add new capabilities, such as hypermedia links, 3-D graphics, and full- motion video segments.[17]

It should be possible to print appropriate parts of electronic documents on local printers. Ideally, high-speed, high-resolution color printers would be supported.[18] (Some aspects of electronic documents like video segments will not be printable).

User requests for information should be confidential, and any cumulative use records the system maintains should not identify the user by name or other unique identifier.

Scholars should be automatically notified when a new work that may be of interest to them is published.

There are two critical enabling factors for the development of a robust scholarly electronic publishing system.

The first factor is reasonable cost access to the Internet and any future national or global networks that will be widely used by universities, colleges, public libraries, and other nonprofit organizations. These institutions must be able to afford to provide subsidized access to the network for faculty, students, other researchers, and the general public. Government agencies at all levels must also be able to easily participate in the network.

The second factor is the development of an appropriate computing and networking infrastructure in universities and other nonprofit organizations that can support access to a scholarly electronic publishing system in libraries, offices, meeting rooms, classrooms, dorm rooms, and users' homes. This infrastructure is quite costly to build and maintain, and it is not fully developed at many of these institutions.

The goals outlined here are not comprehensive nor are they all achievable with current technologies. Some goals conflict with others. In the real world, there are complex, interrelated cultural, economic, legal, political, technical, and other factors that enable or constrain possible solutions to the problem of how to best provide scholarly electronic information services. However, these goals do provide some tentative criteria that we can use to assess proposed scholarly electronic publishing systems.

Discussion of the Models

What is striking about most of the electronic publishing models reviewed here is the desire for large-scale, comprehensive systems.

The interdisciplinary Scholarly Communication System offers a number of benefits, such as one-stop shopping, a unitary user interface, linkage of all related information, consolidated use statistics, authoritative master copies, and ease of backup. However, this system seems to be envisioned as being an information monopoly, which is a highly unlikely development in our democratic and capitalist society. Even if it could be done, the potential for abuse to is simply too great, no matter how noble the aims of the system. For intellectual freedom to flourish and for scholarship to make paradigm changes, there must be a multiplicity of publishing outlets. Although the development of a Scholarly Communication System seems improbable in the foreseeable future, some of the technical and operational features of this system might prove useful in smaller-scale systems.

On a reduced scale (only one discipline), the National Physics Information System (NPIS) shares some of the advantages of the Scholarly Communication System. Given the increasingly interdisciplinary nature of scholarship, the NPIS would likely need to be linked to other electronic information systems to truly meet all of the information needs of physicists. Unlike the Scholarly Communication System, the NPIS relies on publishers to supply the system with information, and individual journals would continue to exist. However, the APS report expresses concern that the NPIS may result in weakened journals and lower quality published material as individual documents become more important than the journals they are published in.[19] It also suggests that publishers will have little choice about participating in the NPIS if they want to reach physicists.[20] If this were true, the problem of information monopoly could arise, because the NPIS could potentially dictate editorial policies, publisher fees, information access changes, and other critical publishing practices for an entire discipline.

Discipline-oriented systems such as the NPIS hold great promise as long as they do not attempt to control all publication activity within their fields. Already, a growing number of professional associations (e.g., the American Mathematical Society) are establishing valuable network information services that may be precursors to such systems. The Comserve system, which is used by communications scholars, is a notable example of a contemporary discipline-based electronic information service that provides computer conferences, a scholarly document archive, a white pages service, an index to journals in the field, an electronic journal, and other services.[21]

Other large-scale electronic publishing models, such as the Corporation for Scholarly Publishing (CSP) and the University- Based Publishing System (UBPS), are more pluralistic and would operate in the larger context of a diverse, competitive information marketplace. While they would not offer one-stop shopping, the existence of these major systems would simplify the search for needed information. Although they would likely be composed of numerous nodes, either a CSP or UBPS could be designed to function as an interconnected whole, offering some of the benefits of centralization noted above, such as a single user interface and linked information, within the context of a distributed system.

If adequate government funding were available, a Corporation for Scholarly Publishing could be established over time, given a firm commitment by universities and donors to help sponsor such a venture during increasingly troubled financial times. Unlike PBS where the public is served by general interest radio and television programming, a CSP is likely to have a much smaller natural constituency (e.g., scholars, students, and researchers) that can be tapped for fundraising purposes. It is uncertain whether a CSP could be structured to be largely self-supporting or whether, in order to be viable, it would require much more university funding than PBS does. Governance of the system would be a key issue. To be truly effective, the CSP would need to be insulated from political pressures from both the right and the left about "appropriate" content of published material.

The University-Based Publishing System (UBPS) doesn't have as broad a proposed funding base as the CSP, and it would likely grow more slowly and be a smaller venture unless there was very strong support from universities.

University presses are an important source of high-quality scholarly publications, and they would appear to be well suited to spearheading a UBPS effort. However, until recently, they

have shown little interest in network-based electronic publication efforts, and they face significant challenges in simply maintaining their conventional publishing activities, which often emphasize producing monographs.[22] Based on several current projects, it seems that a growing number of university presses are recognizing the potentials of electronic publishing, and they may take a stronger leadership role in the future. If they decide to do so, university presses may need an infusion of new funds to initiate electronic publishing ventures.

It is unclear how many universities would be willing to divert funds from other needy programs to support a new electronic publishing system. Since the UBPS would substitute for conventional library materials to some degree, it could be argued that needed funds should partially come out of library budgets; however, the most likely place to take these funds from are collection development budgets, and there could be considerable faculty resistance to reducing the acquisition of print materials to support an unproven electronic publishing system. Given the current fiscal realities of higher education, a UBPS would undoubtedly attempt to raise grant funds from federal, foundation, and corporate sources to provide seed money for the system.

Since scholars already publish a wide variety of useful material on the Internet and other networks, the "Circle of Gifts" model is viable, but restrained by current technological and other limitations. Unlike more centralized models, this model offers a highly diverse-and fragmented-information marketplace. This model encourages vigorous innovation, free or low-cost information dissemination, the open exchange of ideas, and minimal (or no) copyright restrictions for noncommercial use; however, it leads to a variety of logistical problems that are either inherent in such a highly decentralized system (e.g., the potential danger that some information will not be permanently preserved) or are the result of present network infrastructure weaknesses (e.g., it is difficult to locate needed information that is scattered across many servers and is not centrally indexed or cataloged).[23]

These scholar-based electronic publishing ventures are fragile because they are undercapitalized and informal. They often rely on volunteer effort, excess computing capacity, free software tools that come with neither formal technical support from the developer nor any assurance of future upgrades, subsidized network access, and institutional goodwill (or indifference). However, since operating expenses are low compared with print-based publishing ventures, they can function with limited funding as long as certain key conditions are stable and the editorial staff's motivation remains strong.

As they mature, some of these informal electronic publishing ventures may collaborate with existing or new publishing organizations. For example, the electronic journal Postmodern Culture is now being published by the Oxford University Press;[24] the electronic journal The Public-Access Computer Systems Review is also published as a print annual by ALA's Library and Information Technology Association; and several professional associations' print journals are being published in electronic form by the Scholarly Communications Project at Virginia Tech.[25] Other scholar-based publishing projects may seek formal institutional recognition and support or impose modest purchase or subscription fees. It will be interesting to see how success affects these ventures' publishing policies and procedures.

The Role of Commercial Publishers

Until now, the focus of this article has primarily been on noncommercial alternatives for a scholarly electronic publishing system. What is the appropriate role of commercial publishers in such a system?

Commercial publishers play a major role in our existing publishing system and there is no reason to believe that they will not continue to play an important role in the future. Although they may now hesitate to plunge into the network marketplace due to entry barriers like "acceptable use" policies that govern some Internet component networks and they may have a variety of concerns about control over electronic information dissemination over

networks,[26] it seems likely that they will more vigorously explore this potentially lucrative marketplace once noncommercial publishers-primarily scholar publishers- demonstrate the feasibility of this type of publishing and build a market for it. Already pioneering publishers have begun to test the Internet waters with free electronic services. For example, table of contents information and sample articles from a variety of print serials are available via the Electronic Newsstand service; some magazines like Mother Jones are putting complete issues on the network; a growing number of publishers' catalogs are available on the network; and O'Reilly & Associates is publishing a hypermedia serial, GNN Magazine, as part of its innovative Global Network Navigator service.

In the more controlled setting of campus networks, Elsevier has initiated the innovative Tulip project to determine how electronic versions of selected print journals would be utilized,[27] and Springer-Verlag is participating in the University of California, San Francisco's Red Sage project by providing electronic versions of some of its journals.[28]

Commercial publishers have the skills and the resources to produce high-quality electronic publications, and network-based electronic scholarly publishing will be significantly enriched by their participation in the network marketplace. However, given the ongoing severe crisis in the cost of library materials, we should be hesitant to let them dominate network-based scholarly electronic publishing to the extent that they do print-oriented scholarly publishing without substantial changes in some of their publishing practices. We need to convince commercial scholarly publishers that their electronic information products must be affordable and be available under reasonable terms and conditions, and this will be a long and difficult effort.

Current trends in the commercial electronic information arena do not bode well for the future. Libraries have been far too sanguine in accepting the inevitability of license agreements for electronic information. The growing use of license agreements is a cancer that is slowly killing the concepts of information ownership and "fair use," and there is nothing on the horizon that will adequately substitute for these key aspects of the current print-oriented publishing system.

Today, many licensed works are either secondary sources, such as indexes, or primary sources that are also available in print form. In the future, the proportion of primary sources that are only available in electronic form will grow, and it is important to realize that these works are unique and that demand for them may be inelastic and not subject to normal pricing pressures.[29]

Within the provisions of the copyright law, libraries should be able to provide scholarly electronic information to their users, share it through interlibrary loan procedures, and preserve it. Scholars should be able to reuse this information at least as freely as they do today for printed materials. Without ownership (or some acceptable legal substitute for ownership), this is not possible. Preservation is an especially troubling issue, because publishers cannot be trusted to preserve information once its economic value declines.[30]

Scholarly electronic information, especially primary source materials (e.g., journals and books), should be available at reasonable and predictable costs. If present trends continue, electronic information may be significantly more expensive to obtain than equivalent print information. Should this happen, libraries will purchase less, and, as electronic information begins to displace rather than complement print information, the overall electronic "holdings" of libraries will decline as will their ability to provide subsidized on-demand access to information stored on remote vendor systems. Publishers must make reasonable profits, but we should be wary about helping to build a brave new world of networked electronic information that will ultimately restrict-not expand-equitable access to scholarly information.

As currently structured, license agreements will not scale up well as electronic information becomes an increasingly important part of libraries' information provision activities. It is not easy to administer a few dozen license agreements, each with its own unique contractual

provisions; it will be harder to administer hundreds, thousands, tens of thousands, or more agreements. The development of "standard" license agreements may help to control this problem, but the use of these agreements will be at the discretion of publishers.[31] Marketplace pressures may help to ensure the use of such agreements; however, libraries will need to present a unified front to exert such pressure, resisting the temptation to comply in order to obtain "must have" items that are unavailable elsewhere.

When contemplating the complex issue of how to balance publishers' and the scholarly community's needs, it is important to realize that license agreements do address real publisher concerns. Selling networked electronic information is like selling air-you can bottle it and sell the bottles, but, once the air is out of the bottle, it is difficult to control its use without destroying its usefulness.[32] The challenge ahead is how to devise new technological tools and legal structures that can protect publishers without undermining the scholarly use of commercial information.

A National Information Infrastructure

The Internet and the NREN are really specialized subsets of a broader network, the National Information Infrastructure (NII), that will need to be developed to meet the nation's communication needs in the coming century.[33] There will be fierce competition among telecommunications, computer, cable, and other companies to play a key role in the development and operation of this network and to shape government policies to favor their interests.[34] There will be a similar struggle among publishing, television, film, software, and other companies to dominate information, entertainment, and other services on the emerging network. Since the long-term stakes are high, these corporations are likely to take a keen interest in government initiatives and regulations that relate to networking.

The Telecommunications Policy Roundtable, which has over 70 nonprofit organizations as members, has suggested seven principles to guide the evolution of the NII: 1) universal access, 2) freedom to communicate, 3) a vital civic sector, 4) a diverse and competitive marketplace, 5) an equitable workplace, 6) privacy, and 7) democratic policy making.[35]

It must be recognized that the explosion of scholarly activity on the Internet and other networks during the last few years occurred because many universities and colleges could afford to subsidize network access for faculty members and students, who are both information producers and consumers. If this ceases to be the case, the current network environment could be radically altered. List owners, electronic journal publishers, Gopher and WAIS providers, and others may be forced to reconsider whether they can continue to provide free or low- cost electronic information services. Users may need to reduce their network activities due to new access and service fees. The unique culture of sharing that has arisen in the network could be in jeopardy.

Universities and other nonprofit organizations will need to take vigorous and sustained action to ensure that the networking needs of the scholarly community are acknowledged and met during the gradual establishment of the NII.

Conclusion

If we act with imagination and determination, we have a historic opportunity to create a network-based scholarly electronic publishing system that meets the needs of academia and industry, involves a large and diverse group of noncommercial and commercial publishers, and provides a rich and equitable information environment. This is likely to be a lengthy and challenging process. To be successful, it requires

> An ubiquitous, technically sophisticated network infrastructure with cost structures that foster broad- based scholarly participation and allow small, noncommercial publishers to participate alongside of large, well-funded commercial publishers;

Continued experimental projects that explore new models of noncommercial publishing activity, develop more sophisticated public domain or low-cost electronic publishing tools, and lay the groundwork for future cooperative effort by universities and others (federal, foundation, and other grant-funding agencies can accelerate the development of scholarly electronic publishing through strategic investments in these projects);

The continued development of standards to enhance the functionality of electronic documents and to permit easy linkage and information interchange between heterogenous network-based electronic information systems;

Scholarly societies and university presses to make greater commitments to electronic publishing efforts;

Publishers to rethink how their economic interests can be fairly balanced with the needs of scholars and libraries; and

Libraries to collect, provide subsidized access to, and preserve electronic primary source materials that fall within the scope of their missions until such a time, if ever, that another social agency takes on this important role.

After decades of discussion, a promising new era of scholarly electronic publishing has finally arrived. It would be a serious mistake for scholars and librarians to do nothing and hope that the electronic publishing system that emerges will meet their needs. Rather, scholars and librarians should be change agents who help build a new network-based scholarly electronic publishing system. Now is time to debate existing models of electronic scholarly publishing, to devise new models, to develop prototype electronic publishing systems that reflect chosen models, and to influence the development of network infrastructures, services, and policies.

Notes

1. For additional sources of information about network-based electronic publishing, see: Charles W. Bailey, Jr., "Electronic Publishing on Networks: A Selective Bibliography of Recent Works," *The Public-Access Computer Systems Review* 3, no. 2 (1992): 13-20 (To retrieve this article, send an e-mail message that says "GET BAILEY PRV3N2 F=MAIL" to LISTSERV@UHUPVM1.UH.EDU.); and Charles W. Bailey, Jr., "Electronic Publishing on Networks: Part II of a Selective Bibliography," *The Public-Access Computer Systems Review* 5, no. 2 (1994): 5-14 (To retrieve this file, send the following e-mail message to LISTSERV@UHUPVM1.UH.EDU: GET BAILEY PRV5N2 F=MAIL). Both files are also available from the University of Houston Libraries' Gopher server: INFO.LIB.UH.EDU, port 70.

2. For a broad discussion of the future of commercial publishing, see: Donald T. Hawkins, et al., "Forces Shaping the Electronic Publishing Industry in the 1990s," *Electronic Networking: Research, Applications and Policy* 2 (Winter 1992): 38-60.

3. Czeslaw Jan Grycz, "Economic Models for Networked Information," *Serials Review* 18, no. 1-2 (1992): 11-14.

4. Miriam A. Drake, "Buying Articles in the Future," *Serials Review* 18, no. 1-2 (1992): 75-77.

5. Charles W. Bailey, Jr., "The Coalition for Networked Information's Acquisition-on-Demand Model: An Exploration and Critique," *Serials Review* 18, no. 1-2 (1992): 78-81.

6. Karen Hunter, "The National Site License Model," *Serials Review* 18, no. 1-2 (1992): 71-72, 91.

7. Sharon J. Rogers and Charlene S. Hurt, "How Scholarly Communication Should Work in the 21st Century," *College & Research Libraries* 51 (January 1990): 5-8.

8. Peter R. Young, "National Corporation for Scholarly Publishing: Presentation and Description of the Model," *Serials Review* 18, no. 1-2 (1992): 100-101.

9. Young, 101.

10. Jerome Yavarkovsky, "A University-Based Electronic Publishing Network," *EDUCOM Review* 25 (Fall 1990): 14-20. (I have used the term "University-Based Publishing System" to describe Yavarkovsky's unnamed system.)

11. "Task Force Report Looks at Future of Information Services," *Bulletin of the American Physical Society* 36, no 4 (1991): 1,105- 1,151. For further discussion, see: T. D. Schultz, "A World Physics Information System: An Online, Highly Interactive Discipline-Oriented Facility," *Serials Review* 18, no. 1-2 (1992): 45-48.

12. Stevan Harnad, "Interactive Publication: Extending the American Physical Society's Discipline-Specific Model for Electronic Publishing," *Serials Review* 18, no. 1-2 (1992): 58-61.

13. Vicky Reich, "Discipline-Specific Literature Bases: A View of the APS Model," *Serials Review* 18, no. 1-2 (1992): 52-54, 65.

14. Charles W. Bailey, Jr., "Network-Based Electronic Serials," *Information Technology and Libraries* 11 (March 1992): 29-35.

15. Ann Okerson, "The Missing Model: `A Circle of Gifts,'" *Serials Review* 18, no. 1-2 (1992): 92-96.

16. For an excellent overview of "fair use" and other copyright issues, see: L. Ray Patterson and Stanley W. Lindberg, *The Nature of Copyright: A Law of Users' Rights* (Athens: University of Georgia Press, 1991).

17. For speculations about network-based multimedia systems, see: Charles W. Bailey, Jr., "Intelligent Multimedia Computer Systems: Emerging Information Resources in the Network Environment," *Library Hi Tech* 8, no. 1 (1990): 29-41; and Stephen Bulick, "Future Prospects for Network-Based Multimedia Information Retrieval," *The Electronic Library* 8 (April 1990): 88-99.

18. High-speed, high-quality printing on demand is likely to be a key technology in the network environment. The following projects suggest the potential of this technology: Sally Taylor, "Primis Mover: McGraw-Hill's Revolutionary Custom Textbook System Comes of Age at Cal-San Diego," *Publishers Weekly* (13 January 1992): 24-25; and *CUPID Architecture Subcommittee, CUPID Protocols and Services (Version 1): An Architectural Overview* (Washington, DC: Coalition for Networked Information, 1992).

19. "Task Force Report," 1,137-1,138.

20. "Task Force Report," 1,137.

21. Timothy Stephen and Teresa M. Harrison, "Comserve: An Electronic Community for Communication Scholars," in *Scholarly Publishing on the Electronic Networks: The New Generation: Visions and Opportunities in Not-for-Profit Publishing: Proceedings of the Second Symposium*, ed. Ann Okerson (Washington, DC: Association of Research Libraries, 1993), 53-58.

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